CITY OF CASSELBERRY

STORMWATER, LAKES MANAGEMENT AND WATER QUALITY MASTER PLAN

AUGUST 2007

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CPH Project No: C1953

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Master Stormwater, Lake Management and
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EXECUTIVE SUMMARY

1. Purpose and Scope

The purpose of the Stormwater, Lake Management and Water Quality Master Plan is to analyze the conditions of the existing stormwater conveyance systems and lakes within the City and project a program for their maintenance, improvements and additions. Many of the stormwater management facilities within the City of Casselberry were constructed decades ago prior to the current requirements for water treatment and pollution abatement. Also because of their age, many facilities require maintenance or replacement to sustain their operability. The Plan summarizes previous studies and reports specifically in regard to recommendations for needed improvements to the City systems. The Master Plan also looks at possible proposed Total Maximum Daily Load (TMDL) limitations the City may be required to meet. Meeting TMDL requirements is likely to be a condition of the City's National Pollution Discharge Elimination System (NPDES) permit. Reduction of pollutant loadings to the City's lakes will improve their water quality and subsequently their aesthetic appeal and functionality for recreation.

This Master Plan sets forth proposed capital and operating expenses for the ten-year period from Fiscal Year (FY) 2008 though FY2017 and financing alternatives to fund those expenses.

This Master Plan is a "Planning Level" Engineering Study of the City's facilities and is written for the purpose of providing guidelines and recommendations to the City for effectively developing and operating the stormwater and lake management programs and facilities.

2. Previous Studies and Reports

On June 7, 1993, the City of Casselberry created a Stormwater and Lake Management Utility based on recommendations in a 1992 Stormwater and Lake Management Utility Report. The primary purpose of the 1992 Report was primarily to establish the Stormwater Utility and adopt a monthly fee for each property in the City to fund stormwater and lake management systems operating, maintenance and capital improvements costs. No increases to the fee, first set in 1993, have been made. Basin studies for Howell Creek, Gee Creek and the Little Econlockhatchee River, which include portions of the City of Casselberry, have been conducted by various consultants for Seminole County. These basin studies primarily investigated the hydraulic carrying capacity of the stormwater systems in each basin with regard to their ability to eliminate or reduce flooding. Very little attention has been given to water quality in these reports. Recommendations for proposed capital projects were made in these studies, but not all have been implemented.

The City has been monitoring the water quality of twelve City lakes since 1993. In October 1997, the Lake Water Quality Report was issued, summarizing the overall water quality of each lake. Overall, the water quality ranged from Fair to Excellent, with more of the analyzed lakes in the "Good" category. The report also contained recommendations for the sampling program that have since been incorporated.

Two other reports, one for the City and the other for the County, as a whole, investigated the sources and quantities of pollutants to the various lake systems. The report written for the City contained a number of recommendations for improvements specific to the City, ranging from

public education to capital improvements for pollutant reduction. The majority of these recommendations have been addressed. Others are carried forth in this document.

3. NPDES Requirements

As a co-permittee with Seminole County and the other cities within the county, the City of Casselberry is required to implement a Stormwater Management Program (SWMP) on a county-wide basis. Requirements of the SWMP include maintaining an updated inventory of the stormwater system infrastructure and inspection and maintenance of those elements on a regular basis. The City is also required to provide public education, enact ordinances and ensure that operation and maintenance procedures are in place to reduce pollutant loadings to its surface waters and ground waters. The City also must have in place inspection, reporting and enforcement procedures to identify and control illicit discharges to surface waters from businesses and private parties within the City. Most of these procedures are already in place. Annual reports are required summarizing these procedures and activities.

4. TMDL Requirements

Lake Jesup, to which the majority of the City of Casselberry is tributary, has been designated as an impaired water body, which means that it does not meet water quality standards set for its proposed use for recreation and propagation of wildlife. As a result, the State of Florida must set TMDL restrictions for the water body. Pollutant loadings from drainage basins tributary to Lake Jesup have been analyzed, and those not meeting standards are also placed on the *Impaired List.* Waterbodies on the *Impaired List* must be further analyzed, verified by the U.S. Environmental Protection Agency (EPA) and TMDLs set. TMDL is the maximum allowable load of a single pollutant which a body of water can receive on an average daily basis and still meet water quality standards. TMDLs will be set by the Florida Department of Environmental Protection (FDEP). Once adopted, a Basin Management Action Plan (BMAP) must be developed and implemented to reduce loadings to the established levels. In addition to Lake Jesup, Howell Creek and Crane Strand Drain are waterbodies on the *Impaired List* that receive flows from areas within the City of Casselberry. Gee Creek was also on the list, but further studies indicate that the water quality parameters do not warrant establishment of TMDLs at this time. However, since Gee Creek is directly tributary to Lake Jesup, reductions of pollutant loadings within the Gee Creek Basin will help to improve the water quality of Lake Jesup and may be useful in offsetting loadings from other basins, specifically Howell Creek.

5. Lakes Management Plan

The City continues to contract for quarterly water quality sampling, analysis and reporting in those lakes with public access. Additionally, the City has an FDEP permit and an ongoing contract for aquatic plant control plan in the majority of the same lakes. Review of both of these programs is ongoing. No changes appear to be needed to the sampling program, but continuing complaints of the overabundance of nuisance aquatic plants, primarily hydrilla, indicate that an increase in that program is necessary.

The City has formed a Lakes Management Advisory Board (LMAB) consisting of lakefront property owners, other City residents and representatives of the State agencies concerned with lake management and water quality. The LMAB's mission is to provide input to City staff on lake management issues. In conjunction with this board, a survey was sent to other lakefront property owners to solicit their opinions on the quality and use of the City lakes. Many of the respondents use the lakes for fishing and/or boating, while others just enjoy their aesthetic value. Most of the users did feel that the number of aquatic plants in the lakes interfered with

those activities. Many felt that muck and silt in the lakes was a problem, as well as clarity of the lake water. The quarterly lake water quality monitoring does not indicate that the amount of muck and silt in the lakes are a problem, nor are their clarity.

Another issue is the preponderance of nuisance and invasive plant species along the shoreline of most lakes. The Public Works Department has begun replacing these nuisance species in Lake Concord with more attractive, beneficial species that can also remove pollutants. It is proposed to expand this shoreline revegetation program to other lakes where the City has access to the shoreline.

6. Capital Improvements Plans

The Stormwater, Lake Management and Water Quality Master Plan provides a summary of recommended improvements from previous reports, requirements of regulatory agencies and infrastructure capacity and maintenance needs. Five-year and ten-year capital improvements plans (CIP) are proposed to meet those needs and requirements.

The capital improvements plans consist of projects or expenditures that can be grouped into five categories. For the more comprehensive Ten-year CIP, the projects may be summarized as follows:

A. Baffle Boxes (debris and sediment removal) – 14 projects totaling $2,310,000;
B. Other Water Quality Projects (aeration, shoreline revegetation, treatment) – 11 projects totaling $2,464,000;
C. Pipe Lining (for infiltration or structural rehabilitation) – 21 projects totaling $2,767,000;
D. Drainage Improvements (to prevent localized flooding) – 6 projects totaling $752,000; and
E. Facility and Equipment Replacements (vehicles, equipment and building) – 10 “projects” for a total of $860,000.

All told, the proposed Ten-year CIP contains projects for an estimated total expenditure of $9,137,000, or an average of $913,700 for each of the ten years 2008 through 2017.

7. Financing Alternatives

The current Stormwater Utility operational and maintenance budget is reviewed for adequacy of personnel and budget to meet operational and maintenance requirements for day to day activities. Various financing alternatives are reviewed to meet the Operation, Maintenance and Capital Improvements Plan requirements. No proposed capital projects are of a large enough scope to justify issuance of bonds or procurement of loans. The City of Casselberry’s Stormwater Utility Fee has not been increased since its inception in 1993 and is currently less than half the average rate for other municipalities in Central Florida. A fee increase is proposed that will fund the Stormwater Utility, including the Capital Improvements Plan, through the ten-year planning period and still be competitive with other surrounding cities.

8. Summary and Recommendations

The major recommendations of this Master Plan are:

A. Adopt the Five-year and Ten-year Capital Improvements Plans contained herein,

B. Implement an immediate Stormwater Utility Fee increase from $2.90 to $7.00 per month per Equivalent Residential Unit (ERU) and perform periodic budget and rate reviews to ensure provision of adequate funding for the proposed Capital Improvements Plans, as well as annual operating and maintenance costs.
C. Investigate and apply for grant funding for eligible projects.
D. Adopt the proposed Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Study (FIS) by ordinance.
E. Ensure compliance with all requirements and required actions of the NPDES permit including maintenance of activities databases and public education.

In order to comply with the NPDES permit as stated above, the following recommendations are made:

A. Adopt an ordinance to prohibit yard and other wastes from being blown or placed in paved areas where it can be easily carried to waterbodies,
B. Further investigate Water Quality Credit Trading for compliance with TMDL reduction goals,
C. Expand storm inlet marker program;
D. Require training of private contractors working in the City regarding disposal of waste materials including lawn clippings and leaves, fertilizers, herbicides, paints and other household hazardous wastes;
E. Support and publicize Amnesty Days;
F. Approach schools and service organizations as well as private individuals for assistance in:
    - The lake water quality monitoring program,
    - Lake Management Advisory Board,
    - Stakeholders meetings,
    - Watching for illicit dischargers,
    - Lake and stream cleanups,
    - *Adopt-A-Highway,*
    - *Watershed Action Volunteers;*
G. Strengthen language in the City Code with regard to specific penalties for violations of illicit discharging;
H. Continue public education and strengthen public involvement in detection and reporting of illicit dischargers;
I. Designate a central reporting point and maintain of a log of reports, responses and enforcement of illicit discharges;
J. Conduct training of personnel on inspection, detection and reporting procedures;
K. Include language in Development Review Committee comments, the City's standard specifications and the Engineering Permit that notify the contractor of the requirements for the NPDES generic permit for construction activities.
L. Include in the City's Unified Land Development Regulations (ULDRs) a listing and brief descriptions of stormwater Best Management Practices contained herein and in EPA literature (including its website) and elsewhere to reduce runoff volumes and improve downstream water quality.
M. Adopt standardized checklists for annual and biennial inspections of stormwater system components to ensure that all items are inspected and/or maintained.

SECTION 1

INTRODUCTION

1.1 Background

A Stormwater and Lake Management Utility Report was prepared in 1992 for the City of Casselberry in conjunction with the formation of the stormwater utility. The purpose of the 1992 Report was to identify general categories of operating and maintenance costs and capital improvements costs in order to establish the basis of a Stormwater Utility. On June 7, 1993, the City of Casselberry created a Stormwater and Lake Management Utility with the passage of Ordinance No. 759. The ordinance has since been codified as Article V of Part II of Chapter 86 of the Casselberry Code of Ordinances.

Since 1992, key legislation and stormwater discharge requirements have been implemented by the Federal and State governments. The Environmental Protection Agency (EPA) has applied the National Pollution Discharge Elimination System (NPDES) to the stormwater systems of the communities of the United States, requiring the City of Casselberry to obtain an NPDES Permit, which it has in conjunction with the other cities of Seminole County and the county itself. The State of Florida is currently in the process of evaluating Total Maximum Daily Loads (TMDLs) requirements for all water bodies in Florida. The City of Casselberry lies within several sub-basins of the Middle St. Johns River Basin, which the Florida Department of Environmental Protection (FDEP) is currently evaluating to establish its TMDLs.

In addition to the regulatory issues, there have been significant changes in the technology used to clean stormwater and there are more treatment techniques available and acceptable to the regulatory agencies. The regulatory agencies are also requiring new operations and maintenance procedures by the Cities to assist in the clean-up of impacted water bodies. These procedures include, but are not limited to, street sweeping, public education, swale maintenance, pond maintenance and trash removal systems.

1.2 Need for the Master Plan

Like most municipalities in Florida, the City of Casselberry has developed from a varied mix of residential and commercial developments, with a spattering of light industry. Many of these developments were constructed prior to the current rules and regulations requiring abatement and treatment of stormwater runoff. Much of the existing stormwater conveyance piping is corrugated metal pipe (CMP) which, due to its age, has corroded to the point of allowing groundwater and the surrounding soils to infiltrate. Some CMP has also corroded to the point of potential structural failure. A Master Plan is needed to efficiently plan for improvements and maintenance activities that will maintain both the older and the newer infrastructure in good working order.

Also like most of Central Florida, Casselberry is dotted with many lakes and streams. Because of the lack of stormwater treatment in the older areas of development, many of the lakes are no longer pristine water bodies. In addition, recent regulations promulgated by both Federal and State regulatory agencies are aimed at requiring reductions in pollutant loadings to these waterbodies. A Master Plan is needed to plan for improvements and maintenance activities to improve the quality of the water bodies within the City of Casselberry.

1.3 Scope and Limitations

In preparation of this Master Plan, review was made of previous drainage basin studies, pollutant load analyses, lake water quality reports, current rules and regulations, and specific infrastructure needs within the City of Casselberry and its immediate vicinity. This study presents a long-range plan to make the capital improvements necessary on the City's stormwater and lake management systems. It includes discussion on phasing, financing, and flexibility that will provide general information and guidance to the City as the systems are developed.

The recommended phasing of the projects presented in this plan provides a starting point for reexamination of the City's Stormwater Utility Fees. Although the phasing of the proposed improvements is based on a prioritization methodology contained herein, improvement timing will depend on the actual needs at various times in the future, and the financing techniques available at those times.

The opinions of probable cost presented in this report are only to planning level accuracy. Costs of all future systems are projected at an average unit cost (for given sizes) without regard to specific details such as differing site conditions, soils, headwalls, inlets, appurtenances, etc. The estimated project costs for items such as surveying, soils testing, engineering, legal, and administrative, are included in the cost figures.

1.4 Purpose of This Plan

The purpose of this Master Plan is to analyze the conditions of the existing stormwater management systems and lakes within the City and project a program for their maintenance, improvements and additions. The Plan includes a physical evaluation of the stormwater conveyance systems, preliminary locations of additional needed facilities, and a description of techniques that may be appropriate for implementation of the program described by the Plan.

This Master Plan is a planning level engineering study of the City's facilities and is developed for the purpose of providing guidelines and recommendations to the City for developing and operating effectively, stormwater and lake management programs and facilities.

SECTION 2

SERVICE AREA, POPULATION AND LAND USE

2.1 Service Area

The Service Area for this Stormwater, Lake Management and Water Quality Master Plan is the City Limits of the City of Casselberry as shown in Exhibit 2-1. There are 4,664 acres, or 7.3 square miles in the incorporated area.

2.2 Geographic Location

The City of Casselberry is located in South Seminole County, in Central Florida, and is about 10 miles north of the City of Orlando. The Cities of Winter Park and Maitland in Orange County border Casselberry to the south along with the unincorporated Fern Park area. The City of Longwood neighbors Casselberry to the northwest with the City of Winter Springs to the north and northeast. Unincorporated Seminole County borders the City on and off from the southeast to the southwest. The City is served by two main highways, US Highway 17-92 generally south to north and State Road 436 west to southeast, with other county roads also providing access to the city.

2.3 Population

Population data is given only to provide information on the relative size, density and the growth patterns of the City. Population figures have little to do with the amount or severity of stormwater flows. According to the 2005 census, the population of the City of Casselberry is approximately 24,899.

2.4 Land Use and Development

The planning area is primarily residential with commercial corridors and light industrial. Land use is established in the City of Casselberry Comprehensive Plan. Exhibit 2-2 is the current zoning map for the City of Casselberry. In general, current zoning classifications are as follows:

- CG, CS – Commercial
- I – Industrial
- OR – Office Residential
- PMX – Planned Mixed development, High or Low density
- PS – Public Service
- ROS – Recreation and Open Space
- R-12.5, -9, -8, -2F, RMH – Low Density Residential
- RMF – High Density Residential
- PRD – Planned Residential Development

A copy of the current Future Land Use Plan is included as Exhibit 2-3. Although in-fill projects and redevelopment are anticipated, comparison of these two exhibits shows that little change to the land use and resulting impervious areas within the City is anticipated. All major new projects will have to provide stormwater facilities in accordance with current land development regulations.

2.5 Climate

Seminole County climate is typically subtropical with generally long humid summers and mild winters that are not commonly humid. The heaviest rainfalls are from June to August with an annual average rainfall of 51 inches. April and May are generally dry months with a high irrigation demand. Irrigation demand is also high during Spring and early Summer due to the unusually high evapotranspiration rate in Florida.

2.6 Topography and Drainage

The City of Casselberry is relatively flat with an elevation range of 50 to 90 NGVD. With many lakes around the area, and sandy soil conditions, the drainage is generally considered good. The City of Casselberry lies predominantly within the Lake Jesup drainage basin that flows to the St. Johns River. Within the overall Lake Jesup Basin, the City lies within the Gee Creek, Howell Creek, Little Econlockhatchee (Little Econ), and Soldiers Creek sub-basins as shown in Figure 2-4. Each of these basins encompasses approximately the following portions within the City Limits:

- Gee Creek – 3,157 acres, or 67.7 percent;
- Howell Creek – 1,252 acres, or 26.8 percent;
- Little Econ – 194 acres, or 4.2 percent;
- Soldiers Creek – 63 acres, or 1.3 percent;

These basins will be discussed in greater detail later in this Master Plan.

2.7 Surface Waters

As mentioned above, there are many lakes in or adjacent to the City of Casselberry. The twelve most notable, that are periodically sampled for water quality and other parameters are Lake Concord, Lake Kathryn, Queens Mirror, Secret Lake, Lake Yvonne, Lake Griffin, Lost Lake, Middle Lake Triplet, North Lake Triplet, South Lake Triplet, Grassy Lake and Trout Lake. The City also borders Lake Howell to the north and west. All surface waters in the area are designated as Class III, which are suitable for recreation and for the propagation of fish and wildlife.

2.8 Soils

Soils have been mapped by the Soil Conservation Service of the U.S. Department of Agriculture. Because most areas of the City have been developed, the predominant soil group is Urban Land–Astatula-Apopka, followed by Urban Land–Tavares–Millhopper. A small area of Myakka-EauGallie-Urban Land is present at the southern end of the City. “Urban Land” is typically covered 50 to 85 percent or more by buildings, concrete, asphalt and the like such that the natural soil can not be observed. The other soil types listed were predominant but have been altered or obscured so that identification is no longer feasible.

Stormwater runoff and water quality can significantly be affected by the character and conditions of the surficial deposits, ground cover and underlying formations. In general, in respect to runoff and/or infiltration rates, the Soil Conservation Service has classified each soil series into four hydrologic soil groups designated as “A”, “B”, “C”, and “D”. These soils series are distinguished by their infiltration rates and runoff potential. For example, Group “A” soils are characterized by

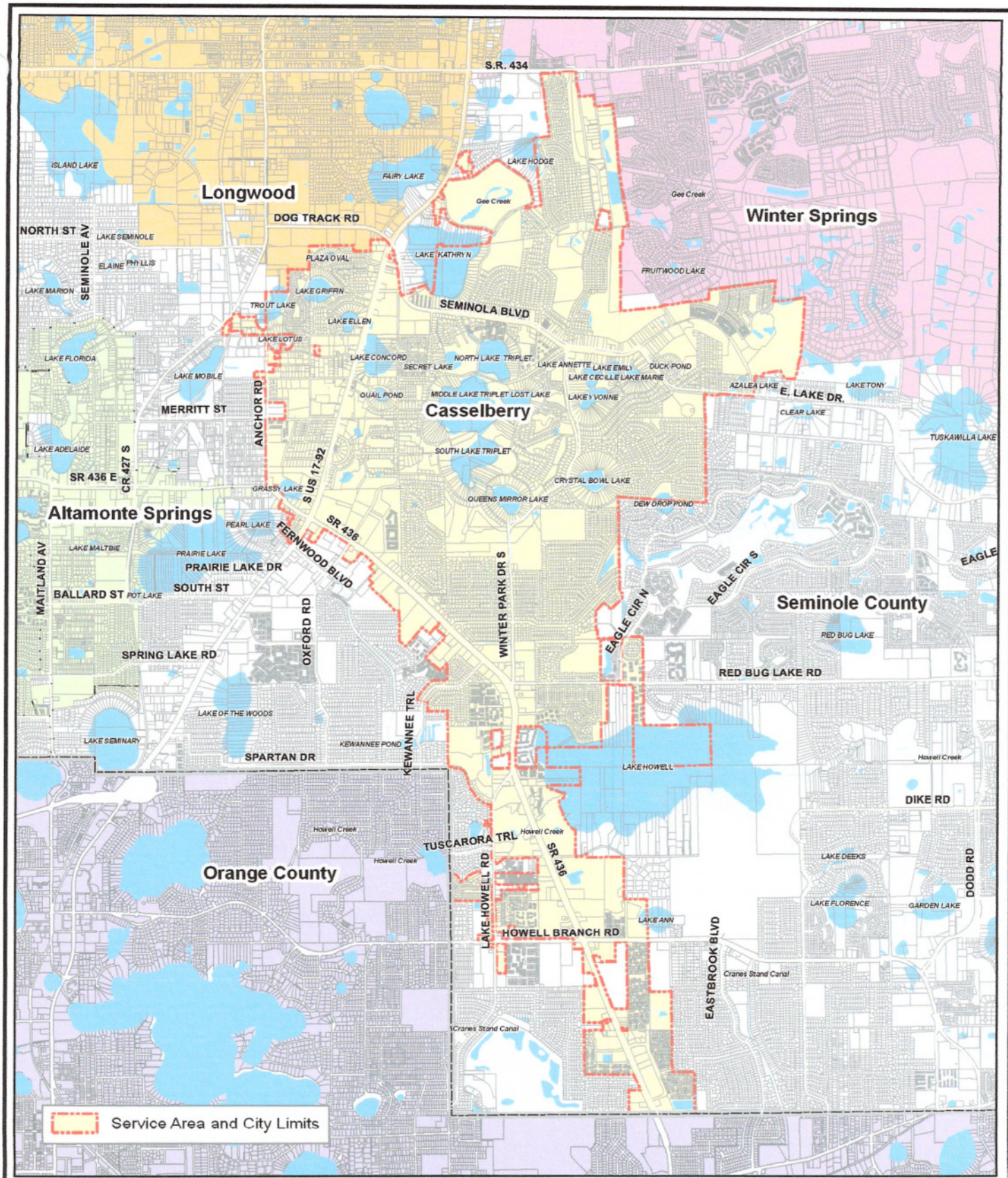
high infiltration rates and low runoff potential while Group “D” soils have a very low infiltration rate and high runoff potential. Of the different soils types in the City of Casselberry, Tavares, Millhopper, Astatula and Apopka sands are highly permeable, belonging to Group “A”. The Myakka-EauGallie soils are of Group “B/D” because they tend to have high groundwater tables within a foot of the surface during the wet season.

2.9 Ecology

Wetlands border the surface water bodies in and around the City and several larger wetland areas are located adjacent to developed areas. No encroachment on existing wetlands is proposed or anticipated. The area has residential, institutional, and commercial/industrial development. There are no prime or unique farmlands or plant and animal communities as this is a well-developed area and a long-standing city. Outside the city limits, there are isolated areas that are still rural in nature.

2.10 Flood Plain

The City of Casselberry has areas that are in minimal flood zones. The majority of these are areas within the 100-year flood plain, and are typically confined to the areas immediately adjacent to the many water bodies and wetlands within Casselberry service area. The flood-prone areas have historically been shown on Flood Insurance Rate Maps (FIRMs). The most recent version was effective April 17, 1995. The Federal Emergency Management Agency (FEMA) has since began a program of map modernization, updating the 1995 series with additional data and converting to digital maps (DFIRMs) available interactively on their website and locally on the Seminole County website (http://www.seminolecountyfl.gov/pd/building/flood/firm.asp). The modernization review process has been completed, with the Letter of Final Map Determination issued in March 2007. The effective date of the DFIRMs and Flood Insurance Study (FIS) is set as September 28, 2007. Between March and September 28, 2007 is a 6-month compliance period for the “Communities” (of which the City of Casselberry is one) to adopt the DFIRMs and the FIS. Copies of preliminary DFIRM panels 155, 165, 170, 255 and 260 each containing portions of the Casselberry City Limits are included in Appendix A.



cph	Scale: 1" = 4000'	SERVICE AREA	Exhibit 2 - 1
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	Photo Date: N/A	SEMINOLE COUNTY, FLORIDA	
	Project No. C1953		
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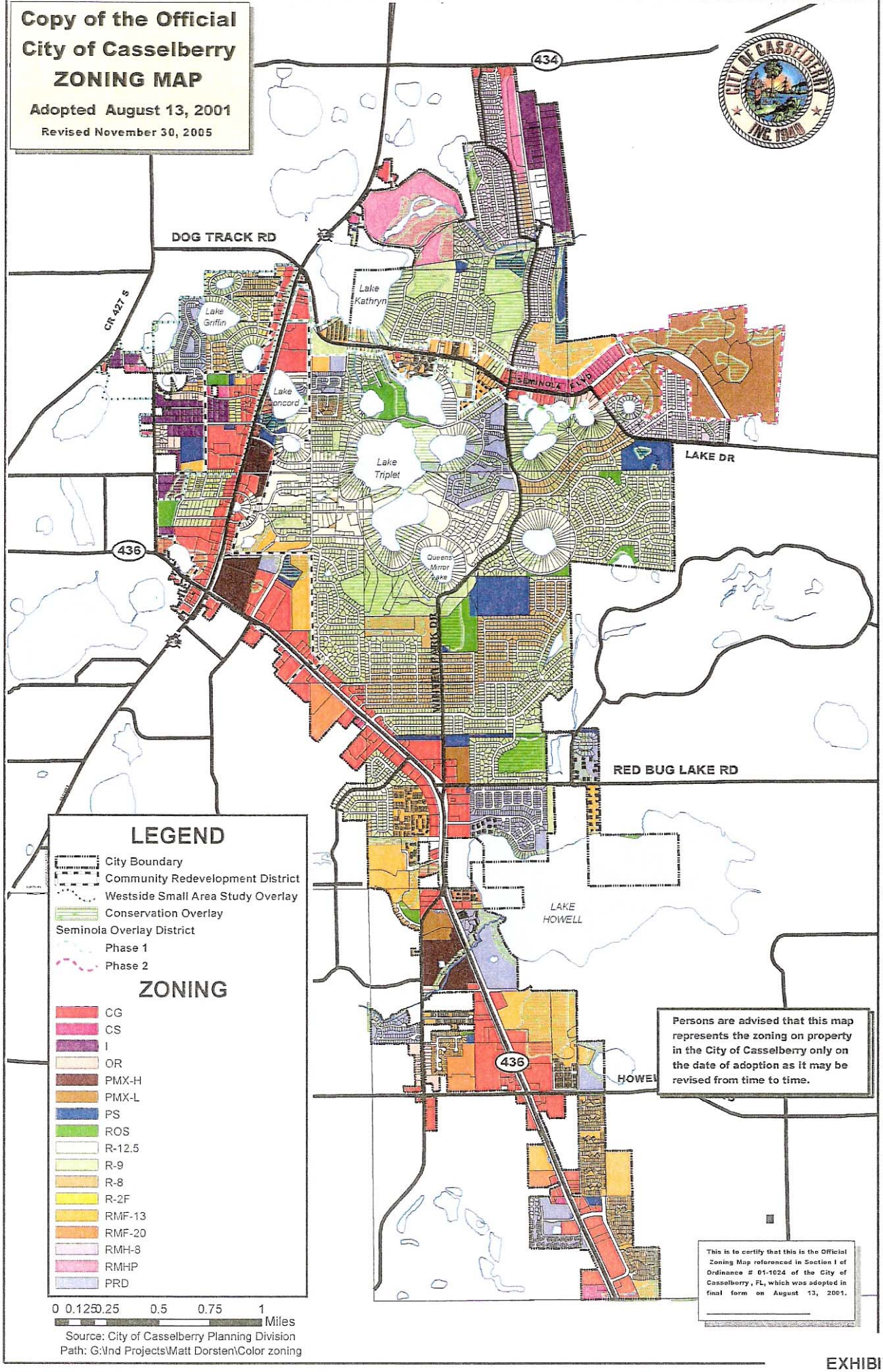
Copy of the Official
City of Casselberry
ZONING MAP
Adopted August 13, 2001
Revised November 30, 2005
434
DOG TRACK RD
CR 427 S
Lake Griffin
Lake Kathryn
Lake Concord
Lake Triplet
Queens Mirror Lake
SEMINOLA BLVD
LAKE DR
436
WINTER PARK DR
RED BUG LAKE RD
LAKE HOWELL
HOWELL
LEGEND
City Boundary
Community Redevelopment District
Westside Small Area Study Overlay
Conservation Overlay
Seminola Overlay District
Phase 1
Phase 2
ZONING
CG
CS
I
OR
PMX-H
PMX-L
PS
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R-8
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RMF-13
RMF-20
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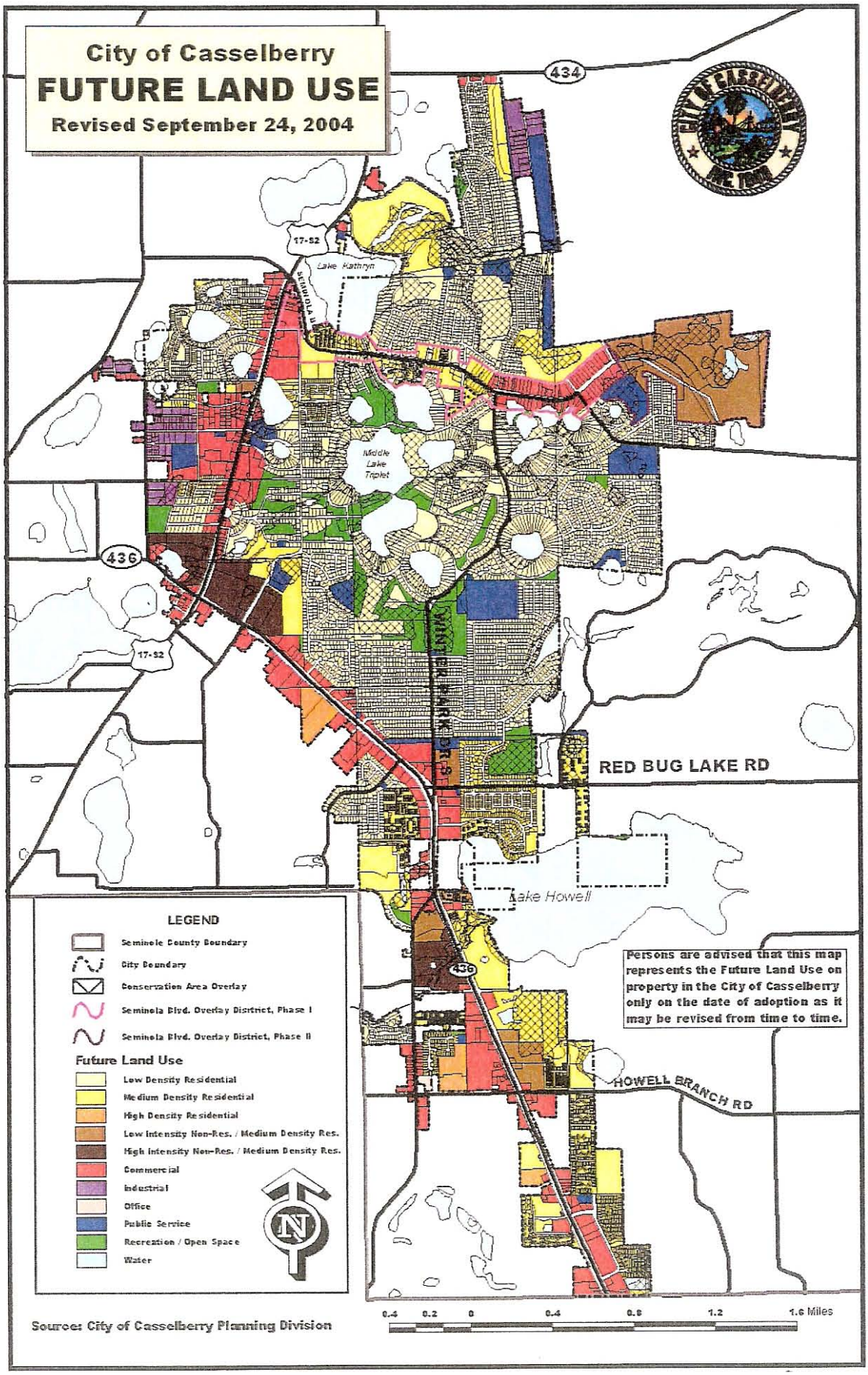
Miles
Source: City of Casselberry Planning Division
Path: G:\Ind Projects\Matt Dorsten\Color zoning
Persons are advised that this map represents the zoning on property in the City of Casselberry only on the date of adoption as it may be revised from time to time.
This is to certify that this is the Official Zoning Map referenced in Section I of Ordinance # 01-1024 of the City of Casselberry, FL, which was adopted in final form on August 13, 2001.

EXHIBIT 2-2


City of Casselberry
FUTURE LAND USE
Revised September 24, 2004
434
17-92
Lake Kathryn
SEMINOLA BLVD
Middle Lake Triplet
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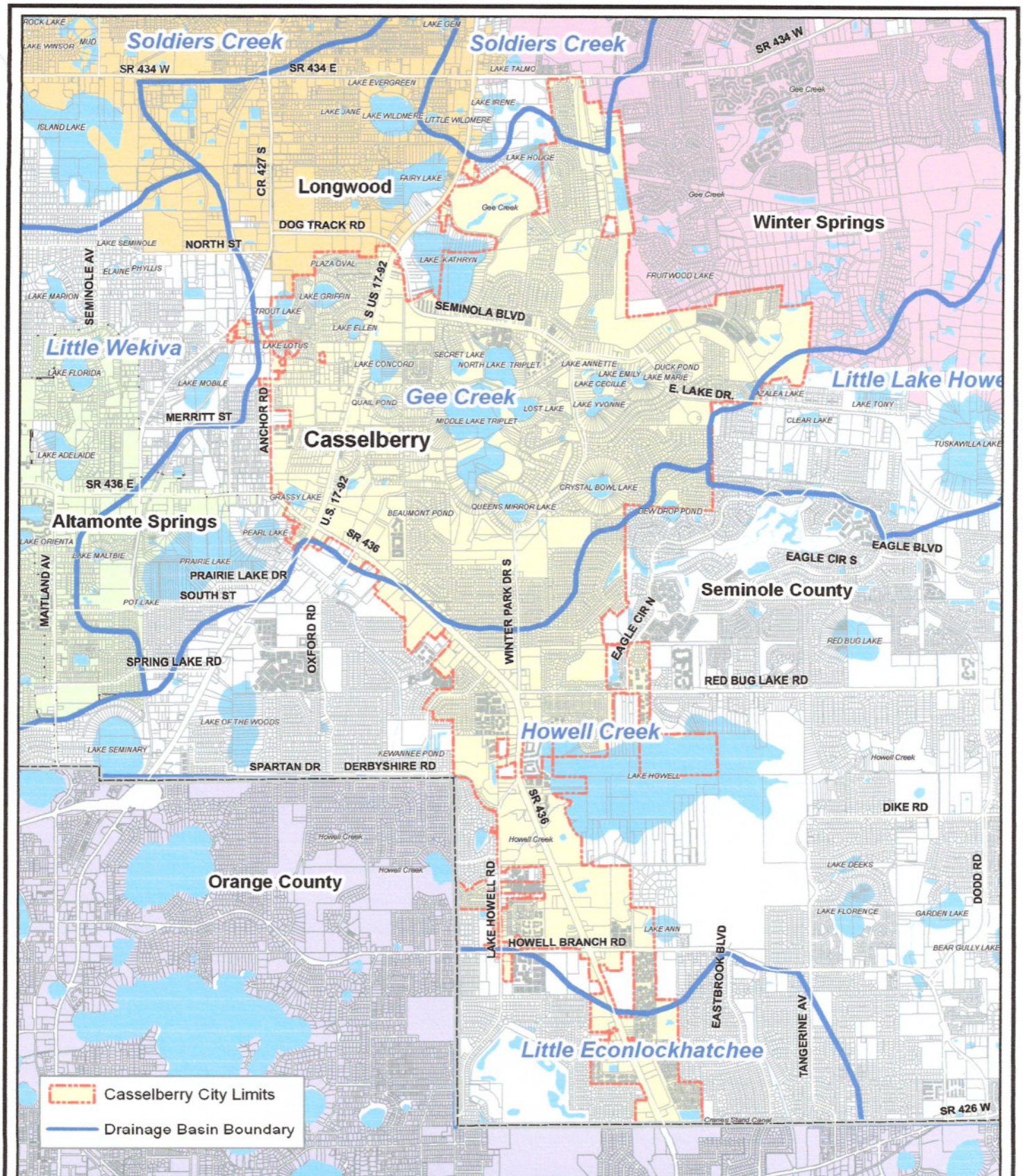
WINTER PARK DR
RED BUG LAKE RD
Lake Howell
436
HOWELL BRANCH RD
LEGEND
Seminole County Boundary
City Boundary
Conservation Area Overlay
Seminola Blvd. Overlay District, Phase I
Seminola Blvd. Overlay District, Phase II
Future Land Use
Low Density Residential
Medium Density Residential
High Density Residential
Low Intensity Non-Res. / Medium Density Res.
High Intensity Non-Res. / Medium Density Res.
Commercial
Industrial
Office
Public Service
Recreation / Open Space
Water
N
Persons are advised that this map represents the Future Land Use on property in the City of Casselberry only on the date of adoption as it may be revised from time to time.
0.4 0.2 0 0.4 0.8 1.2 1.6 Miles
Source: City of Casselberry Planning Division

EXHIBIT 2-3



cph	Scale: 1" = 2000'	N	DRAINAGE BASIN MAP
	Date: August 2007		CITY OF CASSELBERRY STORMWATER MASTER PLAN
	Photo Date: N/A		SEMINOLE COUNTY, FLORIDA
	Project No. C1953		Exhibit 2 - 4
	PM: BG		

CHAPTER 3

BACKGROUND

3.1 Previous Basin Studies

In order to assess the stormwater management system currently serving the City of Casselberry in Seminole County, FL, previous stormwater planning documents were studied for the following drainage basins; Gee Creek, Howell Creek, and Little Econlockhatchee. According to the previous studies listed above, there are plans for improvements and upgrade projects throughout the City of Casselberry, as well as in Altamonte Springs, Winter Springs, Longwood and Maitland, that may possibly impact the water quality of Casselberry. The three major drainage basins within the City of Casselberry are shown in Exhibit 2-4, as well as Soldiers Creek which encompasses a small portion of the Timberlane Trail/Belle Avenue area in the northern part of the City.

3.1.1 "Gee Creek Basin Engineering Study and Drainage Inventory"

The study of Gee Creek Basin was prepared for Seminole County by Singhofen & Associates, Inc. in December, 1996 to evaluate deficient drainage facilities and determine necessary improvements in order to meet the Level of Service (LOS) standards. Gee Creek flows for a distances of about 3.75 miles, northeasterly from Lake Kathryn (headwaters) to Lake Jesup (outfall). The discharge waters of numerous lakes in the Casselberry area converge with Lake Kathryn including; Fairy Lake, Trout Lake, Lake Griffin, Secret Lake, Prairie Lake, Pearl Lake, Grassy Lake, Queens Mirror, Triplet (North, Middle, and South), Marie, Emily, Annette, Cecille, Yvonne, and Lost.

The 7,808 acre Gee Creek drainage basin consists of 21 percent wetlands and 79 percent uplands, and was divided into thirteen sub-basins in this particular study: Gee Creek, Cross Creek, Noname Creek, Mosswood Creek, Greyhound Outfall, Winter Park Drive Ditch Outfall, Lake Hodge (Lake Kathryn lake systems), Triplet Lakes, Secret/Concord Lakes, Prairie Lake Outfall, Trout/Griffin Lakes, Wildmere/Fairy Lakes, and Columbus Harbor Outfall. A map of the Gee Creek Basin with each sub-basin boundary can be found in Appendix B, Figure 1.2. Each sub-basin was then assessed for possible improvements needed for the existing stormwater management system and drainage structures that do not meet the criteria set forth by the County's Level of Service (LOS). The four Seminole County service levels are:

- LOS A - Flow contained within system
- LOS B - Water contained within the Right-of-Way
- LOS C - Water contained within the property
- LOS D - Structure (building) flooding

The LOS is based on the basin's hydraulic performance and the impact flood stage and duration of storms has on hydraulic elements that could result in damage to property and affect public safety. Hydraulic elements include culverts, storm sewers, channels, and ponds.

In the study, 161 channel cross sections were surveyed, and 6 additional cross sections identified from topographic maps were studied. 122 structures were field surveyed, and 163 additional structures identified from previous studies were surveyed. Although Gee Creek encompasses areas in the City of Altamonte Springs, the City of Longwood, the City of Winter

Springs and the City of Casselberry, the focus in the section is solely on the City of Casselberry. A table exhibiting the proposed capital improvements program prepared by Singhofen & Associates, Inc. in 1996 can be seen in Appendix B, Figure 6.1 & Table 6.1.

3.1.1.1 Gee Creek Sub-Basin

Gee Creek Sub-Basin covers an expansive, 1,416 acre region from Lake Kathryn to Lake Jesup (its outfall). Runoff from this sub-basin is conveyed through an interconnected lake system that discharges to the headwaters of Lake Kathryn. Upstream of Laura Street is a weir that controls discharge form Lake Kathryn. Stormwater runoff is also directly discharged into Gee Creek and controlled and treated by a storm sewer system, overland sheet flow, tributaries and channels, and retention/detention facilities. According to hydrologic studies conducted in Gee Creek Sub-Basin, the streets of a mobile home community adjacent to Lake Kathryn, near its outfall will flood under all storm events that were analyzed. The weir that is intended to control the peak stages in Lake Kathryn is located in Casselberry. The 1996 report does not discuss any specific recommendations for this sub-basin.

3.1.1.2 Greyhound Outfall Sub-Basin

There are two depressional wetlands interconnected by culverts and swales which receive stormwater runoff from the Greyhound Outfall Sub-Basin and act as storage and conveyance systems for the area near the former Seminole Dog Track to northwest of Gee Creek. This is one of the larger sub-basins in the Gee Creek Basin covering 426 acres and located east of Winter Park Drive. Stormwater runoff from the residential areas of the sub-basin is treated by detention/retention ponds before discharging into the lower wetland. Parts of Seminola Boulevard also discharge to the lower wetland. The sources of discharge into the upper wetland are the City of Casselberry, east of Duck Pond, Seminola Boulevard, and the former Seminole Dog Track. The former dog track property is currently being redeveloped as the primarily residential Legacy Park.

Some existing structures surveyed in this study were recommended for clean out because of blockage due to debris, packed dirt and vegetation. A 32 percent to 52 percent reduction in flow capacity is a result of the blockage. However, the structures were considered to be in good condition.

The study states the structures at Seventh Street have since been cleaned out and existing twin 24-inch corrugated metal culverts were replaced by the City of Casselberry with triple 36-inch reinforced concrete pipe (RCP).

Runoff along Lake Drive ultimately contributes to the large detention pond located and maintained by the City of Casselberry east of Duck Pond. There are several other lakes and ponds along the intersection of Lake Drive and Park Drive. Many of the small retention areas serve Sterling Oaks and Spicewood and there is a small lake servicing All Faiths Cemetery. Although a detailed study was not performed in this area, the report states the possibility of inundation of sections of Lake Drive when assessing stormwater routing. The study recommended performing a detailed study and assessment of storm infrastructure to assess the actual flooding potential and need for improvement along Lake Drive. Although Lake Drive itself is a County road, the properties adjacent to it in this area are within the City and justify further study to address drainage issues.

3.1.1.3 Winter Park Drive Ditch Outfall Sub-Basin

Storm sewers and surface flow govern surface runoff in this 117 acre sub-basin located west of Winter Park Dr. However, 4 percent of the sub-basin is wetlands which act as storage and conveyance systems. The runoff from the eastern portion of the sub-basin discharges directly into Gee Creek.

According to the basin study, the culvert at Cross Street is deficient. The flow capacity has been reduced by 26 percent due to debris and other material; the headwall is broken and part of the pipe is bent. However, the remaining structures were considered to be in good condition, and under all storm events Winter Park Drive Ditch Outfall and the wetlands outfall were contained within the system.

The study recommended cleaning out and maintaining the culvert at Cross Street. This is an on-going City maintenance item.

3.1.1.4 Lake Hodge Sub-Basin

Lake Hodge Sub-Basin is located near the intersection of S.R 17-92 and S.R. 434 with surface runoff being directed by a storm sewer system, retention/detention facilities, and overland flow to Lake Hodge and Lake Irene. Lake Irene covers 49 percent of the 163 acre sub-basin while Lake Hodge covers the rest of the sub-basin; however the lakes are not interconnected. Lake Hodge overflows to Gee Creek under severe circumstances. The flood stages of some secondary drainage facilities in the City of Casselberry are reported to impact adjacent residential neighborhoods.

There is currently no outfall structure for the Lake Hodge outfall. The outfall area which was once undeveloped is now developed with single and multi-family homes. The outfall has been incorporated into conservation easements throughout the residential lots locate on the east side of Laura Street. It became apparent flooding was an issue when the City of Casselberry reported flooding of “at least two homes” (between Lots 10 and 11) to Seminole County. According to the report the two homes had swales with improper grading. A figure exhibiting the Lake Hodge Outfall easement can be found in Appendix B, Figure 4.8.

Another flooding issue in the City of Casselberry was at Lake Hodge Park. It was reported that secondary storm structures serving residences adjacent to the park were being adversely affected by the flood stages. It was concluded by a County survey that in order for Lake Hodge to discharge to Gee Creek, the lake must have an elevation of 56.1 feet. [During the hurricane season of 2004, the park flooded to such an extent it had to be closed] The proposed correction of this deficiency is shown in Appendix B, Table 6.1, as follows:

- Short-Term – Recommendations were to regrade the outfall swale along Laura Street and install driveway culverts to provide positive outfall to Gee Creek near bridge. This work has been completed.

- Long-Term – It was recommended to construct an outlet drop structure consisting of an FDOT Type “D” inlet at Lake Hodge and approximately 1,150

linear feet of 18-inch CMP of storm sewer through the conservation easement to Gee Creek. This item has not yet been addressed.

3.1.1.5 Trout-Griffin Lakes Sub-Basin

The stormwater treatment system in this sub-basin consists of FDOT storm sewer system including several ponds. The storm sewer discharges into Lake Kathryn at the intersection of US 17-92 and Seminola Blvd. The Trout-Griffin Lakes Sub-Basin covers 344 acres.

Golden Days Road is being inundated under a 10-year and 25-year storm event. The location of this deficiency can be found on the deficiency map for Gee Creek Basin in Appendix B, Figure 6.1. The correction phasing is shown in Appendix B, Table 6.1.

According to Singhofen & Associates, Inc., steps were being taken in 1996 to eliminate or improve flooding conditions by decreased inflow, increased capacity of existing stormwater sewer, and enhanced outlet capability. The roadway improvements on Seminola Blvd. being performed by Seminole County during the time of the study included an upgrade of the final outfall structure. Improvements to upgrade structures along US 17-92 that serve Trout-Griffin Lakes Sub-Basin were being designed by the FDOT at the time of the study as well. These improvements significantly reduced flooding conditions within the Trout-Griffin Lakes Sub-Basin.

Construction of a second storm sewer line along Golden Days Rd. and the north right-of-way, and a conversion to a 45-inch by 29-inch elliptical concrete pipe to upgrade the existing storm sewer line were the two proposed solutions to the flooding issues. The pipe has since been upsized.

Slope erosion protection was recommended for the outfall channel from North Griffin Drive to Slumber Lane. The City has installed a 42-inch storm sewer within this channel.

3.1.1.6 Triplet Lakes Sub-Basin

A majority of the Triplet Lakes Sub-Basin (1,479 acres) is located South of Seminola Blvd. and east of US 17-92 consisting of a network of lakes, including the Triplet Lakes (South, Middle, and North) and is a tributary to Lake Kathryn. Crystal Bowl does not contribute runoff to this sub-basin because it is considered a land locked basin.

Existing structures were surveyed in the Triplet Lakes Sub-Basin and most were in good condition. However there were several structures that were deficient and needed improvements.

Three deficiencies of concern in Gee Creek Basin study include the Oxford Pond control structure weir that is somewhat collapsed and severely deteriorated, the downstream fragment of the Seminole Plaza (*now Casselberry Exchange*) pond outfall culvert which has broken off and is partially collapsed, and the Winter Park Drive Culvert from Lake Yvonne has a 24 percent reduced capacity due to debris and other substances. The Oxford Pond control structure was recommended to either be replaced or repaired, and has been replaced.

3.1.1.7 Concord/Secret Lakes Sub-Basin

In this 324 acre sub-basin located north of SR 436 on the east and west sides of US 17-92 and south of Seminola Boulevard, the basin study identified two landlocked basins which do not contribute to the sub-basin - Quail Pond and Lake Ellen. In actuality, Quail Pond has a control structure with overflow to Lake Concord. Drainage is governed by overland flow, retention/detention facilities, and storm sewer system.

Most of the storm structures surveyed appeared to be in good condition with the exception of a structure at Secret Way. Debris and blockage at the outfall had reduced its capacity by about 30 percent. Another concern was flooding issues near Secret Lake. The structure at Secret Way was recommended to be cleaned out. This is an on-going City maintenance item.

3.1.1.8 Prairie Lake Outfall Sub-Basin

The majority of the northern portion of this sub-basin is west of US 17-92 and north of S.R. 436, while most of the southern portion of the sub-basin is south of S.R. 436 and west of US 17-92. Runoff from this 1,000 acre sub-basin is governed by a storm sewer system and overland flow.

With the exception of a few structures, existing structures were surveyed to be in good condition. Reduced capacity is of concern because of debris and blockage to the culverts at Live Oak Blvd. off anchor Road (single culvert), North Lake Triplet Lake Drive (three culverts), and Southcot Drive (two culverts). Other deficiencies were recognized along Ball Park Road north of Live Oak Center in Casselberry where an existing water well drain is not functioning properly, wetlands adjacent to Ball Park Road are flooding, and one home on Ball Park Road is flooding. A map showing the location of this deficiency can be found in Appendix B, Figure 6.1, with deficiency correction shown in Appendix B, Table 6.1, and as follows:

- The three culverts on North Lake Triplet Drive, two on Southcot Drive and one on Live Oak Boulevard off Anchor Road were recommended for clean out. This is an on-going City maintenance item;

- To reduce flooding within the wetland adjacent to Ball Park Road, a diversion channel was recommended from Anchor Road to the structure at Live Oak Center along the north side of the center. Other drainage improvements have been made to reduce flooding in this area; and

- Flood proofing the home on Ball Park Road was also suggested, and has been completed.

3.1.2 "Howell Creek Basin Drainage Inventory Engineering Study"

The previous study performed in the Howell Creek Basin for Seminole County by Dyer, Riddle, Mills & Precourt, Inc. in February, 1994 surveyed 326 structures and cross sections in the City of Casselberry, the City of Winter Springs, the City of Altamonte Springs, and the City of Oviedo. The 20,480 acre Basin is 20 percent wetlands and 80 percent uplands. As in the Gee Creek Basin, Seminole County's established LOS standards were used in this study in order to determine the surveyed structures and cross sections were maintained properly.

Within the Howell Creek Basin, there are ten sub-basins, according to the previous study. The three major conveyance systems within the Howell Creek Basin are Howell Creek, Bear Gully Creek Canal, and Lightwood Knox Canal; and the two lake basins include Lake Howell and Bear Gully Lake. The City of Casselberry lies within the Lake Howell Sub-Basin (11-04) and the Cassel Creek Sub-Basin (11-05) shown in Exhibit 3 in Appendix C.

3.1.2.1 Lake Howell Sub-Basin (11-04)

From Howell Branch Road east of SR 436 to, and including most of Deer Run, this 3,099 acre sub-basin is heavily developed with single and multifamily residential parcels as well as commercial establishments.

Four structures surveyed in the Lake Howell Sub-Basin had insufficient capacity during a 25-year, 24-hour storm event. Inadequate maintenance, erosion, flooding, and insufficient channel capacity also proved to be problematic in the area. The deficient structures include two on Lake Ann Lane, one on Lake Howell Lane and one on Red Bug Lake Road, in the City of Casselberry. However, these deficiencies are located on County roads and are therefore under their jurisdiction.

3.1.2.2 Cassel Creek Sub-Basin (11-05)

This 779 acre sub-basin is fully developed with single and multifamily homes and many commercial establishments. Oxford Road borders the west side of the sub-basin, Seminole County line borders the south and SR 436 borders the sub-basin to the north and east.

One structure surveyed in the Cassel Creek Sub-Basin had insufficient capacity during a 25-year, 24-hour storm event. An existing 6’ x 8’ concrete box culvert at Cassel Creek Blvd. crossing SR 436, was being overtopped during a 25-year, 24-hour storm event, in turn causing overtopping of the upstream culvert crossing Cassel Creek Blvd. Inadequate maintenance, erosion, and flooding, also proved to be problematic in the area. Surrounding buildings were appeared to be being flooded in this area. However, finished floor elevations in this area were unknown.

Recommendation was to replace the existing 6’ x 8’ concrete box culvert with a 6’ x 12’ concrete box culvert. The work has since been completed.

3.1.3 “Engineering Study and Drainage Inventory for the Little Econlockhatchee River Basin”

The Little Econonlockhatchee River was designated an Outstanding Florida Water (OFW) in 1992. The watershed study of the Little Econlockhatchee (Little Econ) River Basin was performed for Seminole County by Singhofen & Associates, Inc. in May, 2001 to investigate the ability of primary drainage infrastructure to provide the required level of service. Such infrastructure includes culverts, water control structures and channels. A map of the Little Econ River Basin including sub-basins can be found in Appendix D, Figure 1.1.

The 92 square mile Little Econ Basin includes 11.2 square miles in Seminole County and the remaining area in Orange County. Portions of the City of Orlando, the City of Winter Park, the City of Casselberry, and the City of Oviedo are within the basin boundaries. The basin is largely developed and comprised of 25 percent wetlands and 75 percent uplands.

The portion of the Little Econ Basin within the City of Casselberry is the Tanglewood System (sub-basin). The Tanglewood System and the Eastbrook System are both portions of what is termed Crane Strand Drain. The four means of stormwater conveyance to the Little Econ River from Tanglewood include the Crane Strand, Border, Bypass, and Eastbrook Canals.

3.1.3.1 Tanglewood System

Following the May, 2001 study, it was determined that three areas were subject to flooding, one of which is of concern to the City of Casselberry. The Casselton Corners commercial center in Casselberry (See Appendix D, Figure 3.29) was found to flood under a 10-year and 25-year storm event. It was also predicted that 89 homes in the Eastbrook and Wrenwood Heights area (Seminole County) would flood under existing conditions. Most of the area lacks treatment for runoff; therefore improvements need to be considered in order to address flooding and treatment issues.

3.1.3.2 Recommended Improvements

Corrective measures for the Tanglewood System were evaluated in conjunction with the Eastbrook System which lies downstream. The recommended alternative was to construct a 21-acre regional stormwater facility at the intersection of Howell Branch Road and Eastbrook Blvd. The Eastbrook Canal would be extended northward to Howell Branch Road and a larger culvert would be installed crossing Howell Branch Road to the regional facility. The canal would be excavated and regraded downstream to increase capacity. Although the planned regional stormwater facility has not been constructed, the culvert crossing Howell Branch Road and the excavation and regrading of canal have been completed.

3.1.4 Current Basin-study Recommended Capital Improvement Projects

3.1.4.1 Seminole County Projects

According to Seminole County Public Works Department, there are six capital improvements scheduled for the City of Casselberry for which Seminole County is responsible that may impact the City's water quality. As a result of drainage improvements, some adverse impacts may occur. Erosion and sedimentation can be caused by construction which increases flow and in turn may increase pollutant loading. It is important to avoid and minimize these possible impacts through utilization of Best Management Practices (BMP's).

A. Anchor Road

The Anchor Road drainage improvements from SR 436 to Melody Lane are considered a secondary system stormwater project. The improvements include piping of ditch, installation of inlets, water quality treatment, as well as roadway improvements. The design phase is scheduled for completion in December 2007 with construction completion by September 2010.

B. Cassel Creek

The Cassel Creek stormwater facility from Howell Creek Basin to Kewanne Trail is still in the design phase until October 2007 and construction is scheduled to be complete by September 2010. This is considered a primary system stormwater project.

C. Howell Creek Dam at Lake Howell Road

From the Orange County line to Lake Howell Road, an existing rubble dam is in need of replacement. According to Seminole County, the design of this primary system stormwater project will begin October 2008, and the construction will begin October 2009.

D. Lake Howell Road Drainage Improvements

This secondary system stormwater project will improve drainage from Howell Branch Road to Meadow Ave. by addressing roadway flooding and water quality treatment. The improvements are scheduled to be complete in September 2007.

E. Prairie Lake

Improvements to the Prairie Lake Outfall from Prairie Lake to south of SR 436, include piping of open ditch are under construction and are scheduled to be complete by the end of October 2007. These improvements are considered a secondary system stormwater project.

F. Red Bug Lake Road

The Red Bug Lake Outfall drainage improvements from Red Bug Lake Road to Lake Howell Road are considered a secondary system stormwater project. This water quality retrofit project will include a wet detention pond with access to Lake Howell, thus addressing stormwater from Red Bug Lake Road and Deer Run area. Design is scheduled for completion in September 2007.

3.2 "Lake Water Quality Report"

3.2.1 Summary

In October 1997, Dyer, Riddle, Mills & Precourt, Inc. (DRMP) issued the "Lake Water Quality Report, Analysis of Existing Data" summarizing water quality data from the thirteen lakes within the City of Casselberry shown in Exhibit 3-1. The report was based in part on previous water chemistry sampling by Environmental Consulting Group, Inc. (ECG) from 1993 to 1997. DRMP supplemented the water quality analyses with vegetation and sediment analyses. The report provided the initial summary of the general condition of each of the thirteen lakes as identified by its Trophic State Index (TSI).

The trophic state is based on the relative nutrient concentrations as defined by the ratio of Total Nitrogen (TN) to Total Phosphorus (TP) plus the values of chlorophyll-a and Secchi depth. When the ratio of TN-to-TP concentrations is between 10 and 30, the lake

is said to be "nutrient-balanced" and more susceptible to aquatic vegetation (macrophyte) growth. Outside these limits, the lake is either nitrogen-limited or phosphorus-limited and growth potential is reduced. Chlorophyll-a is an indirect measure of the amount of algae within the lake. A Secchi Disk is an alternating black and white colored disk lowered into the lake. The depth at which the disk is no longer visible is an indicator of the relative clarity of the lake water. The Trophic State Index values and meanings are shown in Table 3-1.

Table 3-1 – Trophic State Index General Definitions

TSI Value	Trophic State	Description
0 – 49	Oligotrophic	Excellent water quality
50 – 60	Mesotrophic	Good water quality
60 – 70	Eutrophic	Fair water quality
> 70	Hypereutrophic	Poor water quality

Based on the 1993 to 1997 water quality sampling, the Casselberry lakes sampled fell into the following categories:

- Oligotrophic – Dew Drop Pool, Grassy Lake and Trout Lake;
- Mesotrophic – Secret Lake, Lake Yvonne, Lake Griffin, Lost Lake, Middle Lake Triplet and North Lake Triplet;
- Eutrophic – Lake Concord, Lake Kathryn, Queens Mirror and South Lake Triplet.
- Hypereutrophic – No lakes were routinely classified as hypereutrophic, although each of the eutrophic lakes experienced at least one excursion into this category.

3.2.2 Recommendations

On the basis of this study, recommendations were made for the water sampling program as follows:

a. Sample all lakes during the same month each year.
b. Collect wind and rainfall at the time of sampling.
c. Establish an annual macrophyte monitoring program.
d. Undertake annual metal sampling.
e. Continue to test for the same water quality parameters.

All above recommendations have been incorporated into the current program.

3.3 "Identification and Quantification of Pollutant Sources"

3.3.1 Summary

In February 1998, DRMP issued the "Lake Water Quality Report, Identification and Quantification of Pollutant Sources" (DRMP Pollutant Load Analysis). This analysis looked at the drainage basins for each of the thirteen lakes previously evaluated. The land uses and estimated pollutant loadings resulting from those land uses were quantified for each of the lake basins. Additionally, pollutant loadings from two

landlocked lakes (Lake Ellen and Crystal Bowl) were evaluated. Only pollutant loadings from stormwater runoff and groundwater (septic tanks) generated within the City of Casselberry were included in this study.

The specific pollutants quantified from stormwater runoff were Total Suspended Solids (TSS), Total Dissolved Solids (TDS), TP, Dissolved Phosphorus (DP), Total Kjeldahl Nitrogen (TKN), Nitrate-Nitrogen, Nitrite-Nitrogen, Biochemical Oxygen Demand (BOD) and Lead (as an indicator of heavy metals). For areas with stormwater treatment such as retention or detention ponds, and for intermediate lakes, pollutant removal rates were factored into the calculations. Only TN, TP, TSS and BOD contributions from septic tanks along lake shorelines were included in the pollutant loading totals. A spreadsheet model was used to calculate the total loadings of each parameter to each lake. Those total annual loadings for each lake basin were summarized in Table 3-7 of that report. Table 3-8 of that report summarizes the annual pollutant loading rates for each lake per acre of basin area. Copies of those tables are included in Appendix E of this report.

The six lakes estimated in that analysis to have the overall poorest water quality based on having the highest pollutant loads were Queens Mirror, Lake Concord, Lake Kathryn, and South, North and Middle Lake Triplet. All six lakes were also those identified in the Lake Water Quality Report as historically being the worst (the first four all eutrophic), with North and Middle Lake Triplet on the high TSI end of mesotrophic.

3.3.2 Recommendations

The DRMP Pollutant Loading Analysis report also included the following recommendations for pollutant reduction measures:

1. Install baffle boxes or sediment removal structures tributary to Lake Concord, Lake Kathryn, Lake Howell and Queens Mirror.
2. Install baffle boxes tributary to Grassy Lake and Lake Griffin. The only piped inlets to Lake Griffin are from retention ponds and thus have existing baffles.
3. Construct a wet detention pond in the wetland area south of Shady Hollow, upstream of Queens Mirror.
4. Construct off-line wetland treatment or wet detention in the wetland area west of Winter Park Drive south of Queens Mirror. Portions of this wetland area have been regraded to promote wetland treatment.
5. Implement a septic tank elimination program for areas in proximity to lakes. This program has been incorporated into the City's Strategic Plan and several capital projects have been completed.
6. Add fecal coliform sampling to quarterly lake analyses and incorporate results into septic tank elimination program prioritization. Fecal coliform sampling has been added to the quarterly program.
7. Convert in-line treatment ponds tributary to lakes into off-line ponds. Conversion of the many in-line ponds was considered not financially feasible, and not pursued.
8. Install aerators in Lake Concord. An aeration system has been installed in Lake Concord.
9. Evaluate installing aerators into Queens Mirror and South Lake Triplet because of their high BOD loads.

10. Implement a Public Education program to increase understanding of the effects of pesticides, herbicides and fertilizers by dissemination of brochures, pamphlets and the like. This program has been established and is ongoing.
11. Implement public meetings with property owners groups as part of Public Education. Landscape Seminars are being held to educate residents.
12. Remove excessive sediment adjacent to City's primary stormwater discharge point to Lake Howell. The sediment has been removed.

3.4 "Pollutant Loading Analysis"

A report entitled Pollutant Loading Analysis was prepared by PBSJ (PBSJ Pollutant Loading Analysis) in April 2002 for Seminole County and encompassed the entire county. The Analysis was divided into basins and sub-basins more in line with the basin studies and not divided into individual lake basins as was the DRMP Pollutant Loading Analysis. This analysis established Level of Service standards based on percentage reductions of pollutants. The percentages were expressed as the ratio of the estimated pollutant loads in the basin to the maximum pollutant loads based on the entire sub-basin being single family residential. It is interesting to note that the values used for the average concentration of the various chemical parameters in runoff during an average storm event (Event Mean Concentration) differed, considerably in some instances, from those used in the DRMP Pollutant Loading Analysis for the different land use categories.

This report established Level of Service standards based on treatment methods within the drainage sub-basins and presented pollutant removal efficiencies of various BMPs, but made no recommendations for specific improvements within the sub-basins. It also was not possible to isolate loadings to specific sub-basins in Casselberry to assist with prioritizing pollutant reduction measures.

3.5 "TMDL Report"

In August 2005, the Florida Department of Environmental Protection issued a Draft "TMDL Report, Nutrient and Unionized Ammonia TMDLs for Lake Jesup, WBIDs [water body identification number] 2981 and 2981A." Most of the City of Casselberry is tributary to Lake Jesup which is included on the Verified List of impaired waters for the Middle St Johns Basin. In accordance with the 1999 Florida Watershed Restoration Act (FWRA), once a waterbody is included on the Verified List, a Total Maximum Daily Load (TMDL) must be developed. See Section 4.3 for further discussion of TMDLs and Section 4.5 for discussion of the TMDL Report.

3.6 "Howell Creek Basin Watershed Management Plan"

In April 2007, the draft "Part I – System Inventory" of the Howell Creek Watershed Management Plan (WMP) was issued. The WMP will consist of three parts. Part I is the inventory update, Part II is the engineering analysis of the system and identification of problem areas, and Part III is the development of alternatives to alleviate flooding and/or develop regional solutions. Figure 1-1 of that report is contained in Appendix F and shows the limits of the Study Area. Figure 2-22 of the report shows the locations of previously identified "problem areas" within Seminole County. Problem Nos. 16, 17, 18 and 19 are within the limits of the City of Casselberry. Table 2-4 identifies that all four are "flooding" problems associated with undersized storm culverts crossing non-city roadways. This Figure and Table are also found in Appendix F.

Also in Appendix F is Figure 2-23 of that report identifying impaired waterbody segments. Although primarily upstream of the City of Casselberry, portions of Sub-Basin 2997A (Howell Creek) are within the City. A portion of the north, west and south watershed of the Lake Howell (WBID 2997B) is within the City. Howell Creek is considered impaired because of high levels of BOD5, DO, nutrients and fecal coliform. Lake Howell exceeds limitations for BOD5, DO and nutrients. See Table 2-5 in Appendix F. The projected year for development of TMDLs for both sub-basins is 2008.

3.7 Summary of Unimplemented Recommendations

Following is a summary of recommendations from the above reports that have not been completed, otherwise resolved or are an ongoing operations and maintenance item:

1. Lake Drive - Perform a detailed assessment to assess the actual flooding potential and necessary improvements. This is a Seminole County roadway with in-city properties adjacent to it.

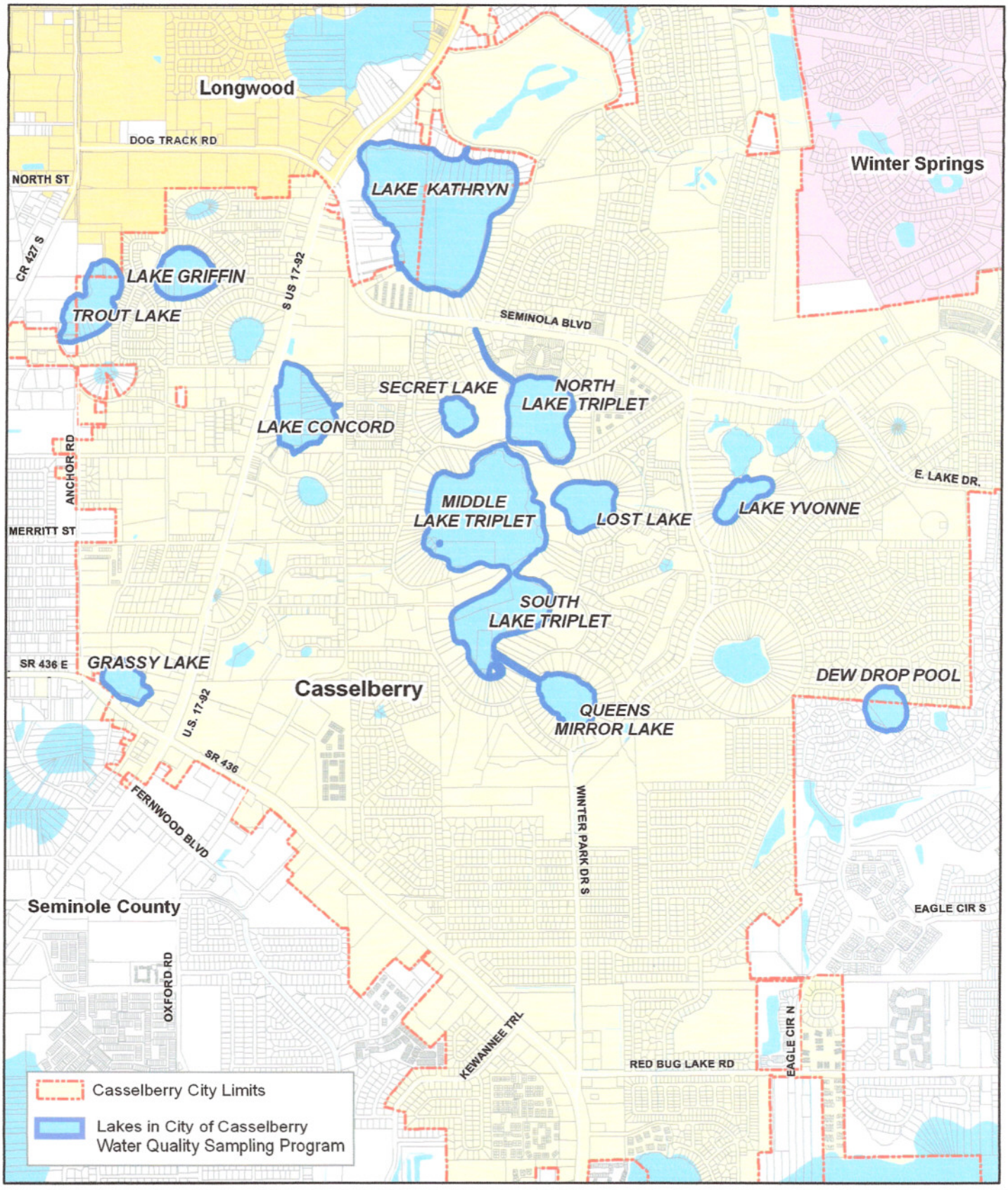
2. Lake Hodge - Construct outfall structure.

3. Install baffle boxes or sediment removal structures tributary to Lake Concord, Lake Kathryn, Lake Howell and Queens Mirror.

4. Install baffle boxes tributary to Grassy Lake.

5. Construct a wet detention pond in the wetland area south of Shady Hollow, upstream of Queens Mirror.

6. Evaluate installing aerators into Queens Mirror and South Lake Triplet because of their high BOD loads.



cph	Scale: 1" = 2000'	LAKES IN CITY WATER QUALITY SAMPLING PROGRAM	Exhibit 3 - 1
	Date: August 2007	CITY OF CASSELBERRY STORMWATER MASTER PLAN	
	Photo Date: N/A	SEMINOLE COUNTY, FLORIDA	
	Project No. C1953		
	PM: BG		

N

SECTION 4

NPDES/TMDL REQUIREMENTS

4.1 National Pollutant Discharge Elimination System (NPDES)

The National Pollutant Discharge Elimination System (NPDES) was introduced by the U.S. Environmental Protection Agency (EPA) in 1972 under the Clean Water Act and is responsible for considerable water quality improvements in the United States. The purpose of the program is to monitor water pollution created by stormwater discharge through the NPDES permit requirements. The City of Casselberry has entered into an Interlocal Agreement with Seminole County, the other cities in the county and the Florida Department of Transportation (FDOT) District Five as joint permittees for the Municipal Separate Stormwater Sewer System (MS4) Permit for the county-wide system(s).

Stormwater pollution can be generated from point sources and non-point sources, although it is more commonly from point sources. A point source is a fixed location from which pollutants are accumulated before discharging directly by way of pipes or ditches. When stormwater runoff flows over land picking up pollutants from multiple sources along the way before discharging into a body of water, it is considered a non-point source. Best management practices (BMP's) are implemented through the NPDES permitting program in order to regulate stormwater discharge pollutants. The EPA has defined six categories of "minimum measures" for pollution abatement as follows:

- Public Education
- Public Involvement
- Illicit Discharge Detection and Elimination (IDDE)
- Construction Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

4.1.1 Public Education and Outreach

It is critical for the success of a stormwater control program to educate the public about the causes and effects of stormwater runoff in their community, particularly permitted MS4s, such as the City of Casselberry, by distributing brochures, public announcements, community involvement organizations, and distributing fact sheets.

4.1.2 Public Participation

The public is encouraged by the EPA to participate in stormwater management programs in their community in order to be a part of the plan's implementation and progress. There are many ways to get involved, including volunteer work, joining the stormwater management panel by serving as a community representative, and attending public hearings. There is a guide for success of public participation in stormwater management through the EPA called *Getting in Step: Engaging and Involving Stakeholders in Your Watershed*.

4.1.3 Illicit Discharge Detection and Elimination

If discharge into a storm sewer is not completely comprised of storm water, it is considered an "illicit discharge." An exception would be if the facility is already under a NPDES permit for that discharge. Such discharge can be generated from sources such as car washes, gas stations, and restaurants. Firefighting activities are also not considered illicit, or illegal. Stormwater runoff often flows without treatment into a body of water, therefore carrying pollutants including pathogens, toxic pollutants, and nutrients with it. Under the NPDES permitting process, an MS4 program must develop a program to address detection, prevention and elimination of illicit discharge spills.

4.1.4 Construction Site Runoff Control

MS4s must develop a program which requires implementation of erosion and sediment control BMPs, control of wastes from the construction site, a procedure for reviewing site plans and a system for inspection and enforcement of BMPs on the construction site. A stormwater pollution prevention plan (SWPPP) is required by the EPA to address erosion and sedimentation control, waste management, and implementation of other BMPs on construction sites through an NPDES generic permit for construction activities.

4.1.5 Post-Construction Runoff Control

MS4s are required to develop a program to deal with post-construction stormwater runoff in order to reduce flows and increase water quality. In order to achieve this goal, methods are implemented to reduce impervious area and practice low-impact development. Although termed "post-construction", these measures for reducing pollution are actually the measures designed and constructed into a development, thus resulting in reduced runoff post-construction.

4.1.6 Pollution Prevention/Good Housekeeping

MS4s such as the City must develop programs to prevent and reduce pollutants from stormwater runoff generated from their own municipal operations. The programs should include an operation and maintenance plan created by using materials provided by the EPA and the state. The goals of the O&M program include prevention or reduction of stormwater pollution, and implementation of stormwater system maintenance by training employees with the help of the materials provided by the EPA. Periodic street sweeping and litter collection are included in this category for abatement of pollution and degradation of water quality.

4.2 Current NPDES Municipal Separate Storm Sewer System (MS4) Permit

The City of Casselberry has entered into an Interlocal Agreement with Seminole County, the other cities in the county and the Florida Department of Transportation (FDOT) District Five as joint permittees for the MS4 Permit for the county-wide system(s). A copy of the permit is included as Appendix G of this document. The permit defines the responsibilities of the permittees, both individually and jointly, and monitoring and reporting requirements. Each permittee must also have a written plan of action for compliance with the permit in the event the Interlocal Agreement is dissolved or in default. The permit also contains the requirement for implementation of the Stormwater Management Program (SWMP) and compliance with the various elements of that program. An Annual Report is to be made to the Department by each

permittee or by a joint committee composed of representatives of each permittee and with input provided by each summarizing the various activities required to comply with the SWMP.

4.2.1 Inspection and Maintenance Activities

In order to verify that the MS4 is operated and maintained to maximize the reduction of pollutants discharged, Table II.A.1.a of the permit identifies specific stormwater management system items requiring inspections and maintenance, the frequencies at which each are to be performed, and the specific inspection and maintenance activities to be performed for each. Each permittee is to maintain an internal record keeping system to track these activities. Annual evaluations are to be performed to assess the appropriateness of the schedule frequencies. A summary of the inspection and maintenance activities and the annual evaluations are to be included in the Annual Report.

4.2.2 Implementation of Stormwater Management Programs

The permit delineates required activities for implementation and compliance with the various elements of the SWMP as follows:

1. *Structural Controls and Stormwater Collection Systems Operation*
    - Maintain up-to-date inventory of stormwater facilities owned by permittee,
    - Update mapping of facilities,
    - Conduct inspection and maintenance per Table II.a.1.a,
    - Define and inventory all roadway structures,
    - Develop and implement an inspection program for the primary stormwater management system,
    - Report inventory updates and inspection and maintenance activities in the Annual Report.

2. *Areas of New Development and Significant Redevelopment*
    - Adhere to City's Comprehensive Plan and to Codes requiring pollution reduction from stormwater management activities.

3. *Roadways*
    - Provide litter collection and street sweeping activities,
    - Provide frequencies and quantities for each activity in the Annual Report.

4. *Flood Control Projects*
    - Maintain list of Capital Improvement Projects proposed by the Master Plan,
    - Update status of projects and quantification of pollutant removals, if applicable, in the Annual Report.

5. *Municipal Waste Treatment, Storage or Disposal (TSD) Facilities Not Covered by an NPDES Stormwater Permit*
    - Identify priorities and procedures for inspections and measures to control discharges from municipal facilities with the possibility of discharge of pollutants to the system,
    - Report status and findings in the Annual Report.

6. *Pesticides, Herbicides and Fertilizer Application*
   - Implement public education program to reduce use of these chemicals,
   - Train municipal applicators on implications of misuse,
   - Report number of seminars and number of persons trained.

7. *Illicit Discharges and Improper Disposal*
   a) *Inspections, Ordinances and Enforcement Measures*
      - Strengthen authority to control illegal dumping.
   b) *Dry weather Field Screening*
      - No requirements at this time.
   c) *Investigation of Suspected Illicit Discharges and/or Improper Disposal*
      - Implement investigative procedures,
      - Establish central reporting point,
      - Provide training courses for staff in the identification of possible illicit discharges,
      - Maintain internal log and summarize in the Annual Report.
   d) *Spill Prevention and Response*
      - Implement Spill Prevention and Response Plan,
      - Provide training courses,
      - Maintain internal log and summarize in the Annual Report.
   e) *Public Reporting*
      - Maintain citizen complaint log,
      - Continue to promote public reporting and education on illicit discharges,
      - Provide summary in Annual Report.
   f) *Oils, toxics, and Household Hazardous Wastes Control*
      - Continue outreach program to educate public on proper disposal of these items,
      - Support and publicize Amnesty Days,
      - Report all activities in Annual Report.
   g) *Limitation of Sanitary Sewer Seepage*
      - Implement procedures to eliminate seepage from sewers and sanitary sewer overflows,
      - Summarize activities in the Annual Report.

8. *Industrial and High Risk Runoff*
   a) *Identification of Priorities and Procedures for Inspection*
      - Maintain inventory of high risk facilities discharging into MS4,
      - Continue inspection program to determine compliance,
      - Report new facilities and number of inspections and results in Annual Report.
   b) *Monitoring for High Risk Industries*
      - Monitor as needed for possible illicit discharges.

9. *Construction Site Runoff*
   a) *Site Planning and Non-Structural & Structural Best Management Practices*
      - Ensure Land Development Regulations require erosion and sediment control on construction projects,
      - Evaluate innovative BMPs,

- Assure all new developments obtain FDEP, WMD and/or NPDES permits, as required, including generic for construction activities,
- No reporting required.

b) *Inspection and Enforcement*
- Inspect construction projects that discharge to MS4,
- Develop standard construction inspection form/report covering current inspection items, including erosion and sediment control,
- Summarize number of inspections and type of enforcement in Annual Report.

c) *Site Operator Training*
- Continue and expand training to public and private site operators and inspectors,
- Notify building permit applicants of requirement for NPDES generic permit for construction activities,
- Provide number of training activities and inspectors trained in Annual Report.

4.2.3 Monitoring and Permitting Requirements

The permittees are required to provide estimates for seasonal loadings and Event Mean Concentrations for each major outfall or water body for various pollutants. The permittees must develop a monitoring plan and submit for FDEP approval, the details of which are to be included in the Annual Report.

The Annual Report must be submitted each year within six months of the end of the annual monitoring period. The report is to include those items listed above. Quantifiable items are to be included in a Summary Table.

4.3 Total Maximum Daily Load (TMDL)

Total Maximum Daily Load (TMDL) is the maximum allowable load of a single pollutant which a body of water can receive and still meet the water quality standards set forth by the state, territory, or designated tribe and also maintain its designated use.

4.3.1 Current TMDL Requirements

Under Section 303(d) of the Clean Water Act (1972), if a body of water does not meet water quality standards set forth by the state, territory, or tribe after the minimum pollution control devices have been implemented, it is considered to be impaired, and TMDLs must be established. A body of water that is designated as impaired may not be meeting its designated use. Florida's surface waters are divided into the following five classes denoting their primary use, which is dependent upon the water quality of that waterbody:

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 (there are no state waters currently in this class)

According to Florida's Watershed Restoration Act in 1999, the current TMDL program is designed in order to obtain a comprehensive understanding of how harmful pollutants affect entire ecosystems and water quality as a whole. Primary pollutants of concern in Florida surface waters include nutrients like nitrogen and phosphorus, bacteria, mercury, and metals like copper and iron. The pollutants can cause adverse health effects for aquatic life and for humans.
In order to successfully improve the quality of Florida's surface waters, government agencies, businesses, and the general public must take an active role in reducing and preventing discharge of harmful pollutants.

4.3.2 TMDL Development Process

The first step for development of TMDLs begins with FDEP's assessment of existing water quality conditions through the methodology of the Impaired Surface Waters Rule. A *Planning List* is then created with the names of the potentially impaired water bodies and submitted to the EPA for their review. As part of FDEP's watershed management approach, the waters listed on the *Planning List* are further assessed focusing on chemical parameters, biological and ecological impairment, and nutrient criteria caused by pollutant discharge to conclude if a body of water is indeed impaired. Bodies of water that are determined to be impaired under the Impaired Surface Waters Rule will be placed on the *Verified List* of impaired waters and considered first priority for development and implementation of TMDLs. After the *Verified list* of impaired water bodies has been approved by the EPA, the TMDLs must be established and implemented as soon as possible.

Florida's approach for TMDL development is through the watershed management approach. This approach focuses on the cumulative effects of human activity in Florida's surface waters throughout each basin by monitoring surface waters, stormwater management, wetland restoration, and public participation. During this process, it is critical to identify the source of pollutants and determine if they are a *point source* or a *non-point source.*

There are 52 basins in Florida which are divided according to natural boundaries. The basins are grouped into five FDEP districts which undergo five phases of the watershed management cycle, as follows, ensuring each basin is evaluated at least every five years according to the rotation schedule:

Phase 1 Watershed evaluation
Phase 2 Strategic monitoring
Phase 3 Development and adoption of TMDLs
Phase 4 Development of Basin Management Action Plans (BMAP)
Phase 5 Implementing BMAPs

The *Planning List* and strategic monitoring plan are created in Phase 1. Phase 2 establishes if a body of water is indeed impaired through monitoring and data collection. The Assessment Report and *Verified List* of impaired waters are also created in this phase. Using the criteria set forth by the Impaired Surface Waters Rule, TMDLs are developed based on a prioritized list of impaired water bodies in Phase 3. The

methodology for that development is contained in Rule 62-303, Florida Administrative Code (F.A.C.). Basin Management Action Plans (BMAPs) developed in Phase 4 identify methods for reduction of pollutants from point and non-point source pollutants in order to meet the TMDL criteria. Rule 62-304, F.A.C. contains generalized pollutant reduction criteria for certain designated impaired waters, including Lake Jesup and Crane Strand Drain. Phase 5 begins execution of BMAPs developed in Phase 4. Throughout each phase, FDEP monitors progress to ensure the TMDL requirements are met.

Appendix H contains an un-numbered figure from FDEP showing the 1998 303(d) Listed Water Segments in Seminole County. Portions of Segments 2994A (Gee Creek) and 3014 (Crane Strand Drain) are within the City of Casselberry, as is Howell Creek (Segment 2997A), that has since been added to the 303(d) list. Howell Creek is listed because of exceedances of the criteria for both fecal coliform and total coliform. Crane Strand Drain is listed as impaired because of not only fecal coliform and total coliform, but also dissolved oxygen (D.O.). Copies of Pages 7 (showing Howell Creek) and 12 (Crane Strand Drain) of the May 18, 2004 Verified List is included in Appendix H.

Gee Creek, although placed on the Verified List for nutrients (based on high chlorophyll A levels), has been added to the Delist List based on the Phase 2 monitoring. Placement on the Delist List means that TMDLs will not need to be established for Gee Creek, during this cycle. However, during the next 5-year cycle, it could be re-listed for that or any other parameter. Additionally, because Gee Creek is tributary to Lake Jesup which is in the process of having TMDLs established (Nutrient and Unionized Ammonia), water quality for Gee Creek will require improvement. Sheet 6 of the Delist List showing Gee Creek is included in Appendix H.

4.4 Current City TMDL Program

The City monitors and protects its surface water quality through local management and involvement of their citizens and the *LakeWatch* program of the University of Florida. Each quarter, the data collected from the Casselberry lakes is summarized in a report that provides information about water quality, hydrological data, and ecological data in a comprehensive manner. Copies of the water quality data are submitted to the Seminole County for inclusion in its Watershed Atlas. Through this analysis, the City of Casselberry is able to identify if a body of water is impaired and determine sources of pollution and what steps must be taken to prevent pollution from discharging into its lakes. As a co-permittee for the NPDES permit, the City of Casselberry is working with Seminole County and the other cities within the county to implement a successful stormwater management program. That cooperative effort has been supplemented through a separate interlocal agreement specifically for TMDL activities. A copy of that agreement is contained in Appendix I of this plan.

The City provides public education, enactment and enforcement of codes designed to reduce pollutants during and after construction and development, and with in-house training programs for residents. City personnel receive training on good housekeeping practices, including its own program of street sweeping and litter removal from rights-of-way within the City.

4.5 Anticipated TMDL Program Requirements

4.5.1 Lake Jesup

Based on Phase 1 evaluations, Lake Jesup has been considered an impaired waterbody. Phase 2 has since placed Lake Jesup and several of its watershed sub-basins are on the *Verified List,* requiring TMDLs to be established. The City of Casselberry is a municipality within the Lake Jesup watershed. A map of the watershed and its sub-basins are included in Appendix J, Figure 4.6. Lake Jesup is considered a Class III waterbody, with a designated use as recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

In the Draft August 15, 2005 TMDL Report for *Nutrient and Unionized Ammonia TMDLs for Lake Jesup WBIDs 2981 and 2981A*, contributing annual pollutant loads from each sub-basin are outlined in Tables 4.11-a (surface runoff), 4.11-b (TN) and 4.11-c (TP). These are included herein in Appendix J. The Draft TMDL report outlines the anticipated required annual load reductions necessary to achieve target water quality standards in Lake Jesup (1995-2002). Table 6.1 in Appendix J shows the required load reduction in the Lake Jesup basin for total nitrogen (TN) of 52% and total phosphorus (TP) of 37%.

To address and improve the TMDL goals presented in the 2005 report, and assuming it will be finalized without significant change, it has been recommended that further analysis be considered in the Lake Jesup watershed. As stated in the report, there was not a sufficient amount of time to conduct the extensive TMDL analysis and sufficient data necessary to fully address functions of the lake system was unavailable. Because the nitrogen fixation rates in the report were estimated based on published literature, it is suggested that nitrogen fixation by blue-green algae be addressed in an attempt to better quantify it. It was also recommended that sediment dredging (Lake Jesup Restoration Program) be addressed in the future to determine if it has positively affected Lake Jesup's water quality or has contributed to additional nutrient loading to the lake water. Economic feasibility of proposed reduction methods will need to be addressed in future studies.

4.5.2 Crane Strand Drain

As stated above, Crane Strand Drain is on the Impaired List for both fecal and total coliforms and for dissolved oxygen (DO). As such, two separate TMDL reports have been drafted, one for coliforms, the other for DO.

The Draft August 16, 2005 TMDL Report for Fecal Coliform and Total Coliform TMDLs for Crane Strand Drain and Crane Strand (WBID 3014 and 3023) identified potential sources of fecal and total coliforms in these watersheds as domestic and wild animals, septic tanks and land spreading of wastewater residuals. Because of the high percentage of residential areas, dogs were felt to be the highest contributors. The Waste Load Allocations for NPDES Stormwater contributions was a 49.2 percent reduction in fecal coliform loadings and a 31.8 percent decrease in total coliforms as shown in Table 6.1 of that report in Appendix J. A BMAP will be developed to identify methods for meeting these reductions.

The Draft August 22, 2005 TMDL Report for Dissolved Oxygen TMDL for Crane Strand Drain (WBID 3014) provided some discussion of the relationships of various parameters with reductions in dissolved oxygen. The primary parameters causing low DO are biochemical oxygen demand (BOD) and total nitrogen (TN). The report identified the main potential sources of BOD and TN within the Crane Strand Drain basin as the nonpoint sources of runoff from developed areas carrying these components from fertilizers, pet waste and erosion and septic tank systems. As shown in Table 6.1 of that report (in Appendix J), the require reductions of these parameters are 57 percent BOD and 29 percent TN, all indicated to be waste load reductions to be applied to NDPES Stormwater sources.

4.6 Water Quality Credit Trading

In December 2006, the FDEP presented a draft report to the Florida Legislature on Water Quality Credit Trading (Pollutant Trading in the law). The report was prepared after extensive coordination with the Pollutant Trading Policy Advisory Committee (PTPAC) composed of multiple disciplines and relevant entities. The proposed legislation would create a trading program between entities discharging to specific basins that would allow them to trade reduction credits for wasteload allocation surpluses as a result of a more cost-effective method of reduction to another whom it would be more costly to reduce to its established goals. Although point source-to-point source (PS-PS) trades would be emphasized, Non-point source-to-point sources trades would be allowed with certain provisions. The trading, at least initially, would likely occur within the NPDES process associated with the BMAP process. This concept was discussed by FDEP and SJRWMD staff in a meeting with City of Casselberry Public Works staff on June 25, 2007. This may be an option for the City to help meet goals for pollutant reduction.

SECTION 5

LAKES MANAGEMENT PLAN

5.1 Current Plan

At this time, the City has only a draft Lakes Management Plan prepared in-house. The Plan includes portions of the following elements:

- Current Level of Service
- Water Quality
- Invasive Plant Control / Shoreline Restoration
- Fish / Wildlife and Recreational Use
- Anticipated Future Conditions

This document is intended to serve as the final Lakes Management Plan.

5.2 Lake Water Quality Monitoring Program

As previously discussed in Section 3, the City of Casselberry has performed water quality sampling and analyses in a number of the City lakes since 1993. The report by DRMP issued in October 1997 summarized these analyses and recommended continuation of the sampling program and addition of several parameters. The City currently utilizes an environmental testing firm (Environmental Research & Design, Inc. (ERD)) to conduct a quarterly surface water quality monitoring program on twelve of the City lakes incorporating the previous report's recommendations. The monitoring program has four primary objectives:

1. Evaluate the suitability of the lakes for use as recreational water bodies.
2. Maintain a database of existing water quality within the City of Casselberry.
3. Provide a means of early detection of declining water quality trends.
4. Demonstrate compliance with FDEP Class III surface water criteria.

The lakes currently in the monitoring program are the following:

- Lake Concord
- Grassy Lake
- Trout Lake
- Lake Griffin
- Secret Lake
- Lake Kathryn
- Lake Yvonne
- Lost Lake
- Queens Mirror Lake
- South Lake Triplet
- Middle Lake Triplet
- North Lake Triplet

The lakes are tested for a total of 21 specific parameters. Grouped by type, the tested parameters are:

Field Measurements, taken from the center of each lake

- pH
- Temperature
- Specific Conductivity
- Total Dissolved Solids (TDS)
- Dissolved Oxygen (DO)
- Oxidation/Reduction Potential (ORP)

- Secchi Disk Depth
- Turbidity

General Parameters

- Alkalinity
- Color
- Biochemical Oxygen Demand (BOD)

Nutrients

- Nitrogen Species (Ammonia-N, Nitrate+Nitrite and Organic N)
- Phosphorus Species (Orthophosphorus and Total)
- Total Nitrogen/Total Phosphorus (TN/TP) Ratio

Biological Parameters

- Chlorophyll-a
- Fecal Coliform

Heavy Metals

- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Zinc

Based on the most recent monitoring report, all twelve lakes are suitable for recreational activities, meeting the requirements of Rule 62-302 Surface Water Quality Standards, Florida Administrative Code (F.A.C.) for Class III Waters (Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife). In general, the Casselberry lakes' water quality characteristics are typical of urban lakes. The water quality of the majority of the tested lakes is relatively stable, with little or no upward or downward movement. Since 2004, the lakes' trophic states have been as follows:

- Oligotrophic – Dew Drop Pool, Grassy Lake and Trout Lake;
- Mesotrophic – Secret Lake, Lake Yvonne, Lake Griffin, Lost Lake, Middle Lake Triplet and North Lake Triplet;
- Eutrophic – Lake Concord, Lake Kathryn, Queens Mirror and South Lake Triplet.
- Hypereutrophic – No lakes were routinely classified as hypereutrophic, although South Lake Triplet and Queens Mirror have met this classification at times.

5.3 Aquatic Plant Control Program

The City maintains an Aquatic Plant Management Permit under the authority of Rule 62C-20, F.A.C. from the FDEP Bureau of Invasive Plants. The rule requires permits for aquatic plant control on water bodies larger than 10 acres. The City's FDEP permit specifically identifies the water body, the plants allowed to be controlled or targeted, the quantity (acreage) of the plant species that may be treated, the depth of water a plant may be targeted in, the allowable means of control and the specific chemicals that may be used on the plants. A copy of the permit is included in Appendix K.

The lakes included in the City's permit are listed below and shown in Figure 5-1:

- Lake Griffin
- Lake Concord
- North Lake Triplet
- Middle Lake Triplet
- South Lake Triplet
- Lost Lake
- Queens Mirror Lake
- Beaumont Pond
- Lake Hodge

The first seven of these nine lakes are also included in the City's quarterly sampling program. Weed control efforts are also conducted in Grassy Lake and Secret Lake, but these lakes are under the 10-acre threshold and are not required to be included in the City's permit.

The aquatic plants targeted under the permit are as follows:

1. Spatterdock
2. Cattail
3. Water Hyacinth
4. Hydrilla
5. Alligator weed
6. Torpedo grass
7. Para grass
8. Filamentous algae
9. Wax myrtle
10. Primrose willow
11. Elephant ear

For those lakes with aquatic weed control, the City employs a licensed, professional aquatic plant management company to conduct the City of Casselberry's aquatic plant control efforts. The City's contractor surveys the lakes on a monthly basis and treats as needed. Additionally, City personnel monitor the lakes and may call the applicator for spraying if required in between the normal monthly sprayings. The applicator of aquatic herbicides is required to carry a license from the State of Florida Department of Agriculture. In-house aquatic plant control efforts are generally restricted to maintenance of the City's wet detention ponds and ditches. The City's Stormwater Division Supervisor is required to acquire and maintain an aquatic herbicide license. The quarterly monitoring reports have indicated excessive vegetation, especially hydrilla, in a number of the lakes. Better control, possibly with mechanical or hand harvesting, may be necessary.

The permit also allows the City to provide and maintain riparian access, or the right to maintain an open area from the shoreline to open water that is either 50 feet wide or 50 percent of the property width at the lakeshore, whichever is less. Typically this permit condition is used by the City to keep boat docks and launching areas clear and accessible.

The City currently receives a 50% grant for aquatic plant control on the Triplet Lake Chain (North Lake Triplet, Middle Lake, South Lake and Queens Mirror). The grant is from the FDEP Invasive Plant Trust Fund and is eligible for lakes with public access.

5.4 Shoreline Revegetation Program

Part 3, Chapter 3, Article 11, Section 5 of the Casselberry Code of Ordinances outlines the City's Lakeshore Protection Ordinance. The ordinance defines and establishes Shoreline protection and lakefront littoral zones, and identifies land use restrictions within lakeshore protection zone(s). The ordinance also requires the development and implementation of a Shoreline Protection Plan for development occurring adjacent to lake shorelines or wetland areas. The primary elements of the Shoreline Protection Plan include:

- A plan for vegetative cover,
- A plan for shoreline and lakefront littoral zone management,
- A plan for protecting Class III waters,
- Identification of required wetland buffer zones, and
- Monitoring and management.

The quarterly reports provided by ERD have identified that "The shorelines of virtually all of the lake systems were observed to be heavily vegetated, with abundant stands of emergent, floating, and submerged littoral vegetation."

In addition to the littoral zone vegetation above, the wetland and upland portions of the majority of the City lakes have been overrun by exotic, nuisance and invasive wetland and upland plant species. These species include Australian pine, Brazilian pepper, Chinese tallow and Water lettuce to name but a few. All these species are fast-growing and extremely difficult to eradicate.

5.5 Lakes Management Advisory Board

On June 23, 2005 the Lakes Management Advisory Board (LMAB) held its first meeting. Appointed by the City Commission, the LMAB is to consist of between five and ten members whose primary duties are to provide citizen input to and assist with the preparation and finalization of the City's Lakes Management Plan and to make recommendations regarding on-going surface water resource policies. Of the ten positions, five members are not required to own or live on lakefront property, with no more than two members of the Board owning and/or living on lakefront property along the same lake. Ex Officio memberships may be offered to the following State agencies: Florida Department of Environmental Protection; Florida Fish and Wildlife Conservation Commission; and St. Johns River Water Management District.

Various subjects have been discussed at the Board's meetings recently including public education on keeping lakes clean, from distribution of various brochures to signs on stormwater inlets and a public lakeshore revegetation demonstration project. Work on preparing the Lakes Management Plan has been intermittent. A group separate from the LMAB has developed the Lake Griffin Aquatic Plant Management Plan and has received a permit for the introduction of Grass Carp into Lake Griffin.

In addition to the LMAB, other citizen organizations have been formed and should be included in discussions regarding lakes management. These are the Friends of Lake Howell and the Friends of Lake Kathryn. Other resources readily available for expertise in this area are as follows:

- Florida Department of Environmental Protection (FDEP) Bureau of Invasive Plants

- Florida Fish and Wildlife Conservation Commission (FFWCC)
- University of Central Florida (UCF) Department of Biology
- University of Florida (UF) Lake Watch

5.6 Lake Survey

In March 2006, the LMAB transmitted a survey document to residents of lakefront property requesting input on issues relative to their perceived quality of the lakes and to their feelings of the recreational usage of the lakes. Approximately 289 of the total of 489 lakefront residents were sent the survey. Of those 289, only 134 responded. A copy of the summary table is included in Appendix L.

Many of the respondents use the lakes, if only their aesthetic value. The majority of the respondents use the lakes for fishing, with boating in second place. Most of the users felt that the number of aquatic plants in the lakes interfered with those activities. Approximately 75 percent felt that 10 to 25 percent coverage of aquatic plants was acceptable, while 90 percent recognized that there is a difference between “good” and “bad” plants. The majority of those surveyed felt that muck and silt in the lakes was a bigger problem than aquatic plants. Lake clarity was an issue with approximately half of the respondents. Most felt that erosion was not a problem for the City lakes. Almost all surveyed expressed interest in being kept informed of the condition and health of the lakes.

5.7 Recommendations

The following recommendations for lakes management are made:

5.7.1 Lake Water Quality

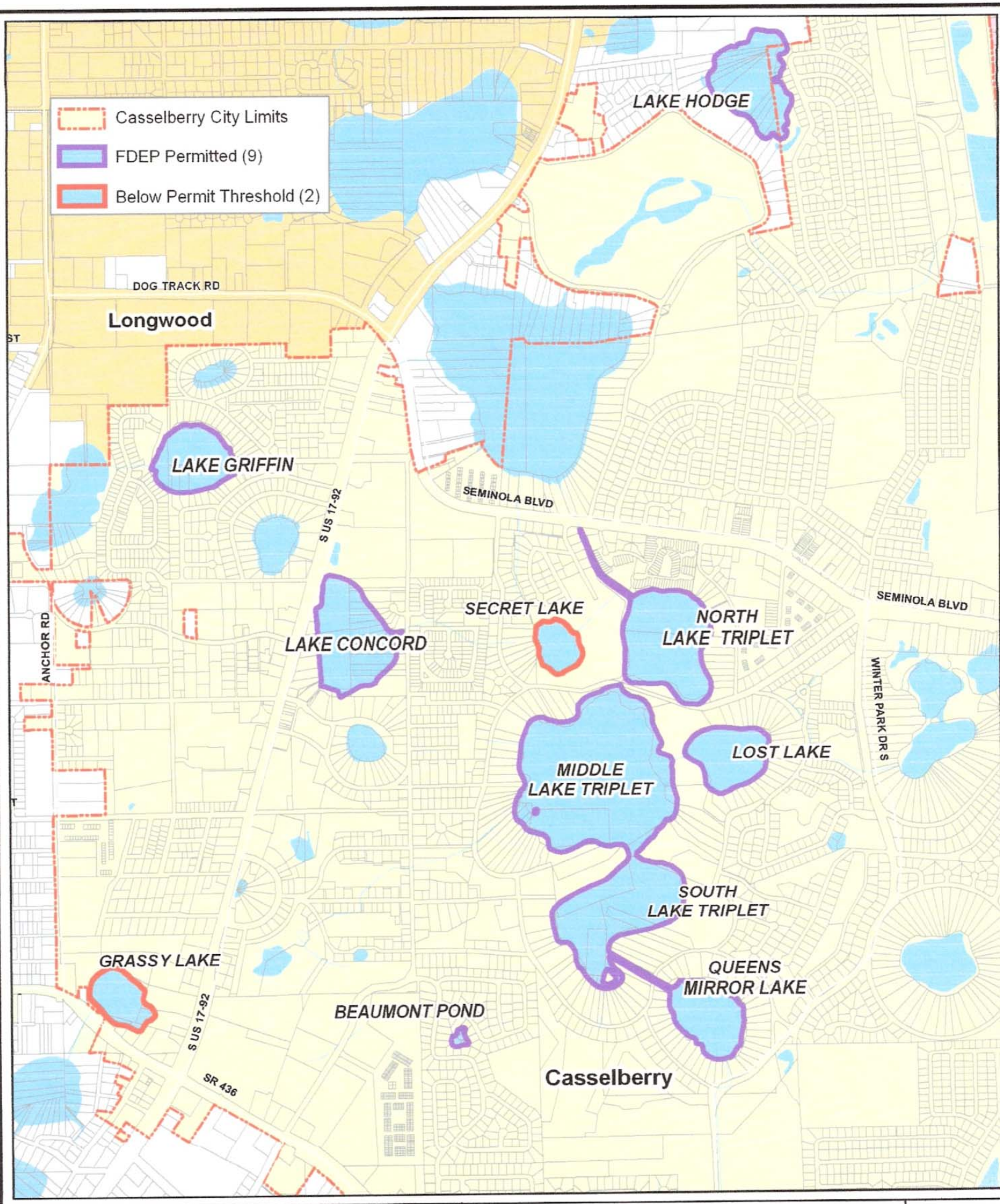
- Continue Public Education campaign.
- Solicit volunteers for Lakewatch or the like for periodic sampling of lakes, especially those with known water quality issues.
- Prioritize capital projects to emphasize those that would result in pollutant reductions, including trash and settleable solids, to the lakes.

5.7.2 Aquatic Plant Control

- Closely monitor the results of the aquatic plant control program, revising as necessary.
- More closely coordinate with the contractor to optimize treatment procedures and results.
- Increase the frequency and extent of harvesting.

5.7.3 Shoreline Revegetation

- Complete the revegetation of the west and south shores of Lake Concord.
- Coordinate with Lakes Management Advisory Board (LMAB) on the other shoreline revegetation projects along areas of lakeshore with public access and high visibility.



cph	Scale: 1" = 1500' Date: August 2007 Photo Date: N/A Project No. C1953 PM: BG	N	LAKES WITH WEED CONTROL CITY OF CASSELBERRY STORMWATER MASTER PLAN SEMINOLE COUNTY, FLORIDA

Exhibit 5 - 1

SECTION 6

AVAILABLE BEST MANAGEMENT PRACTICES (BMPs)

6.1 General

Urbanization of an area involves the conversion of undeveloped, rural land to a developed, more impervious area. This conversion usually increases erosion and the discharge and volume of storm water runoff in a watershed. It also causes other potential problems that affect soil, surface and underground water quality, which will affect not only the environment but also human and other living species. Although much of the City of Casselberry has been developed, at least to a certain extent, there continues to be additional new development and redevelopment along major roadway corridors. Additionally, many of the older developments including single and multi-family residential subdivisions were constructed prior to current land development regulations and provide little or no treatment of stormwater runoff.

6.2 United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Menu

Within the EPA website, the NPDES website contains a "National Menu of Stormwater Best Management Practices" that offers links to fact sheets and information on numerous BMPs (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm). The six minimum control measures categories identified in the menu are as follows:

- Public Education
- Public Involvement
- Illicit Discharge Detection and Elimination (IDDE)
- Construction Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

A general discussion of these categories is included in Chapter 4 "NPDES/TMDL Requirements" of this Master Plan. This chapter provides descriptions of specific BMPs that may be applicable for the City of Casselberry.

6.3 Public Education and Outreach on Stormwater Impacts

Local and state governments must learn how to prevent stormwater pollution by informing themselves and their communities about the NPDES program and how to implement it effectively. An effective guide, provided by the EPA, in creating a public outreach program for MS4s is *Getting in Step: A Guide for Conducting Watershed Outreach Campaigns*. A variety of public outreach materials are available through the EPA as well for the construction industry, homeowners, city and state governments, and children. Through these materials the construction industry can be educated about stormwater permitting and pollution prevention plans. These materials may be customized for the specific state or local government through the EPA. Homeowners can learn what they can do to help prevent stormwater pollution, such as low-impact landscaping, proper maintenance for septic systems, and disposing of household wastes properly.

6.3.1 Current City Public Education Practices

The City of Casselberry currently makes available a wide variety of brochures related to how the public can assist with efforts to reduce pollutant loadings to surface and ground waters. The City also employs storm drain markers, indicating that they drain to a lake and that dumping of waste is prohibited.

6.3.2 Additional Public Education Practices

- Expand storm inlet marker program.
- Require training of private contractors working in the City regarding disposal of waste materials including lawn clippings and leaves, fertilizers, herbicides, paints and other household hazardous wastes.
- Adopt an ordinance specifically prohibiting lawn clippings and leaves from being blown into roadways where they can be carried to surface water bodies.
- Support and publicize Amnesty Days

6.4 Public Involvement/Participation

6.4.1 Current City Public Involvement Efforts

The City of Casselberry works with the University of Florida *Lakewatch* program in order to successfully manage surface water quality and evaluate effectiveness of their stormwater management plan. The City also collects data from 12 of their lakes quarterly and submits it to the *Seminole County Watershed* Atlas to monitor lake water quality. The City has created the Lakes Management and Advisory Board (LMAB) of lake front residents to provide input and opinions affecting the quality and use of City lakes.

6.4.2 Additional Public Involvement Opportunities

The City should approach schools and service organizations as well as private individuals for assistance in:

- The lake water quality monitoring program,
- Lake Management Advisory Board,
- Stakeholders meetings,
- Watching for illicit dischargers,
- Lake and stream cleanups,
- *Adopt-A-Highway,*
- *Watershed Action Volunteers.*

6.5 Illicit Discharge Detection and Elimination (IDDE)

Under the NPDES permitting process, an MS4 program must develop a program to address detection, prevention and elimination of illicit discharge spills.

6.5.1 Current IDDE Practices

Section 94-10 of the City Code of Ordinances states that, "It shall be unlawful for any person to permit any refuse such as grass, logs or other debris to be released or thrown into the lakes and canals covered by this Chapter..."

6.5.2 Additional IDDE Practices

- The language in the City Code should be strengthened, with specific penalties for violations,
- Solicit more public education and involvement in detection and reporting of dischargers.
- The NPDES permit requires that the City designate a central reporting point and maintenance of a log of reports, responses and enforcement.
- Conduct training of personnel on inspection, detection and reporting procedures.

6.6 Construction Site Stormwater Runoff Control

The City is responsible for requiring contractors to use best management practices addressing erosion and sediment control include temporary and permanent sodding and seeding, sediment basins and rock dams, silt fences, and vegetative buffers. All of these practices help reduce harmful pollutants in stormwater runoff from the construction site. Wastes from the construction site should be managed through recycling, providing adequate and appropriate storage and disposal facilities, and preventing spills that may contaminate groundwater or surface water, as well as providing adequate equipment and materials to address a clean-up of any hazardous material. Although preserving the natural vegetation of the site by minimizing clearing and grubbing is preferred, it is not always possible or practical. In order to preserve the site, it is important to minimize soil exposure by immediately stabilizing any exposed portions of the site, protect steep slopes by applying geotextiles or other erosion control measures.

6.6.1 Current Construction Requirements in the City of Casselberry

The following are excerpts from the City of Casselberry Unified Land Development Regulations (ULDRs) describing the current requirements for meeting minimum measures and certain requirements of its NPDES permit:

> "**Section 3-11.2. Soil erosion and sedimentation control.**
> A. *Applicability.* In order to prevent both soil erosion and sedimentation, a soil erosion and sedimentation control plan shall be required as a part of an application for site plan review whenever a development will involve any clearing, grading, or other form of disturbing land by the movement of earth.
> B. *Definitions.* For the purposes of this Article the following definitions are provided:
> 1. *Soil erosion:* Any removal and/or loss of soil by the action of water, gravity, or wind. Erosion includes both the detachment and transport of soil particles.
> 2. *Sedimentation:* The settling out of the soil particles which are transported by water or wind. Sedimentation occurs when the velocity of water or wind in which soil particles are suspended is slowed to a sufficient degree and for a

sufficient period of time to allow the particles to settle out of suspension or when the degree of slope is lessened to achieve the same result.

3. *Erodible slope:* All slopes with inclines in excess of four percent unless modified by the City Engineer based on consideration of specific soil conditions.

4. *Large flat surface area (unpaved):* An area which is flat or whose slope is less than four percent and which consists of more than 1,000 square feet of exposed soil.

C. *Erosion control measures.* All measures necessary to minimize soil erosion and to control sedimentation in the disturbed land area shall be implemented. The following protection shall be provided for all disturbed areas: minimize velocities of water runoff, maximize protection of disturbed areas from stormwater runoff, and prevent or retain sedimentation within the development site as early as possible following disturbances.

D. *Applicability.* Appropriate measures shall be taken during land clearing and building operations to assure that exposed, destabilized or otherwise altered soil is expeditiously covered with an acceptable erosion control material. The provision shall be applicable to the act of subdividing and installation of related improvements as well as during the development review process including the period during which improvements may occur as well as the length of time soil may be exposed to the environment.

The tree and native vegetation protection ordinance shall be applicable to all clearing and grading activities and shall include specifications for management principles guiding the removal or placement of vegetation and landscaping design. Regulations shall also require developers to take precautionary measures, where necessary, to avert destruction or damage to native vegetation."

6.6.2 Additional Construction Runoff Control Practices

Per the requirements of the NPDES permit, the City should include language in its Development Review Committee comments and its standard specifications that notify the contractor of the requirements for the NPDES generic permit for construction activities.

6.7 Post-Construction Stormwater Management in New Development and Redevelopment

By the design and construction of proper stormwater management systems, post-construction impacts of stormwater runoff can be minimized. All construction should meet the permit requirements of the City and the St Johns River Water Management District. All development and redevelopment projects within the City of Casselberry are subject to review by the City's Development Review Committee (DRC) to ensure compliance with City Code and Land Development Regulations.

6.7.1 Current City Requirements for Post-Construction Stormwater Management

The following excerpts from the City of Casselberry Unified Land Development Regulations (ULDRs) describe the current general requirements for meeting minimum measures for post-construction stormwater management:

"ARTICLE XII. STORMWATER MANAGEMENT

Section 3-12.1. Purpose and intent.
This Article is intended to protect water resources in the City, recognizing that they are critical to the public health, safety, and welfare. This Article is intended to encourage innovative approaches to stormwater management. The concurrent control of erosion, sedimentation, and flooding is mandatory. The following provisions shall apply to both public and private improvements.

Section 3-12.3. Standards and requirements.
The following general criteria shall be applicable to all stormwater management plans as approved by the City Engineer:

A. *Rules of construction.* These requirements are intended to complement regulations of the Florida Department of Environmental Regulation (FDER) including but not limited to those found in the Florida Administrative Code, chapter 17-25, Regulation of Stormwater Discharge, and the Stormwater Rules of the St. Johns River Water Management District, all as adopted or as may be amended from time to time. Approval of a stormwater management system under these requirements shall not relieve any applicant of the necessity to obtain required permits or approvals from other state, regional or local agencies, including specifically, but not limited to, observance of DER permitting requirements for the use of the "landward extent of waters of the state," as defined in the Florida Administrative Code, Section 17-4.02(17). In the event of a conflict between the City regulations and state regulations, the more restrictive regulations shall prevail.

B. *Nonstructural methods.* When possible, the nonstructural approach shall be used to meet both surface water quantity and quality requirements.

C. *Stand-alone systems.* The drainage system for each phase of a development shall be capable of standing on its own if subsequent areas planned for development are not developed.

D. *Accommodating existing runoff.* Permitted rates and volumes of stormwater runoff, whether discharged into natural or artificial watercourses, shall meet existing water quality standards at the first downstream receiving water body for which such standards have been established.

E. *Innovative techniques.* The general criteria, as outlined herein, shall in no way be construed as prohibiting new and innovative techniques.

1. All such new and innovative techniques shall be subject to the approval of the City Engineer at a pre-design conference prior to their use in the design of any development.

2. Storm drainage information shall include adequate data to show that the surface runoff from the project during construction, as well as thereafter, shall be controlled in a manner so as not to degrade, either directly or indirectly, bodies of receiving water from the standpoint of their classification and use. Types of data necessary shall include information relating to:

a. Water quality.
b. Water quantity.
c. Frequency characteristics of the runoff.
d. Control structures.

e. Treatment techniques.
f. Effects on the quality and use of the receiving bodies of water.

F. *Maintain predevelopment conditions.* The storage and controlled release or retention onsite, and the infiltration into the ground, of excess stormwater runoff from any commercial, industrial, and residential developments will be required so that neither runoff rate nor volume therefrom will be greater than it was prior to development.

G. *The effects of soil on stormwater runoff disposal.* The procedure for disposing of excess stormwater runoff shall be dependent on the hydrologic soil classifications of the soils within the proposed development boundaries. The hydrologic soil classification shall be as used and defined by the Soil Conservation Service of the U.S. Department of Agriculture (A, B, C, or D, and A/D, B/D, and C/D) in the publication, Seminole County, Florida--Soils, and in other publications of the Soil Conservation Service. However, the location and designation of the various soil types as depicted therein shall be fully substantiated by a soils analysis, if required by the City Engineer.

H. *Natural drainageways and watercourses.* Should the proposed development area contain an existing natural watercourse drainageway, channel, or the like, the natural watercourse and the vegetation inherent therewith shall be maintained and the proposed development designed so as to preserve them. However, the use of the natural watercourse to carry off runoff, after treatment, from any development may be permitted if provision for control of sediment in the excess runoff is made prior to entrance of the runoff to the natural watercourse. This does not preclude the use of isolated wetlands for storage and treatment of stormwater runoff as long as the integrity of the wetland is not degraded.

I. *Upstream runoff.* The drainage system for each development shall be sized to accommodate existing upstream runoff.

J. *Effect of development on environmentally sensitive lands.* No site alteration shall cause siltation of wetlands, pollution of wetlands, or reduce the natural retention or filtering capabilities of wetlands.

K. *Avoiding potential health hazards.* No site alteration shall allow water to become a health hazard.

L. *Provide necessary facilities.* All site alteration activities shall provide for such water-retention and settling structures and flow-attenuation devices as may be approved by the City Engineer to ensure that the foregoing standards and requirements are met.

M. *Maintain existing surface drainage.* Site alteration shall not adversely affect existing surface water flow pattern. To the extent feasible, drainage subbasin boundaries shall be maintained.

N. *Maximize recharge.* The parcel shall be developed to maximize the amount of natural rainfall which is infiltrated into the soil and to minimize direct overland runoff into adjoining streets and watercourses. Stormwater runoff from roofs and other impervious surfaces shall be diverted into swales or terraces on the lot when possible.

O. *Overland flow.* To the extent feasible runoff from impervious areas shall be diverted so as to flow over vegetated areas prior to flowing into gutters, storm drains and retention areas.

P. *Waterfront development.* Waterfront properties which drain directly into adjacent water bodies shall utilize pre-berms, terracing,

swales, and natural vegetative buffers to divert, detain, and/or filter stormwater before it enters the receiving water body in an effort to preserve the aquatic environment therein.

Q. *Preservation of native vegetation.* In no case shall reduction of the groundwater occur so as to disturb natural vegetation on- or offsite.

In addition to these general requirements, the ULDRs contain specific design criteria to the various elements of the stormwater management system. As indicated in Section 3-12.3.E above, the City encourages the use of innovative techniques for stormwater management.

6.7.2 Additional City Opportunities for Post-Construction Stormwater Management

Following is a partial listing and descriptions of stormwater Best Management Practices contained in EPA literature (including its website) and elsewhere to reduce runoff volumes and improve downstream water quality. A brief description of each of these practices should be included in the ULDRs to further promote their use. Retention or detention facilities of one form or another are required to meet the criteria of the ULDRs for water quality treatment, but are included herein to show the relative benefits between various types.

6.7.2.1 Dry Retention/Detention – A dry retention/detention facility is one that drains completely between rainfall events. These basins are designated for use in soils with flat slopes and good percolation. Improper design can make these facilities an eyesore and a mosquito-breeding mud hole. Dry retention/detention ponds settle pollutants out, but soluble pollutants pass through. Typical sections of a dry retention/detention pond are shown in Exhibit 6-1.

6.7.2.2 Wet Detention/Retention – Wet detention/retention areas are designated for soils with high water table problems and poor percolation. They have excellent pollution removal efficiency if property designed, but efficiency can be poor if the bottom becomes anoxic. Wet detention/retention ponds remove pollutants by settling and dissolving pollutants biochemically as shown in Exhibit 6-2. Therefore, they have better pollutant removal efficiency than dry retention/detention ponds. Wet detention/retention ponds are relatively maintenance free after the first year except for major clean-out at about 10-year intervals. An aesthetic design like that shown in Exhibit 6-3 can make these ponds an asset to the communities where they are utilized and adjacent properties can actually increase in value. However, they must maintain adequate water depth at all times and have shape and other properties to be acceptable aesthetically. Wet detention/retention ponds are excellent as regional facilities and they can incorporate recreational activities. One drawback to wet detention ponds is that of the high cost caused by often times having to excavate very large quantities below the water table to get the depth of water needed.

6.7.2.3 Reverse Berm Sections – A reverse berm is a raised earthen ridge near the low part of a slope that prevents runoff from continuing to flow downgradient into a surface water. (See Exhibit 6-4.) The reverse berm

section can be used in areas where stormwater runoff discharges directly into lake systems. The reverse sections would be mostly used in areas where steep slopes exist. Soil analysis would be required to determine compaction and stabilization requirements of the berms. Most of the soils in the steep-sloped areas have good permeability so percolation from the basin should not present a problem. For those areas that do not percolate, underdrains may be required to meet the drawdown requirements.

6.7.2.4 Roadway Swale Section – Swales are vegetated, open channels that are designed to transport, treat and temporarily store runoff. Construction of swales should be considered for low flow velocities and high infiltration capacity. Impurities in the runoff waters are removed by sedimentation, filtration and chemical and biological processes. Some swale areas may require berming on the back slope of the swale due to steep slopes outside of the pavement as shown in Exhibit 6-5. Flatter sloped areas will allow a typical swale section. Right-of-Way widths should be verified in each case to determine if additional easement area is necessary or if a reduction in typical width is required. Swale checks may also be constructed along some swales where insufficient land area or other factors exist that would limit the construction of pollution abatement areas at points of outfalls. The primary drawback with roadside swales is that, in time, they tend to fill in (sometimes intentionally by the property owner) and cease to function as intended. Where considered, public education on maintaining the swale section is critical.

6.7.2.5 Wetland System – The Henderson Wetland Act authorized the use of certain isolated wetlands for stormwater treatment. Wetlands are nature's kidneys. As such, they can effectively store stormwater and filter out the pollutants. However, care must be taken to protect the natural mechanisms within the wetland plants and sediments that breakdown the pollutants. A pre-treatment pond adjacent to a wetland can reduce sediment loads, remove oils and greases and attenuate stormwater volumes.

The stormwater must be allowed to sheet flow through the wetland to maximize contact between the stormwater and the wetland plants, sediments and microorganisms that provide treatment. Major advantages of using wetlands for stormwater management are the reduced operation/maintenance needs, the preservation of wetlands, the restoration of drained wetlands and the use of uplands for development rather than for stormwater management.

6.7.2.6 Multi-Component Pollution Abatement Facility – A multi-component facility relies on both sedimentation and biological removal to obtain a final level of quality suitable for discharge. In areas with existing wetland vegetation, it may be possible to install a pretreatment basin (sedimentation basin) upstream and allow the native plants to provide subsequent treatment. This combination process would result in similar pollutant removal as a wetland system, but would cost considerably less to install. The design of such a system must consider many factors to assure that the wetland filter is not damaged and the wetland ecologically harmed. It

may be difficult to permit this type of system, depending on the vegetative nature of the low area, effect of water level changes, etc.

6.7.2.7 Exfiltration Trench – Exfiltration trenches are on-site retention/detention systems, located below ground. These trenches are excavated, backfilled with coarse aggregate in which perforated pipe is placed and covered. The exfiltration trenches are placed in-line or off-line. They serve the purpose of percolating a specific volume of stormwater into the surrounding soil. Exfiltration trenches are used to:

- Retain first flush of stormwater runoff,
- Filter contaminants out of the runoff,
- Promote recharge of groundwater and reduction in runoff,
- Retrofit built-out environments,
- Control flooding to some degree,

A stormwater pretreatment device is recommended to remove particulate matters, which may clog the system. Anything that will reduce the velocity of the flow to the point that suspended solids drop out, can be used as a sediment control device. The sediment control device can be above or below ground, and can be a grassy swale or other vegetated area.

The exfiltration system should be "off-line" for maximum removal efficiencies. For retrofitting projects, it can be an on-line system with pretreatment facilities upstream at inlet locations. These inlets or pretreatment facilities at upstream locations must be sized and designed to allow for heavy sediments to settle. The inlets may require baffles to increase the residence time and to decrease the velocity. The inflow and outflow inverts of the inlets need to be three to five feet above the bottom of the structure, depending on the size of the structure and they will require sediment removal and regular maintenance to keep the system effective.

6.7.2.8 Inlets in Grass – Another simple BMP is to place stormwater inlets in grassed areas rather than in pavement. The grass pre-treats the stormwater and helps to remove oils, greases, heavy metals and other stormwater pollutants.

6.7.2.9 Baffle Boxes - The term “Baffle Box” as used herein refers to a stormwater manhole-like structure that is designed to remove floating debris and settleable solids. The structures are larger than typical manholes, creating lower flow-through velocities which allow for sand and certain other solids to settle out in the structure for subsequent removal. Often these structures will contain baffles at the effluent pipe that trap branches and other such floating objects. Some patented products use a vortex principal to facilitate separation of the particles from the stormwater and are dubbed Off-line Units.

6.7.2.10 Low Impact Development (LID) – Low Impact Development measures are designed to reduce runoff and pollution at the source. LIDs contradict traditional and newer development concepts of wide boulevards

and sidewalks that double as bike trails. By reducing the width of these impervious areas, runoff is reduced. Use of open paver blocks allows water to percolate into the soils rather than runoff to storm sewers. Reduction of pavement widths also allow for the use of grassed swales and "rain gardens" described below.

6.7.2.11 Green Roofs – Sometimes called a "vegetated roof cover," a green roof consists of a drainage system, filter cloth, lightweight planting medium and plants that act as a stormwater management system. According to the EPA, green roofs reduce stormwater runoff from buildings by absorbing approximately 50% rainfall, therefore reducing the overall peak flow to the storm sewer system. Another benefit of using a green roof is the possible removal of pollutants, such as phosphorus and nitrogen. The ability of the system to absorb heat and act as insulation increases energy efficiency of the building. Green roofs can be built on industrial, commercial and large residential buildings, and are functional for new or retrofitted construction, although structural loads are a consideration on the latter. Although green roofs are well established in European countries, they have yet to become common practice in the United States

6.7.2.12 Bioretention – Another alternative BMP is Bioretention, sometimes known as "rain gardens". Bioretention consists of a grass buffer strip, sand bed, ponding area, organic layer, planting soils, and plants. This type of stormwater treatment is ideal for treating runoff from impervious areas and is typically implemented in median strips, parking lot islands, and swales. To minimize sediment loading and avoid clogging, it is suggested to use bioretention in stable drainage areas. This BMP is not highly recommended for colder climates or where the ground water table is within 6 feet of the surface.

6.7.2.13 Alum Injection – Alum is an acid salt of aluminum that has been used for many years in the treatment of drinking water, and for phosphorus removal in the wastewater industry. Within the last few years, it has also been utilized on a permanent basis to treat stormwater inputs in two small receiving water bodies (Lake Dot - 5.9 acres and Lake Alla - 13.3 acres in the Orlando area). Alum forms non-toxic precipitates which, when combined with phosphorus, suspended solids and heavy metals, causes them to be deposited as sediment on the lake bottom. The addition of alum to water has the overall affect of consuming alkalinity from the treated water, which causes the water to become acidic. To provide safeguards against alum added to the runoff stream resulting in excessive acidity, sodium aluminate, an alkaline form of alum, is injected simultaneously with the acid form of alum through a separate pumping system.

6.7.2.14 Biological Filters - One new technology involves the flow of stormwater along channels containing attached surficial growths of periphytons and ozone pre-treatment. The ozone maximizes the potential for the periphyton filter to adsorb various chemical components from the stormwater.

6.7.2.15 Electrocoagulation - This technology is similar to that above but uses an electric current to precipitate out the various pollutants. Rather than using chemicals for treatment as in chemical coagulation, an electrical current is introduced to the water being treated to remove pollutants through oxidation and reduction reactions. This proves to reduce operating and maintenance costs because no chemicals are needed, therefore no chemical byproducts are produced that need removed, and the need for operators is minimal. The sludge produced from the electrocoagulation process is nontoxic and is 60% to 80% less than that of chemical coagulation according to the West Palm Beach, Florida pilot study. The most common application of electrocoagulation is in industrial pretreatment according to another pilot study in City of Los Angeles, CA. This process can be relatively land-intensive.

6.7.2.16 Water Reuse Pond - Wet detention ponds may also be used as a water source, usually for irrigation. In this case, the water balance used in sizing the pond must account for the water that will be taken from the pond. The USEPA references one study conducted in Florida that estimated that a water reuse pond could provide irrigation for a 100-acre golf course at about one-seventh the cost of the market rate of the equivalent amount of water ($40,000 versus $300,000). The following BMPs are typically used for retrofitting existing systems for additional pollution abatement and flow mitigation.

6.7.2.17 Catch Basin Inserts - Several manufacturers offer inserts that fit into existing catch basins that are capable of removing suspended solids and/or chemical pollutants. Often these inserts are simply filter bags or screens that require routine cleaning or replacement. Other inserts are made of materials that attract and adsorb chemical pollutants, notably hydrocarbons.

6.7.2.18 In-Line Exfiltration - Retro-fitting of existing stormwater culverts with perforated materials encompassed by coarse aggregate exfiltration systems can reduce both volume and pollutant loadings through conveyance structures.

6.7.3 Pollutant Removal Capabilities

The addition of nutrients from surface runoff into Florida's aquatic system is of concern because it may lead to impaired water quality. Specific nutrients of concern include phosphorus and nitrogen. The nutrient concentrations must be controlled and monitored in order to prevent eutrophication. Eutriophication removes oxygen from the water body resulting in destruction of aquatic life. The table below summarizes the potential pollutant removal efficiencies for the "Best Management Practices" discussed above.

Table 6-1: Pollutant Removal Efficiencies

Best Management Practice (BMP)	Pollutant Removal Efficiencies (%)			
	BOD	TSS	Phosphorus	Nitrogen
Wet Detention	20-40	40-90	40-70	70-80
Dry Detention	30-60	N.A.	25-40	30-60
Retention	>80	>80	>80	>80
Extended Dry Detention	20-30	80-90	20-30	0-20
Swales	20-40	70-90	40-63	41-51
Bioretention	>80	>80	65-87	49
Catch Basin Inserts	50-90	30-97	20-70	10-70
Baffle Boxes	N.A.	80-90	N.A.	N.A.
Infiltration Trench	N.A.	>75	60-70	50-60
Wetlands	N.A.	70-80	40-60	20-60
Alum Injection	N.A.	95-99	40-95	50-70
Biological Filters	N.A.	N.A.	N.A.	N.A.
Electrocoagulation	98+/-	99+/-	>83	94+/-

N.A. – Not Available

6.8 Pollution Prevention/Good Housekeeping for Municipal Operations

This "minimum measure" relates primarily to the day-to-day operations of the municipality. Training is required on a regular basis to educate new personnel and remind existing personnel regarding operational practices for promoting pollution prevention, by themselves and others.

6.8.1 Existing Pollution Prevention Practices

The City already has in place a number of practices that fit this category. Several of these are street sweeping, litter control, storm sewer system maintenance and training on good housekeeping practices and proper disposal of wastes.

6.8.1 Additional Pollution Prevention Practices

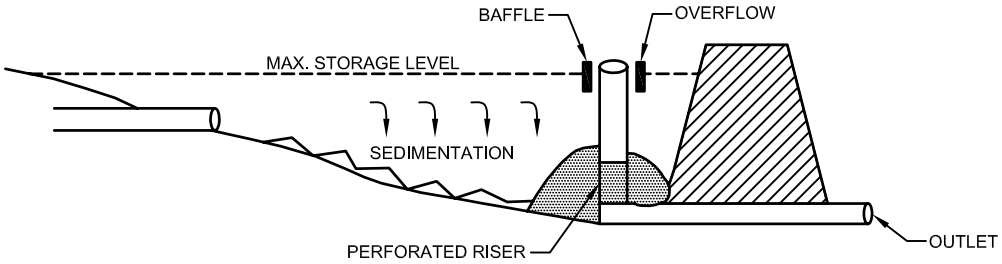
Adopt standardized checklists for inspections of system components to ensure that all items are inspected and /or maintained.

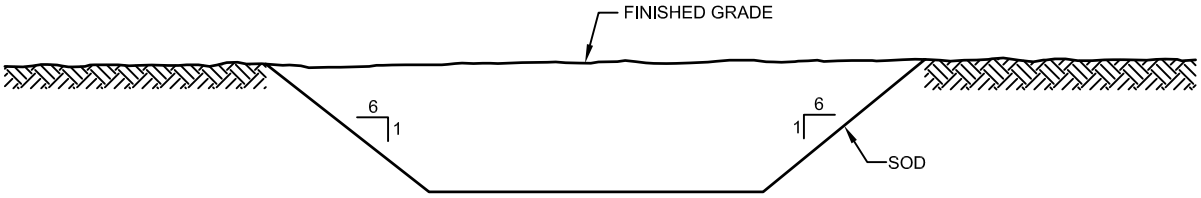
6.9 Summary and Recommendations

Following is the summary of recommended additional measures for compliance with the City's NPDES permit by incorporation of Best Management Practices for the City of Casselberry:

- Expand the storm inlet marker program;
- Require training of private contractors working in the City regarding disposal of waste materials including lawn clippings and leaves, fertilizers, herbicides, paints and other household hazardous wastes;

- Adopt an ordinance specifically prohibiting lawn clippings and leaves from being blown into roadways where they can be carried to surface water bodies;
- Support and publicize Amnesty Days;
- Approach schools and service organizations as well as private individuals for assistance in:
    - The lake water quality monitoring program,
    - Lake Management Advisory Board,
    - Stakeholders meetings,
    - Watching for illicit dischargers,
    - Lake and stream cleanups,
    - *Adopt-A-Highway,*
    - *Watershed Action Volunteers;*
- Strengthen language in the City Code with regard to specific penalties for violations of illicit discharging;
- Promote more public education and solicit greater public involvement in detection and reporting of dischargers;
- Designate a central reporting point and maintain of a log of reports, responses and enforcement of illicit discharges;
- Conduct training of personnel on inspection, detection and reporting procedures;
- Include language in Development Review Committee comments, the City's standard specifications and the Engineering Permit that notify the contractor of the specific requirements for the NPDES generic permit for construction activities.
- Include in the ULDRs a listing and brief descriptions of stormwater Best Management Practices contained in EPA literature (including its website) and elsewhere to reduce runoff volumes and improve downstream water quality.
- Adopt standardized checklists for the required annual and biennial inspections of system components to ensure that all items are inspected and /or maintained.





cph

Engineers Architects Surveyors
Planners Landscape Architects
Environmental Scientists
Construction Management
Design / Build

1117 East Robinson Street
Orlando, Fl. 32801
Phone: 407.425.0452
Fax: 407.648.1036

Date: June 2007
Job No. C1953
Scale: N.T.S.

Certificate of Authorization No. 3215

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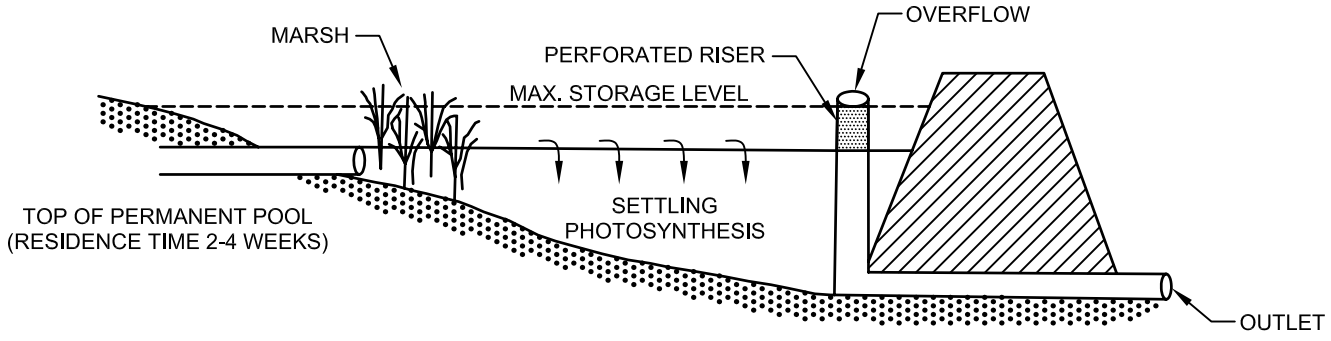
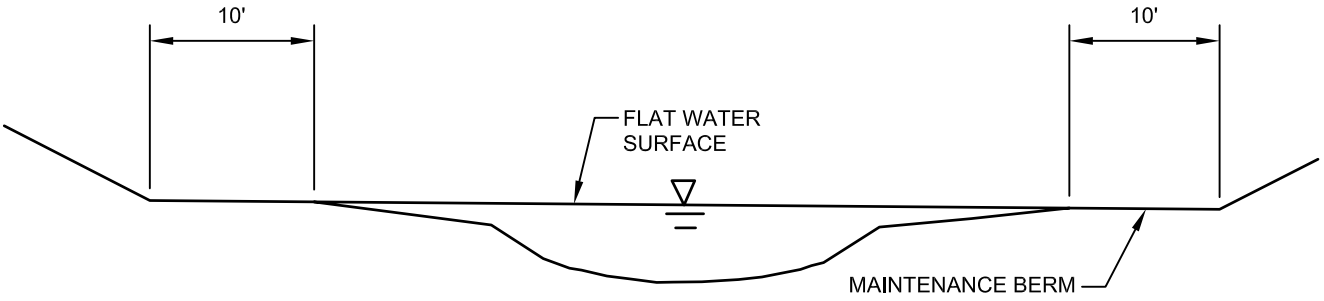
DRY RETENTION/ DETENTION POND SECTIONS

CITY OF CASSELBERRY
STORMWATER, LAKES MANAGEMENT AND WATER QUALITY MASTER PLAN

EXHIBIT 6-1



WET DETENTION SYSTEM



TYPICAL POND

cph

Engineers Architects Surveyors
Planners Landscape Architects
Environmental Scientists
Construction Management
Design / Build

1117 East Robinson Street
Orlando, Fl. 32801
Phone: 407.425.0452
Fax: 407.648.1036

Date: June 2007
Job No. C1953
Scale: N.T.S.

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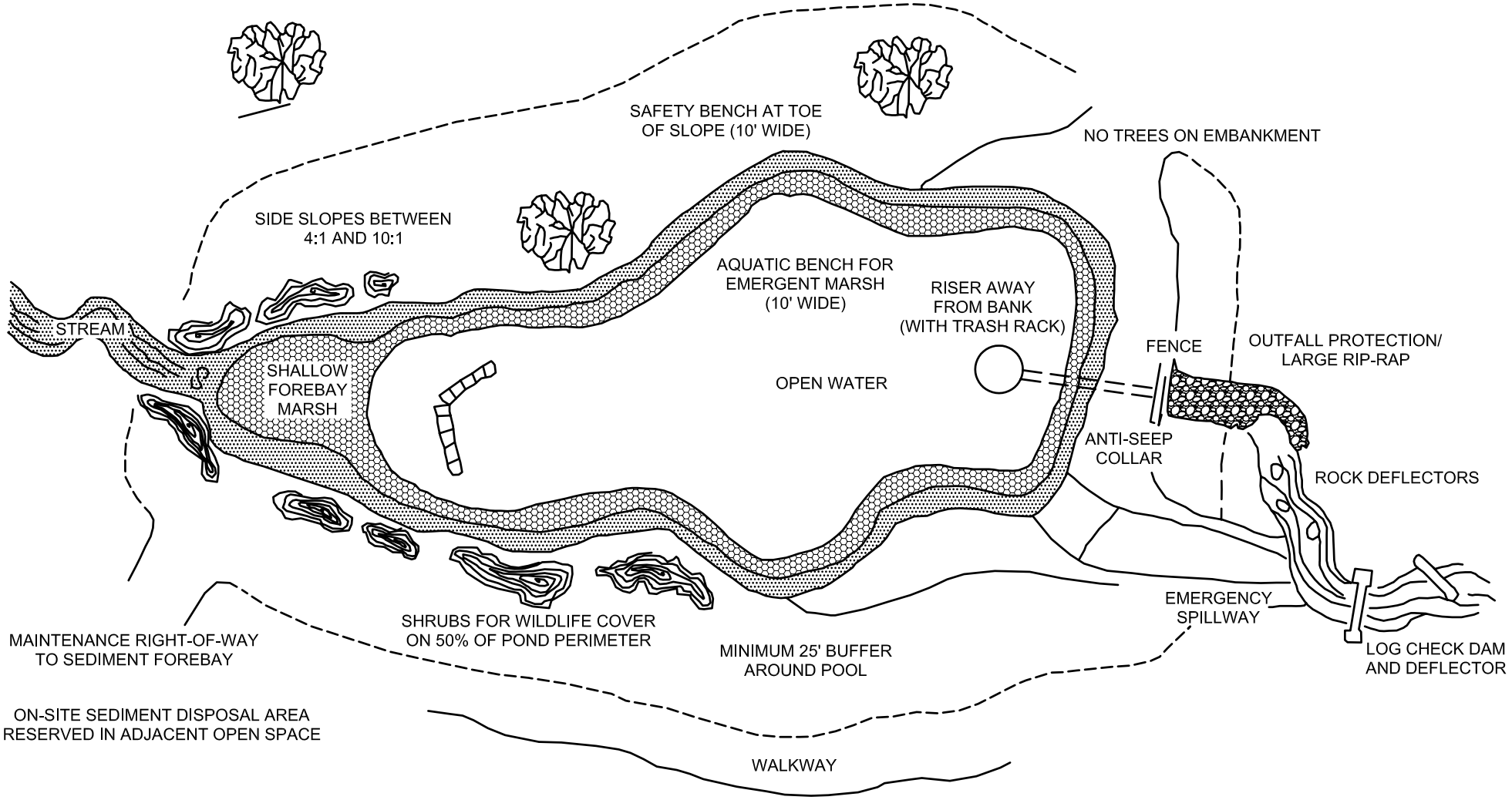
WET DETENTION/ RETENTION POND SECTIONS

CITY OF CASSELBERRY
STORMWATER, LAKES MANAGEMENT AND WATER QUALITY MASTER PLAN

EXHIBIT 6-2



SOURCE: METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

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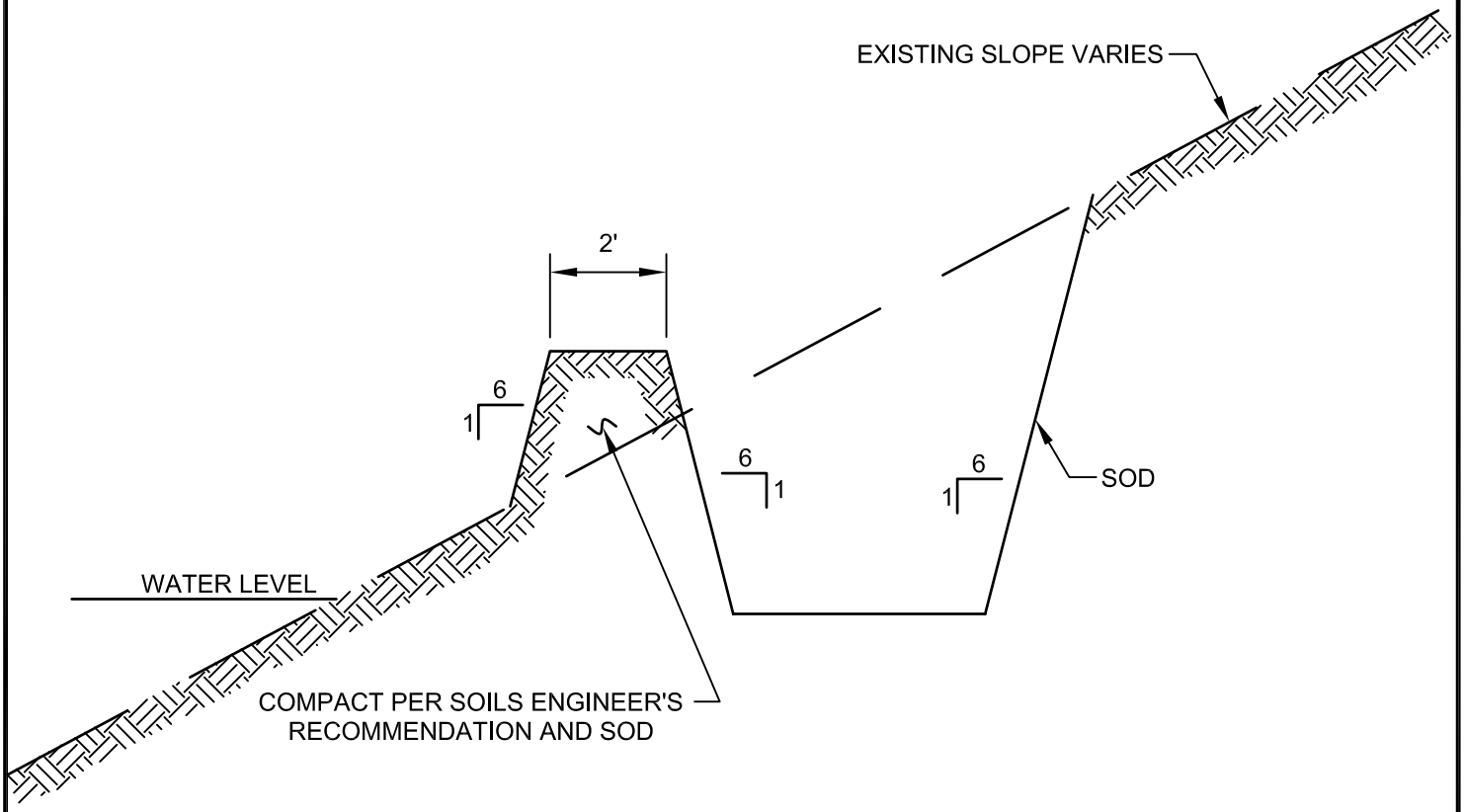
DETENTION POND DESIGN FEATURES - PLAN VIEW

CITY OF CASSELBERRY
STORMWATER, LAKES MANAGEMENT
AND WATER QUALITY MASTER PLAN

EXHIBIT
6-3



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REVERSE BERM SECTION

CITY OF CASSELBERRY
STORMWATER, LAKES MANAGEMENT
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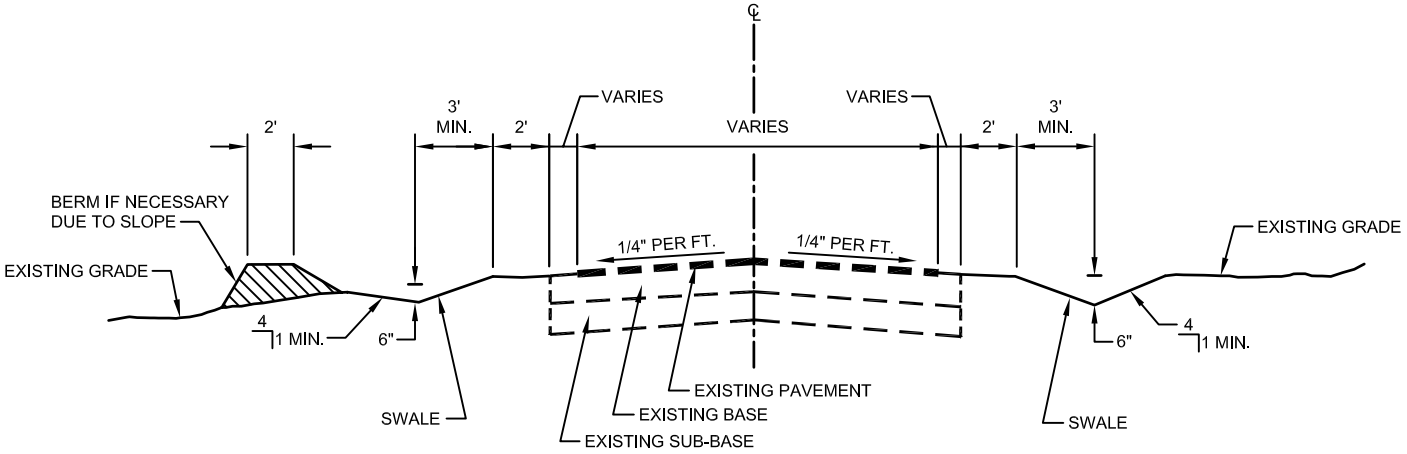
EXHIBIT
6-4



cph	*Engineers Architects Surveyors* *Planners Landscape Architects* *Environmental Scientists* *Construction Management* *Design / Build* *1117 East Robinson Street* *Orlando, Fl. 32801* *Phone: 407.425.0452* *Fax: 407.648.1036*	Date: June 2007 Job No. C1953 Scale: N.T.S. *Certificate of Authorization No. 3215* © 2007	ROADWAY SWALE SECTION CITY OF CASSELBERRY STORMWATER, LAKES MANAGEMENT AND WATER QUALITY MASTER PLAN	EXHIBIT 6-5

SECTION 7

RECOMMENDED CAPITAL IMPROVEMENTS PLANS

7.1 Capital Projects Prioritization

7.1.1 General

The methodology for use in assisting with the prioritizing of the City of Casselberry proposed capital improvement projects is a matrix using the following criteria:

- Flood Impacts
- Pollutant Reduction
- Lake Water Quality
- Lake Management
- Repair & Maintenance
- Benefit/Cost Ratio
- Public Support

Points for a specific project are assigned based upon severity criteria within each category. Where a project is not designed to correct a deficiency within a specific category, zero points are assigned. The points are added together for each project and a prioritization factor is obtained. All projects and prioritization factors are placed in a matrix in order of declining prioritization factor value. The Capital Improvement Plan projects are scheduled based on available funding and project priority factor.

7.1.2 Flood Impacts

In the City of Casselberry, flooding is a relatively minor issue. There is periodic localized flooding on portions of several roads and intersections, but there are no known home or building flooding problems at this time. The adopted Level of Service (LOS) for stormwater conveyance facilities is capacity to convey a ten-year storm. The LOS for stormwater retention areas is the ability to withstand a 25-year storm event. Projects designed to correct LOS deficiencies are assigned points as follows:

Criteria	*Points*
Multiple buildings or Collector Roads	3
Single building, Local Road, intersection.	2
Nuisance area	1

7.1.3 Pollutant Reduction

Although the exact criteria are unknown at this time, a key component of the Master Plan will be to address Total Maximum Daily Loads (TMDL).

Criteria	*Points*
Water quality treatment and flow reduction[1]	5
Water quality treatment OR flow reduction[2]	4
Detritus removal or reduction[3]	3
Illicit Discharge Detection & Elimination	2
Erosion Control	1

[1]An example of water quality treatment AND flow reduction would be addition of detention/retention ponds or swales, or exfiltration trenches that would accomplish both.
[2]An example of water treatment without flow reduction would be "electro-coagulation."
[3]Detritus removal examples would be on- or off-line baffle boxes for removal of leaves, branches, sand, and oil.

7.1.4 Lake Management

The other focus of this Master Plan is Lake Management. Two categories are included to address the two major perceived issues regarding overall lake quality. The Lake Water Quality Criteria are based on its Trophic State Index. Priority ratings to address these aspects are as follows:

Water Quality Criteria	*Points*
Hypereutrophic	5
Eutrophic	3
Mesotrophic	2
Oligotrophic	1

Lake Vegetation Criteria	*Points*
Aquatic plant control	3
Revegetation	2
Aesthetics	1

7.1.5 Repair & Maintenance

Repair and maintenance projects are those required to maintain existing infrastructure at the desired LOS or correct any deficiencies.

Criteria	*Points*
Structural integrity – critical area[1]	4
Structural integrity – non-critical area[2]	2
Leaking/groundwater intrusion[3]	1

[1]In right-of-way, near building, etc.
[2]open area, away from structures
[3]Reduces available carrying capacity

7.1.6. Benefit/Cost Ratio

This category relates a quantification of the relative benefit of a project to its estimated construction cost. Included on the cost side of the equation would be credits for potential grants, low interest (SRF) loans or the like.

Criteria	*Points*
High	3
Medium	2
Low	1

7.1.7. Public Support

This category is a relative indicator of the general public's desire for and acceptance of a specific project. Factors may include the desire to have clean, weed-free lakes, or eliminate local areas of flooding.

Criteria	*Points*
High	3
Medium	2
Low	1

7.2. Identification of Capital Projects

7.2.1 Previous Recommendations by Others

The following capital improvement projects were recommended in the various studies and reports discussed in Chapter 3:

1. Lake Drive - Perform a detailed assessment to assess the actual flooding potential and necessary improvements.
2. Lake Hodge - Construct outfall structure.
3. Install baffle boxes or sediment removal structures tributary to Lake Concord
4. Install baffle boxes tributary to Lake Kathryn
5. Install baffle boxes tributary to Lake Howell
6. Install baffle boxes tributary to Queens Mirror.
7. Install baffle boxes tributary to Grassy Lake
8. Install baffle boxes tributary to Lake Griffin.
9. Construct a wet detention pond in the wetland area south of Shady Hollow, upstream of Queens Mirror.
10. Evaluate installing aerators into Queens Mirror.
11. Evaluate installing aerators into South Lake Triplet.

7.2.2 Operations and Maintenance Recommendations

The City of Casselberry's Stormwater Division tends to the day-to-day operations and maintenance duties of the City. In that role, the Division personnel are the most

knowledgeable of the needs of the City's stormwater and lake management systems. In that regard, the capital needs of the City related to operations and maintenance fall into three basic categories:

1. **Operation and maintenance equipment requirements**. This category includes vehicles such as pickup, flat bed and dump trucks to transport personnel and equipment to various locations for maintenance. It also includes the City's Gradall for cleaning and re-sloping swale and canal slopes and the street sweeper for removing pollutants from roadways, prior to entry into the lake systems. Current City purchasing guidelines is for this type of equipment to be replaced every 8 years or after 80,000 vehicle miles.

2. **Lining of deteriorating storm sewers.** There are generally two materials used for storm sewers within the City, each with its own potential problem. Much of the older pipe is corrugated metal pipe (CMP), typically galvanized steel. The galvanized coating is often damaged, although maybe only slightly, during construction. In time, this damaged area can corrode to the point that it adversely affects the structural integrity of the pipe. When this pipe is under a roadway, it can collapse and result in collapse of the road. The other main type of pipe in the City system is reinforced concrete pipe (RCP). Structurally, RCP easily outlasts CMP. However, if the RCP is placed in areas of muck (as on Casselton Drive), the pipe can settle and be displaced, opening up the joints. When this happens, surrounding soils can wash in, creating a void and ultimately settlement of the surface soils. As with CMP, in or near roadway, this can result in a hole, a safety hazard. The City has already begun a program to line all CMP, and those sections of RCP that have shown joint separation. Additional areas identified for correction are included herein.

3. **Correction of drainage deficiencies that result in temporary flooding**. The City of Casselberry's drainage system functions extremely well, with only a very few small areas of minor flooding during rainfall events. Projects for correction of these problem areas are proposed below.

7.2.3 Water Quality Projects

This category of projects relates to those projects that upgrade the water quality of the lakes and streams within the City, both to enhance the aesthetics and usefulness of the lakes and to address pending TMDL reductions in the Lake Jesup basin. Many of these types of projects have been previously recommended and include installation of baffle boxes and aeration systems. Also included are shoreline revegetation projects that provide a more balanced population of aquatic plants to increase nutrient uptake and are more aesthetically pleasing.

7.3 Proposed Capital Improvement Projects

Exhibit 7-1 shows the locations of the proposed Capital Improvements Projects. Descriptions of the proposed projects are as follows:

1. *Melody Lane Stormwater & Lake Concord Water Quality Improvement and Revegetation Project* – This project is the first step in the upgrade of the City of Casselberry Municipal Complex with a focus on the Lake Concord waterfront. The

City-owned properties on the northwest, west to southeast shore of Lake Concord will be cleaned of the nuisance vegetation and replaced with beneficial aquatic, littoral and upland species. A boardwalk would be constructed along the edge of the lake in the same area, allowing the revegetation portion to be used as an educational demonstration tool with identifying signage. The current lake aeration system would be replaced with a series of attractive foundations, combining form and function. The existing retention pond east of the Police Department would be replaced with an underground exfiltration gallery to provide additional usable open area. A baffle box would be installed in the City Hall outfall piping to remove sediment and debris.

2. *North Lake Triplet Shoreline Revegetation* – The existing nuisance vegetation on City properties along the south (N. Lake Triplet Drive) and west (Secret Lake Park) shores of North Lake Triplet would be removed and replaced with attractive and beneficial species.

3. *Middle Lake Triplet Shoreline Revegetation* – The City properties along the north shore of Middle Lake Triplet would be cleaned of nuisance vegetation and replaced with beneficial aquatic, littoral and upland species.

4. *Baffle Boxes* – This project would replace existing storm manholes with Baffle Boxes for removal of pollutants (sediment and detritus) at the following locations (receiving waterbody in parentheses):

    a. Sonora Drive at Desoto Drive (Lake Howell),
    b. 672 San Pablo Avenue (Lake Howell),
    c. 676 San Pablo Avenue (Lake Howell),
    d. Madrid Drive at Desoto Drive (Lake Howell),
    e. 360 South Lake Triplet Drive (South Lake Triplet),
    f. 530 South Lake Triplet Drive (South Lake Triplet),
    g. 205 Secret Way (Secret Lake),
    h. Secret Way at canal (Secret Lake),
    i. 808 Osceola Trail (Gee Creek),
    j. Lake Hodge Park (Lake Hodge) – North end,
    k. 161 South Lake Triplet Drive (Middle Lake Triplet),
    l. 51 North Lake Triplet Drive (Middle Lake Triplet),
    m. Live Oaks Center (Grassy Lake),
    n. Carriage Hill Unit 4 (Queens Mirror) – At the three outfall north of Violet Dell, Tulip Trail and Lowndes SquareQueens Mirror.

    It is proposed to group the construction of these baffle boxes geographically in order to secure a 50-50 grant from the EPA through the FDEP pursuant to Section 319 of the Clean Water Act. Funding is available for projects that reduce nonpoint sources of pollution.

5. *Storm Sewer Lining* - Lining of existing storm sewers is typically performed for two reasons; (1) sealing leaking joints that allow groundwater infiltration and migration of surrounding soils into the pipe resulting in reduction of carrying capacity and formation of voids over the pipeline possibly resulting in surface subsidence; or (2) restoration of structural integrity of deteriorating (rusting) corrugated metal pipe (CMP). The following portions of the City storm sewer systems are proposed to be lined:

a. *Casselton Drive* – Leaking joints in 1,170 linear feet (l.f) of 36-inch and 500 l.f. of 48-inch reinforced concrete pipe (RCP) along west side of roadway plus approximately 1,375 l.f. of 15-inch to 24-inch RCP road crossings.
b. *Oxford Road* - Leaking joints in 400 l.f. of 36-inch, 60 l.f. of 48-inch, 324 l.f. of 54-inch and 390 l.f. of 60-inch CMP.
c. *Woodstream System* – Line 50 l.f. of 18-inch and 524 l.f. of 24-inch CMP along Woodstream Lane and Sundown Trail and 146 l.f. of 30-inch to ditch to east.
d. *Surrey Run / Sundown System* – Line 475 l.f. of 18-inch CMP between homes on Surrey Run, crossing Sundown Trail to wetland.
e. *Concord Woods System* – Line entire storm sewer system in Concord Woods consisting of a total of approximately 1,810 l.f. of 18-inch to 42-inch CMP.
f. *City Hall Complex System* – Line 164 l.f. of 15-inch behind City Hall and 585 l.f. of 48-inch CMP from Melody Lane to Lake Concord outfall.
g. *Gregory Drive* – 40 l.f of 18-inch across Gregory Drive at Wilshire Boulevard and a total of 540 l.f. of 24-, 30- and 36-inch along Gregory south of Wilshire Drive.
h. *South Lake Triplet Drive crossing* - 130 l.f. of 15-inch CMP and 380 l.f. of 18-inch at 530 S. Lake Triplet Dr.
i. *Concord Woods discharge* – Line 153 l.f. of 42- and 48 -inch CMP from Concord Woods ditch across Secret Way to discharge ditch and 147 l.f. along Secret Way.
j. *Micanopy to Turtle Mound* – Line 40 l.f. of 15-inch, 160 l.f. of 18-inch, 570 l.f. of 24-inch and 40 l.f. of 30-inch CMP and RCP on Micanopy Court and between homes to Turtle Mound Drive.
k. *Turtle Mound to Wolf Trail* – Line 620 l.f. of 18-inch CMP and RCP along Turtle Mound Drive, then 230 l.f. of 15-inch CMP to east between homes to Wolf Trail.
l. *Kantor System* – Line 390 l.f. of 15-inch and 40 l.f. of 18-inch CMP along Kantor Boulevard and 410 l.f. of 48-inch and 160 l.f. of 54" along rear lot lines between Kantor and Stanhope Drive.
m. *Stanhope System* – Line 500 l.f. of 18-inch and 310 l.f. of 24-inch CMP and RCP along Stanhope Drive and 153 l.f. of 48-inch RCP between homes to Sausalito Boulevard.
n. *Quintuplet System* – Line approximately 3,540 l.f. of 15-inch to 36-inch RCP and CMP along portions of Quintuplet Drive.
o. *Overbrook/South Triplet Lake Drive* – Line 110 l.f. of 15-inch and 520 l.f. of 24-inch ECMP (elliptical) along north side of Overbrook Drive between Women's Club and Golf Course Clubhouse, 60 l.f. of 54-inch on South Lake Triplet at Overbrook and 600 l.f. of 30-inch CMP crossing Overbrook south of 148 Overbrook.
p. *Paul McClure System* – Line 93 l.f. of 18-inch CMP along Niblick Drive and between lots to discharge.
q. *Concord Drive System* – Line 290 l.f. of 24-inch CMP at east end of Concord Drive.
r. *Lake Ann Lane* – Line 445 l.f. of 36-inch CMP on Lake Ann Lane just north of Howell Branch Road.

s. *Gee Creek Lane* – Line 124 l.f. of 15-inch and 230 l.f. of 24-inch RCP outfalling to Gee Creek.
t. *Timberlane/Osceola Trails* – Line 210 l.f. of 15-inch, 533 l.f. of 30-inch and 577 l.f. of 42-inch ERCP at north end of Lake Hodge.
u. *Bridle Path* – Line 660 l.f. of 24-inch and 540 l.f. of 30-inch CMP along Bridle Path.

6. *Laura Street Weir* – Replace existing weir structure north of Laura Street on Gee Creek. Existing structure is structurally unsound and located on private property (Lake Kathryn Estates Mobile Home Park), but is the City's responsibility to operate and maintain.

7. *Park Drive Drainage/Wetland Improvements* – Construction of stormwater retention area on Lots 10A & 11 on north side of Park Drive.

8. *West Concord Drive Drainage Improv*ements – Construction of curb and gutter drainage system along West Concord Drive between Anchor Road and Lotus Lane with stormwater retention for existing neighborhood.

9. *Overbrook and Southcot Drives Drainage Improvements* - Construction of curb and gutter drainage system along Overbrook Drive and Southcot Drive from Piney Ridge to Southcot.

10. *Lake Hodge Outfall* – There currently exists no positive outfall for Lake Hodge during high rainfall periods. This was evident during the 2004 hurricane season when Lake Hodge Park was flooded to such an extent that the park had to be closed for several months. This project would provide an overflow structure with piping to the existing system on Osceola Trail.

11. *Lowndes Square Underdrain* – Replacement of the existing underdrain system on both sides of Lowndes Square along the east-west portion.

12. *Carriage Hill Stormwater Detention Pond* – Construction of a wet detention pond in the wetland area that is the outfall for four sub-systems that collectively comprise stormwater collection systems for Carriage Hill Unit 1, 2 and 3.

13. *Install Aeration System in Queens Mirror* – Installation of an aeration system to satisfy the high BOD loading to this waterbody.

14. *Install Aeration System in South Lake Triplet* – Installation of an aeration system to satisfy the high BOD loading to this waterbody.

15. *New Stormwater/Streets/Fleet Division Building* – The current Stormwater Division Building is proposed to be used by the Parks & Recreation Department's Maintenance Division. The current Streets and Fleet Maintenance Building has a multitude of electrical system problems including no backup power. Because the Stormwater and Streets Maintenance crews regularly work together, it is proposed to co-locate them in the same building. In order to house all personnel and vehicles, a new, larger building is required. The new building would be approximately 20,000 square feet. The cost shown reflects the Stormwater Division's pro-rata share of the total cost.

16. *Temporary Stormwater Division Building* - During the construction of the new Stormwater Division Building, the Division offices are proposed to be located in a leased modular office building.

17. *Fountain/Aeration and Revegetation for Grassy Lake* – Installation of an aeration system to satisfy the high BOD loading to this waterbody but constructed as a decorative fountain because of its location as an entry point to the City, as envisioned in the Community Redevelopment District (CRD) Master Plan. The project would also include shoreline revegetation for both aesthetics and nutrient removal.

18. *Alum Injection System for Carriage Hill Detention Pond* – Construction of a feed system for the addition of aluminum sulfate salt (alum) to the influent to the new wet detention pond for removal of pollutants, especially phosphorus, from stormwater system influent to Queens Mirror and the Triplet Lake chain.

19. *Howell Creek Basin TMDLs* – Funds are included for potential contribution to the ongoing or subsequent studies for the establishment of TMDLs for the Howell Creek Basin.

20. *Gee Creek Basin TMDLs* - Funds are included for potential contribution to the ongoing or subsequent studies for the establishment of TMDLs for the Gee Creek Basin.

21. *Vehicle and Equipment Replacements* – The City's current policy for vehicle replacement is 8 years or 80,000 miles, whichever occurs first. During the next ten-year period, several vehicles or equipment are projected to meet one of these criteria, as follows:

    a. 1988 Gradall (has since been auctioned off). Recommend replacing.
    b. 1996 F350 Flat Bed
    c. 1997 Chevrolet Silverado Utility
    d. 2000 Elgin Eagle Street Sweeper
    e. 2000 Ford Arm Tractor
    f. 2000 25 hp Mercury Outboard Motor
    g. 2002 GMC Sierra 4 X 4
    h. Flail Mower

22. *Lake Hodge Park Shoreline Revegetation* – The shoreline along the east shore of Lake Hodge at Lake Hodge Park would be cleaned of nuisance vegetation and replaced with beneficial aquatic, littoral and upland species.

Table 7-1 presents the proposed capital improvement projects within the project prioritization matrix, with the prioritization scores assigned. The points assigned to each criterion are the average values assigned by a committee composed of Public Works and CPH Engineers, Inc. staff. Table 7-2 shows the results of the prioritization ranking process, from highest to lowest. This relationship is then used to develop the 5-year and 10-year Capital Improvements Plans. Development of the 5-year and 10-year Capital Improvements Plans is based on the assumption that all proposed projects will be completed within the ten-year horizon, and that sufficient funds will be available. The total estimated cost of all projects ($9,137,000) was

divided by ten and spread by priority ranking over the ten-year period, yielding an average annual capital outlay of $913,700. Vehicle and equipment replacements were proposed in accordance with City purchasing policy. The capital improvement projects were spread over the ten-year period based on each project's prioritization points total.

7.4 Five-Year Capital Improvements Plan

Table 7-3 outlines the projects identified to be completed within the initial 5-year period assuming the average annual capital outlay of $913,700 above. On that basis, the major project recommended for Fiscal Year (FY) 2008 is the improvements adjacent to Lake Concord (revegetation of the west and south shores and Melody Lane stormwater facility retrofit and baffle box) and in Lake Concord (new aeration/fountain equipment, boardwalk with shoreline vegetation demonstration signage). Replacement of the Stormwater Division's flail mower is also proposed.

For FY2009, the corrugated metal stormwater culverts behind City Hall would be lined to complete the proposed work in this area. Additionally, three baffle boxes are proposed, all tributary to Lake Howell. It is recommended to apply for a Section 319 Non-point Source or TMDL Water Quality grant (see Section 8.3.5) to also include the baffle box at Sonora and Desoto Drives (Project 4.a). All four locations are within the Lake Howell Sub-Basin which is on the *Impaired List* of waterbodies. If 50% matching funds are received, the Sonora Drive box construction could be moved forward from FY2010. Also proposed for FY2009 are replacements of the street sweeper, flat bed truck and a utility vehicle (pickup truck). An allowance of $200,000 for additional studies related to the Howell Creek Basin TMDL BMAP would be included this year.

Recommended projects for FY2010 are fountain/aeration systems in Grassy Lake, Queens Mirror and South Lake Triplet. A baffle box is also proposed at the outfall from the Live Oaks Center to Grassy Lake, with shoreline revegetation around Grassy Lake. Also recommended is construction of the outfall for Lake Hodge to reduce the potential for flooding of the lake and closing of the park as occurred during the 2005 hurricane season. If not funded by a grant in FY2009, the Sonora Drive baffle box would be constructed. Replacement of the Laura Street weir on Gee Creek is recommended for this year, if not before. An additional allowance of $200,000 for studies and undesignated projects related to the Howell Creek Basin TMDL BMAP would also be included this year.

For FY2011, four additional baffle boxes are recommended, on Osceola Trail and South Lake Triplet Drive (3). All three are within the Gee Creek Sub-Basin, which has been on the *Impaired List*, but has been deleted. These projects may be eligible for a Section 319 grant, but with a lower point score since no longer on the *Impaired List.* It is also recommended to replace the Division's Gradall used for cleaning and regrading of swales and ditches.

The fifth year, FY2012, it is recommended to construct a wet detention pond in a wetland area through which the majority of the Carriage Hill subdivision (Units 1, 2 ad 3) drains. Currently, no stormwater treatment is provided in that subdivision. Three baffle boxes from Carriage Hill Unit Four are also proposed for FY2012, and replacement of the tractor and outboard motor are also recommended for FY2012.

7.5 Ten-Year Capital Improvements Plan

The full Ten-Year Capital Improvements Plan is presented in Table 7-4, based on an assumed average annual funding of approximately $913,700 and the priority point totals assigned each project. It is recommended that priorities for projects proposed for the second five year period be re-evaluated prior to budgeting for that period.

Table 7 - 1

City of Casselberry
Stormwater, Lakes Management and Water Quality Capital Improvements Plan
Prioritization Scores

				Point Awards							
Item No.	**Project Description**	**Estimated Cost**	**Impacted Waterbody**	**Flooding** 3, 2, 1	**Pollutant Reduction** 5, 4, 3, 2, 1	**Water Quality** 5, 3, 2, 1	**Lake Vegetation** 3, 2, 1	**Repair & Maintenance** 4, 2, 1	**Benefit/ Cost** 3, 2, 1	**Public Support** 3, 2, 1	**TOTALS**
1	Melody Lane Stormwater & Lake Concord Water Quality Improvement and Revegetation Project	$900,000	Lake Concord	0	4	5	2	0	3	3	**17**
2	Revegetation - N. Lake Triplet south & west shores	$96,000	North Lake Triplet	0	4	2	2	0	2	2	**12**
3	Revegetation - Middle Lake Triplet north shore	$33,000	Middle Lake Triplet	0	4	2	2	0	2	2	**12**
4.a	Sonora Dr. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	2	**15**
4.b	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	3	**16**
4.c	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	3	**16**
4.d	Madrid Dr. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	5	5	1	0	3	3	**17**
4.e	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	South Lake Triplet	0	4	5	1	0	2	2	**14**
4.f	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	South Lake Triplet	0	4	5	1	0	2	2	**14**
4.g	Secret Way (Secret Lake) Baffle Box	$60,000	Secret Lake	0	4	3	1	0	1	2	**11**
4.h	Secret Way (Secret Lake) Baffle Box	$170,000	Secret Lake	0	4	3	1	0	2	2	**12**
4.i	Osceola Tr. (Gee Creek) Baffle Box	$140,000	Gee Creek	0	4	5	1	0	1	2	**13**
4.j	Osceola Tr. (Lake Hodge) Baffle Box	$170,000	Lake Hodge	0	4	5	1	0	2	2	**14**
4.k	S. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$170,000	Middle Lake Triplet	0	4	5	1	0	2	2	**14**
4.l	N. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$140,000	Middle Lake Triplet	0	3	5	1	0	1	2	**12**
4.m	Live Oaks (Grassy Lake) Baffle Box	$100,000	Grassy Lake	0	4	5	1	0	2	2	**14**
4.n	Carriage Hill Unit 4 Baffle Boxes (3)	$400,000	Queens Mirror	0	5	3	1	0	2	2	**13**
5.a	Line Casselton Dr. Pipe & Crossings	$409,000	Little Econolockatchee	0	1	2	0	4	3	2	**12**
5.b	Line Oxford Rd. pipe	$359,000	Queens Mirror	0	1	3	0	4	2	2	**12**
5.c	Line Woodstream System	$76,500	Gee Creek	0	1	3	0	2	2	1	**9**
5.d	Line Surrey Run / Sundown System	$37,600	Gee Creek	0	1	3	0	2	2	1	**9**
5.e	Line Concord Woods System	$186,000	Secret Lake	0	4	1	0	4	2	2	**13**
5.f	Line City Hall Complex System	$143,000	Lake Concord	0	3	5	0	4	3	2	**17**
5.g	Line Gregory Drive Pipe	$74,500	Lake Howell	0	4	1	0	2	2	2	**11**
5.h	Line S. Lake Triplet Dr. crossing	$38,800	South Lake Triplet	0	1	1	0	4	2	2	**10**
5.i	Line Secret Way	$44,500	Secret Lake	0	1	1	0	4	2	2	**10**
5.j	Line Micanopy to Turtle Mound	$79,800	Gee Creek	0	1	1	0	2	2	2	**8**
5.k	Line Turtle Mound System to Wolf Trail	$64,900	Gee Creek	0	1	1	0	2	2	2	**8**
5.l	Line Kantor System to Stanhope	$183,000	Lake Howell	0	1	1	0	4	3	2	**11**
5.m	Line Stanhope System	$107,000	Lake Howell	0	1	1	0	2	2	2	**8**
5.n	Line Quintuplet System	$362,000	Lake Yvonne	0	1	1	0	2	2	2	**8**
5.o	Line Overbrook/S. Lake Triplet Dr. System	$158,000	Middle Lake Triplet	0	1	1	0	2	2	2	**8**
5.p	Line Paul McClure Court System	$7,400	Lost Lake	0	1	1	0	2	2	2	**8**
5.q	Line Concord Drive System	$30,000	Lake Concord	0	1	1	0	2	2	2	**8**
5.r	Line Lake Ann Lane System	$68,500	Lake Howell	0	1	1	0	4	2	2	**10**
5.s	Line Gee Creek Lane System	$32,500	Gee Creek	0	1	1	0	4	2	2	**10**
5.t	Line Timberline/Osceola trail System	$170,000	Gee Creek	0	1	1	0	4	2	2	**10**
5.u	Line Bridle Path System	$135,000	Gee Creek	0	1	1	0	2	2	2	**8**
6	Laura St. Weir	$50,000	Gee Creek	3	1	1	0	4	3	2	**14**
7	Park Dr. Drainage / Wetland Improvements	$36,000	Lake Yvonne	2	5	1	0	0	2	2	**12**
8	West Concord Dr. Drainage Improvements	$490,000	Lake Lotus	2	4	1	0	0	2	2	**11**
9	Overbrook and Southcot Drainage Improvements	$45,000	Middle Lake Triplet	3	4	1	0	0	2	2	**12**
10	Lk Hodge Outfall	$111,000	Gee Creek	3	3	4	0	0	3	2	**15**
11	Lowndes Square Underdrain	$20,000	Queens Mirror	2	2	0	0	2	2	2	**10**
12	Construct wet detention pond at Carriage Hill outfall	$475,000	Queens Mirror	0	5	5	0	0	2	2	**14**
13	Install Aeration in Queens Mirror	$30,000	Queens Mirror	0	4	5	0	0	3	3	**15**
14	Install Aeration in South Lake Triplet	$40,000	South Lake Triplet	0	4	4	0	0	3	3	**14**
15	New Stormwater/Streets/Fleet Division Buliding	$300,000	Not applicable	0	0	0	0	4	3	1	**8**
16	Temporary Building	$40,000	Not applicable	0	0	0	0	4	3	1	**8**
17	Fountain/Aeration and Revegetation in Grassy Lake	$150,000	Grassy Lake	0	4	5	3	0	2	2	**16**
18	Alum addition system for Carriage Hill Pond	$120,000	Queens Mirror	0	5	5	0	0	2	2	**14**
19	Howell Creek Basin TMDLs	$400,000	Howell Creek	0	5	5	0	0	3	2	**15**
20	Gee Creek Basin TMDLs	$200,000	Gee Creek	0	4	4	0	0	3	2	**13**
21.a	Replace 1988 Gradall	$250,000	Not applicable	0	0	0	0	2	2	2	**6**
21.b	Replace 1996 F350 Flat Bed	$25,000	Not applicable	0	0	0	0	4	3	2	**9**
21.c	Replace 1997 Chevrolet Silverado Utility	$25,000	Not applicable	0	0	0	0	4	3	2	**9**
21.d	Replace 2000 Ford Arm Tractor	$40,000	Not applicable	0	0	0	0	2	2	2	**6**
21.e	Replace 2000 25 hp Mercury Outboard Motor	$2,000	Not applicable	0	0	0	0	2	2	2	**6**
21.f	Replace 2000 Elgin Eagle Street Sweeper	$150,000	Not applicable	0	0	0	0	4	3	3	**10**
21.g	Replace 2002 GMC Sierra 4 X 4	$25,000	Not applicable	0	0	0	0	1	2	2	**5**
21.h	Replace Flail Mower	$3,000	Not applicable	0	0	0	0	4	3	2	**9**
22	Revegetation - Lake Hodge Park shoreline	$20,000	Gee Creek	0	3	2	2	0	2	2	**11**

Flooding
Multiple buildings or Collector Roads 3
Single building, Local Road, intersection. 2
Nuisance area 1

Pollutant Reduction
Water quality treatment and flow reduction 5
Water quality treatment OR flow reduction 4
Detritus removal or reduction 3
Illicit Discharge Detection & Elimination 2
Erosion Control 1

Downstream Lake Water Quality
Hypereutrophic 5
Eutrophic 3
Mesotrophic 2
Oligotrophic 1

Lake Vegetation
Aquatic plant control 3
Revegetation 2
Aesthetics 1

Repair & Maintenance
Structural integrity – critical area 4
Structural integrity – non-critical area 2
Leaking/groundwater intrusion 1

Benefit/Cost
High 3
Medium 2
Low 1

Public Support
High 3
Medium 2
Low 1

Table 7 - 2

City of Casselberry
Stormwater, Lakes Management and Water Quality Capital Improvements Plan
Prioritization Rankings

				Point Awards							
Item No.	**Project Description**	**Estimated Cost**	**Impacted Waterbody**	**Flooding** 3, 2, 1	**Pollutant Reduction** 5, 4, 3, 2, 1	**Water Quality** 5, 3, 2, 1	**Lake Vegetation** 3, 2, 1	**Repair & Maintenance** 4, 2, 1	**Benefit/ Cost** 3, 2, 1	**Public Support** 3, 2, 1	**TOTALS**
1	Melody Lane Stormwater & Lake Concord Water Quality Improvement and Revegetation Project	$900,000	Lake Concord	0	4	5	2	0	3	3	**17**
4.d	Madrid Dr. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	5	5	1	0	3	3	**17**
5.f	Line City Hall Complex System	$143,000	Lake Concord	0	3	5	0	4	3	2	**17**
4.b	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	3	**16**
4.c	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	3	**16**
17	Fountain/Aeration and Revegetation in Grassy Lake	$150,000	Grassy Lake	0	4	5	3	0	2	2	**16**
19	Howell Creek Basin TMDLs	$400,000	Howell Creek	0	5	5	0	0	3	2	**15**
4.a	Sonora Dr. (Lake Howell) Baffle Box	$170,000	Lake Howell	0	4	5	1	0	3	2	**15**
10	Lk Hodge Outfall	$111,000	Gee Creek	3	3	4	0	0	3	2	**15**
13	Install Aeration in Queens Mirror	$30,000	Queens Mirror	0	4	5	0	0	3	3	**15**
4.j	Osceola Tr. (Lake Hodge) Baffle Box	$170,000	Lake Hodge	0	4	5	1	0	2	2	**14**
4.k	S. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$170,000	Middle Lake Triplet	0	4	5	1	0	2	2	**14**
4.e	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	South Lake Triplet	0	4	5	1	0	2	2	**14**
4.f	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	South Lake Triplet	0	4	5	1	0	2	2	**14**
12	Construct wet detention pond at Carriage Hill outfall	$475,000	Queens Mirror	0	5	5	0	0	2	2	**14**
18	Alum addition system for Carriage Hill Pond	$120,000	Queens Mirror	0	5	5	0	0	2	2	**14**
4.m	Live Oaks (Grassy Lake) Baffle Box	$100,000	Grassy Lake	0	4	5	1	0	2	2	**14**
6	Laura St. Weir	$50,000	Gee Creek	3	1	1	0	4	3	2	**14**
14	Install Aeration in South Lake Triplet	$40,000	South Lake Triplet	0	4	4	0	0	3	3	**14**
4.n	Carriage Hill Unit 4 Baffle Boxes (3)	$400,000	Queens Mirror	0	5	3	1	0	2	2	**13**
20	Gee Creek Basin TMDLs	$200,000	Gee Creek	0	4	4	0	0	3	2	**13**
4.i	Osceola Tr. (Gee Creek) Baffle Box	$140,000	Gee Creek	0	4	5	1	0	1	2	**13**
5.a	Line Casselton Dr. Pipe & Crossings	$409,000	Little Econolockatchee	0	1	2	0	4	3	2	**12**
5.b	Line Oxford Rd. pipe	$359,000	Queens Mirror	0	1	3	0	4	2	2	**12**
4.h	Secret Way (Secret Lake) Baffle Box	$170,000	Secret Lake	0	4	3	1	0	2	2	**12**
4.l	N. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$140,000	Middle Lake Triplet	0	3	5	1	0	1	2	**12**
2	Revegetation - N. Lake Triplet South & West Shores	$80,000	North Lake Triplet	0	4	2	2	0	2	2	**12**
9	Overbrook and Southcot Drainage Improvements	$45,000	Middle Lake Triplet	3	4	1	0	0	2	2	**12**
7	Park Dr. Drainage / Wetland Improvements	$36,000	Lake Yvonne	2	5	1	0	0	2	2	**12**
3	Revegetation - Middle Lake Triplet North Shore	$33,000	Middle Lake Triplet	0	4	2	2	0	2	2	**12**
8	West Concord Dr. Drainage Improvements	$490,000	Lake Lotus	2	4	1	0	0	2	2	**11**
5.l	Line Kantor System to Stanhope	$183,000	Lake Howell	0	1	1	0	4	3	2	**11**
4.g	Secret Way (Secret Lake) Baffle Box	$60,000	Secret Lake	0	4	3	1	0	1	2	**11**
22	Revegetation - Lake Hodge Park shoreline	$20,000	Gee Creek	0	3	2	2	0	2	2	**11**
5.e	Line Concord Woods System	$186,000	Secret Lake	0	1	1	0	4	2	2	**10**
5.t	Line Timberline/Osceola Trail System	$170,000	Gee Creek	0	1	1	0	4	2	2	**10**
5.r	Line Lake Ann Lane System	$68,500	Lake Howell	0	1	1	0	4	2	2	**10**
5.i	Line Secret Way	$44,500	Secret Lake	0	1	1	0	4	2	2	**10**
5.h	Line S. Lake Triplet Dr. crossing	$38,800	South Lake Triplet	0	1	1	0	4	2	2	**10**
5.s	Line Gee Creek Lane System	$32,500	Gee Creek	0	1	1	0	4	2	2	**10**
11	Lowndes Square Underdrain	$20,000	Queens Mirror	2	2	0	0	2	2	2	**10**
21.h	Replace Flail Mower	$3,000	Not applicable	0	0	0	0	4	3	2	**9**
5.c	Line Woodstream System	$76,500	Gee Creek	0	1	3	0	2	2	1	**9**
5.d	Line Surrey Run / Sundown System	$37,600	Gee Creek	0	1	3	0	2	2	1	**9**
5.n	Line Quintuplet System	$362,000	Lake Yvonne	0	1	1	0	2	2	2	**8**
15	New Stormwater/Streets/Fleet Division Buliding	$300,000	Not applicable	0	0	0	0	4	3	1	**8**
5.o	Line Overbrook/S. Lake Triplet Dr. System	$158,000	Middle Lake Triplet	0	1	1	0	2	2	2	**8**
5.u	Line Bridle Path System	$135,000	Gee Creek	0	1	1	0	2	2	2	**8**
5.m	Line Stanhope System	$107,000	Lake Howell	0	1	1	0	2	2	2	**8**
5.j	Line Micanopy to Turtle Mound	$79,800	Gee Creek	0	1	1	0	2	2	2	**8**
5.g	Line Gregory Drive Pipe	$74,500	Lake Howell	0	1	1	0	2	2	2	**8**
5.k	Line Turtle Mound System to Wolf Trail	$64,900	Gee Creek	0	1	1	0	2	2	2	**8**
16	Temporary Building	$40,000	Not applicable	0	0	0	0	4	3	1	**8**
5.q	Line Concord Drive System	$30,000	Lake Concord	0	1	1	0	2	2	2	**8**
5.p	Line Paul McClure Court System	$7,400	Lost Lake	0	1	1	0	2	2	2	**8**
21.f	Replace 2000 Elgin Eagle Street Sweeper	$150,000	Not applicable	0	0	0	0	4	3	3	**10**
21.b	Replace 1996 F350 Flat Bed	$25,000	Not applicable	0	0	0	0	4	3	2	**9**
21.c	Replace 1997 Chevrolet Silverado Utility	$25,000	Not applicable	0	0	0	0	4	3	2	**9**
21.a	Replace 1988 Gradall	$250,000	Not applicable	0	0	0	0	2	2	2	**6**
21.d	Replace 2000 Ford Arm Tractor	$40,000	Not applicable	0	0	0	0	2	2	2	**6**
21.e	Replace 2000 25 hp Mercury Outboard Motor	$2,000	Not applicable	0	0	0	0	2	2	2	**6**
21.g	Replace 2002 GMC Sierra 4 X 4	$25,000	Not applicable	0	0	0	0	1	2	2	**5**
	Total Capital Outlay	$9,137,000									
	Average Capital Outlay per year for 10-year period	$913,700									

Flooding
Multiple buildings or Collector Roads 3

Single building, Local Road, intersection. 2
Nuisance area 1

Pollutant Reduction
Water quality treatment and flow reduction 5

Water quality treatment OR flow reduction 4
Detritus removal or reduction 3

Illicit Discharge Detection & Elimination 2
Erosion Control 1

Downstream Lake Water Quality
Hypereutrophic 5
Eutrophic 3
Mesotrophic 2
Oligotrophic 1

Lake Vegetation
Aquatic plant control 3
Revegetation 2
Aesthetics 1

Repair & Maintenance
Structural integrity – critical area 4
Structural integrity – non-critical area 2
Leaking/groundwater intrusion 1

Benefit/Cost
High 3
Medium 2
Low 1

Public Support
High 3
Medium 2
Low 1

Table 7 - 3

City of Casselberry
Five-year Capital Improvements Plan

Item No.	Project	Estimated Cost	Priority Points	Concern	FISCAL YEAR 2008	2009	2010	2011	2012
1	Melody Lane Stormwater & Lake Concord Water Quality Improvement and Revegetation Project	$900,000	17	SNI, UE	$900,000				
21.h	Replace Flail Mower	$3,000	9	R	$3,000				
5.f	Line City Hall Complex System	$143,000	17	SG		$143,000			
4.d	Madrid Dr. (Lake Howell) Baffle Box	$170,000	17	SNI		$170,000			
4.b	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	16	SNI		$170,000			
4.c	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	16	SNI		$170,000			
21.f	Replace 2000 Elgin Eagle Street Sweeper	$150,000	13	R		$150,000			
21.b	Replace 1996 F350 Flat Bed	$25,000	13	R		$25,000			
21.c	Replace 1997 Chevrolet Silverado Utility	$25,000	13	R		$25,000			
19	Howell Creek Basin TMDLs	$400,000	15	U		$200,000	$200,000		
17	Fountain/Aeration and Revegetation in Grassy Lake	$150,000	16	NT			$150,000		
4.a	Sonora Dr. (Lake Howell) Baffle Box	$170,000	15	SNI			$170,000		
10	Lake Hodge Outfall	$111,000	15	CS			$111,000		
13	Install Aeration in Queens Mirror	$30,000	15	NT			$30,000		
4.m	Live Oaks (Grassy Lake) Baffle Box	$100,000	14	SNI			$100,000		
6	Laura St. Weir	$50,000	14	R			$50,000		
14	Install Aeration in South Lake Triplet	$40,000	14	NT			$40,000		
4.j	Osceola Tr. (Lake Hodge) Baffle Box	$170,000	14	SNI				$170,000	
4.k	S. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$170,000	14	SNI				$170,000	
4.e	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	14	SNI				$140,000	
4.f	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	14	SNI				$140,000	
21.a	Replace 1988 Gradall	$250,000	12	R				$250,000	
12	Construct wet detention pond at Carriage Hill outfall	$475,000	14	NT					$475,000
4.n	Carriage Hill Unit 4 Baffle Boxes (3)	$400,000	13	SNI					$400,000
21.d	Replace 2000 Ford Arm Tractor	$40,000	12	R					$40,000
21.e	Replace 2000 25 hp Mercury Outboard Motor	$2,000	12	R					$2,000
	ANNUAL TOTALS				$903,000	$1,053,000	$851,000	$870,000	$917,000

Project Concern

SG Repair existing drainage system to prevent sediment and groundwater intrusion
SN Retrofit existing drainage system to provide sediment and nutrient removal
SNI Retrofit existing drainage system to provide sediment and nutrient removal to an impaired water body
CMP Line corrugated metal pipe to prevent collapse
NT Retrofit older existing neighborhood to provide stormwater treatment
UT Retrofit older existing neighborhood to improve stormwater treatment
F Retrofit older existing neighborhood to prevent street flooding
R Replacement of existing facility or equipment
CS Construct control structure and connect to existing drainage system to prevent flooding of Lake Hodge Park
UE Upgrade of existing facilities
U Undesignated capital improvement to address Lake Jesup Basin TMDLs

Need Further Study and/or Preliminary Engineering

Howell Creek Basin TMDLs
Lk Hodge Outfall
Install Aeration in Queens Mirror
Wet detention pond from Carriage Hill
Alum addition system for Carriage Hill Pond
Install Aeration in South Lake Triplet

Table 7 - 4

City of Casselberry
Ten-year Capital Improvements Plan

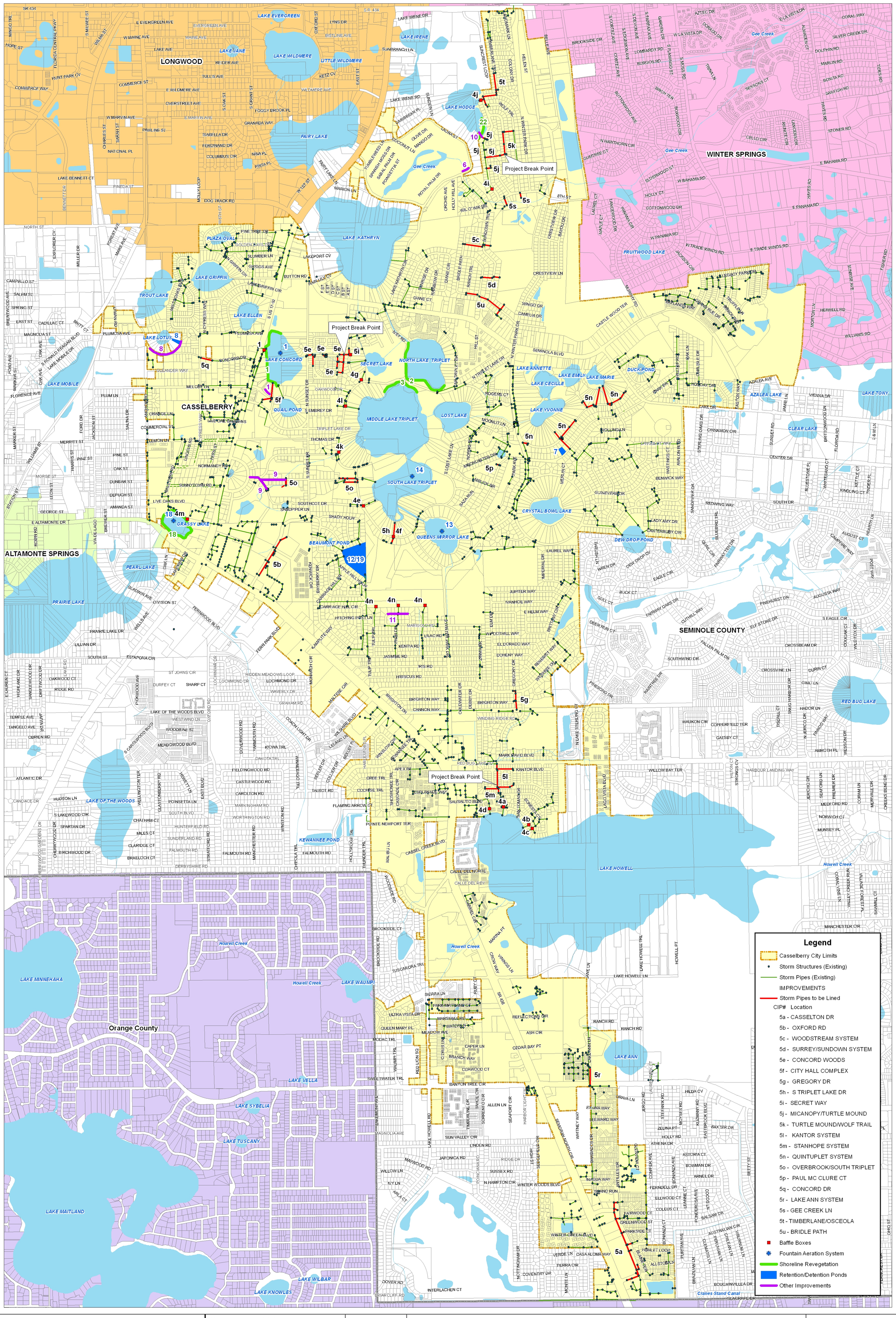
Item No.	Project	Estimated Cost	Priority Points	Concern	FISCAL YEAR 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	Melody Lane Stormwater & Lake Concord Water Quality Improvement and Revegetation Project	$900,000	17	SNI, UE	$900,000									
21.h	Replace Flail Mower	$3,000	9	R	$3,000									
5.f	Line City Hall Complex System	$143,000	17	SG		$143,000								
4.d	Madrid Dr. (Lake Howell) Baffle Box	$170,000	17	SNI		$170,000								
4.b	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	16	SNI		$170,000								
4.c	San Pablo Ave. (Lake Howell) Baffle Box	$170,000	16	SNI		$170,000								
19	Howell Creek Basin TMDLs	$400,000	15	U		$200,000	$200,000							
17	Fountain/Aeration and Revegetation in Grassy Lake	$150,000	16	NT			$150,000							
4.a	Sonora Dr. (Lake Howell) Baffle Box	$170,000	15	SNI			$170,000							
10	Lk Hodge Outfall	$111,000	15	CS			$111,000							
13	Install Aeration in Queens Mirror	$30,000	15	NT			$30,000							
4.m	Live Oaks (Grassy Lake) Baffle Box	$100,000	14	SNI			$100,000							
6	Laura St. Weir	$50,000	14	R			$50,000							
14	Install Aeration in South Lake Triplet	$40,000	14	NT			$40,000							
4.j	Osceola Tr. (Lake Hodge) Baffle Box	$170,000	14	SNI				$170,000						
4.k	S. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$170,000	14	SNI				$170,000						
4.e	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	14	SNI				$140,000						
4.f	S. Lake Triplet Dr. (South Lake Triplet) Baffle Box	$140,000	14	SNI				$140,000						
12	Construct wet detention pond at Carriage Hill outfall	$475,000	14	NT					$475,000					
4.n	Carriage Hill Unit 4 Baffle Boxes (3)	$400,000	13	SNI					$400,000					
18	Alum addition system for Carriage Hill Pond	$120,000	14	NT						$120,000				
20	Gee Creek Basin TMDLs	$200,000	13	U						$200,000				
4.i	Osceola Tr. (Gee Creek) Baffle Box	$140,000	13	SNI						$140,000				
5.a	Line Casselton Dr. Pipe & Crossings	$409,000	12	SG						$409,000				
7	Park Dr. Drainage / Wetland Improvements	$36,000	12	NT						$36,000				
2	Revegetation - N. Lake Triplet South & West Shores	$80,000	12	UT							$80,000			
5.b	Line Oxford Rd. pipe	$359,000	12	CMP							$359,000			
4.h	Secret Way (Secret Lake) Baffle Box	$170,000	12	SNI							$170,000			
4.l	N. Lake Triplet Dr. (Middle Lake Triplet) Baffle Box	$140,000	12	SNI							$140,000			
9	Overbrook and Southcot Drainage Improvements	$45,000	12	F							$45,000			
3	Revegetation - Middle Lake Triplet North Shore	$33,000	12	UT							$33,000			
22	Revegetation - Lake Hodge Park shoreline	$20,000	11	UT							$20,000			
4.g	Secret Way (Secret Lake) Baffle Box	$60,000	12	SNI								$60,000		
8	West Concord Dr. Drainage Improvements	$490,000	11	NT								$490,000		
5.l	Line Kantor System to Stanhope	$183,000	11	CMP								$183,000		
5.e	Line Concord Woods System	$186,000	10	CMP								$186,000		
5.t	Line Timberline/Osceola Trail System	$170,000	10	SG									$170,000	
5.r	Line Lake Ann Lane System	$68,500	10	CMP									$68,500	
5.i	Line Secret Way	$44,500	10	CMP									$44,500	
5.h	Line S. Lake Triplet Dr. crossing	$38,800	10	CMP									$38,800	
5.s	Line Gee Creek Lane System	$32,500	10	SN									$32,500	
11	Lowndes Square Underdrain	$20,000	10	F									$20,000	
5.c	Line Woodstream System	$76,500	9	CMP									$76,500	
5.d	Line Surrey Run / Sundown System	$37,600	9	CMP									$37,600	
5.n	Line Quintuplet System	$362,000	8	SN									$362,000	
5.k	Line Turtle Mound System to Wolf Trail	$64,900	8	CMP									$64,900	
15	New Stormwater/Streets/Fleet Division Buliding	$300,000	8	R										$300,000
16	Temporary Building	$40,000	8	R										$40,000
5.o	Line Overbrook/S. Lake Triplet Dr. System	$158,000	8	CMP										$158,000
5.u	Line Bridle Path System	$135,000	8	CMP										$135,000
5.m	Line Stanhope System	$107,000	8	CMP										$107,000
5.j	Line Micanopy to Turtle Mound	$79,800	8	CMP										$79,800
5.g	Line Gregory Drive Pipe	$74,500	8	SN										$74,500
5.q	Line Concord Drive System	$30,000	8	CMP										$30,000
5.p	Line Paul McClure Court System	$7,400	8	CMP										$7,400
21.f	Replace 2000 Elgin Eagle Street Sweeper	$150,000	10	R		$150,000								
21.b	Replace 1996 F350 Flat Bed	$25,000	9	R		$25,000								
21.c	Replace 1997 Chevrolet Silverado Utility	$25,000	9	R		$25,000								
21.a	Replace 1988 Gradall	$250,000	6	R				$250,000						
21.d	Replace 2000 Ford Arm Tractor	$40,000	6	R					$40,000					
21.e	Replace 2000 25 hp Mercury Outboard Motor	$2,000	6	R					$2,000					
21.g	Replace 2002 GMC Sierra 4 X 4	$25,000	5	R							$25,000			
	TOTALS	$9,137,000			$903,000	$1,053,000	$851,000	$870,000	$917,000	$905,000	$872,000	$919,000	$915,300	$931,700

Project Concern

- SG Repair existing drainage system to prevent sediment and groundwater intrusion
- SN Retrofit existing drainage system to provide sediment and nutrient removal
- SNI Retrofit existing drainage system to provide sediment and nutrient removal to an impaired water body
- NT Retrofit older existing neighborhood to provide stormwater treatment
- UT Retrofit older existing neighborhood to improve stormwater treatment
- F Retrofit older existing neighborhood to prevent street flooding
- R Replacement of existing facility or equipment
- CS Construct control structure and connect to existing drainage system to prevent flooding of Lake Hodge Park
- UE Upgrade of existing facilities
- U Undesignated capital improvement to address Lake Jesup Basin TMDLs

Need Further Study and/or Preliminary Engineering

- Lake Drive Drainage Improvements
- Wet detention pond from Carriage Hill
- Alum addition system for Carriage Hill Pond
- Install Aeration in Queens Mirror
- Install Aeration in South Lake Triplet
- Howell Creek Basin TMDLs
- Gee Creek Basin TMDLs
- Lk Hodge Outfall



cph

CITY OF CASSELBERRY INC. 1940

Scale: 1" = 1000'

Date: August 2007

Photo Date: N/A

Project No. C1953

N

STORMWATER AND LAKE MANAGEMENT
MASTER CAPITAL IMPROVEMENTS PLAN

CITY OF CASSELBERRY STORMWATER MASTER PLAN
SEMINOLE COUNTY, FLORIDA

Exhibit

7 - 1

SECTION 8

FINANCING ALTERNATIVES

8.1 Stormwater Utility Fund - Annual Budget

8.1.1 General

The annual budget for the Stormwater Utility is divided into three categories: Personal Services, Operating Expenses and Capital Outlay. Personal Services include personnel costs such as salaries, including certificate pay and overtime; FICA taxes; retirement contributions; and health, disability, workers compensation and life insurances. Operating Expenses include professional and contractual services (the latter primarily maintenance services); communications; utilities; leases; office and operating supplies; professional memberships; small tools and minor equipment. Capital Outlay includes major contracts for repairs such as re-lining of storm sewers, replacement of Capital Equipment (over $1,000 in value or cost) and Capital Improvement Projects.

8.1.2 Revenues

The City of Casselberry created the Stormwater Utility in 1993. At that time, the utility rate was set at $2.90 per month per ERU. This rate structure has gone unchanged since the utility's inception. Currently, there are approximately 20,808 ERUs within the City's Service Area, yielding annual revenue of $724,188. The Stormwater Division budget line items and year-end actual expenditures for the last four years are shown in Table 8-1. In the last few years, personnel costs have rose to approximately $300,000 annually and operating and maintenance costs are approximately $190,000, for a total of $490,000. It must also be noted that the personnel costs would be approximately 20 percent higher except for long term vacancies in certain positions. This leaves approximately $234,000 annually for Capital Outlay, with an average of $913,700 needed for the proposed Capital Improvement Plan.

8.1.3 Operation and Maintenance Levels of Service

The intent of this sub-section is to establish Levels of Service, or a measurement of the frequency of provision of certain services, or capacities of facilities required to obtain the desired result or efficiency. The Levels of Service of the various services provided by the City's Stormwater Division dictate the operation and maintenance costs and annual budget for that division. Since 1993, costs for all items included in the various areas of the budget have steadily increased, without a corresponding increase in fees.

The established Levels of Service for the Stormwater Utility are as follows:

- Street Sweeping – Once per month for each City street. Approximately 1,700 miles of streets are swept each year. A comparison of street sweeping frequencies for other cities in Seminole County was compiled by the Stormwater Technical Committee in included as Appendix M.

- Mowing of City stormwater retention areas and ditches – Monthly.

- Aquatic Weed Control – Monthly inspections by contractor. Applications as determined necessary.

- General lake monitoring – for trash, algae, etc. – Daily. This monitoring is performed by City personnel and also includes a general inspection of each lake's aquatic weed population, possibly resulting in more frequent applications.

- Mosquito Control – By an Intergovernmental Agreement between Seminole County and all Cities within the County, this function is proposed to be gradually turned over to the County. A copy of this agreement is included in Appendix N.

It must be noted that these Levels of Service do not take into consideration the additional daily duties of the Stormwater Division, such as repairing, cleaning and maintaining the stormwater structures and culverts; and completing minor construction projects.

8.2 Capital Projects

Chapter 7 contains the proposed Five-year and Ten-year Capital Improvements Plans for the City of Casselberry Stormwater Utility.

8.3 Projected Budget Needs

Table 8-2 shows the actual expenditures, revenues and fund balances for the Stormwater Utility Fund since Fiscal Year (FY) 2000. Except for the significant transfer to the General Fund in FY 2006, capital outlay expenditures have been relatively low. Because of the low expenditures, several items previously budgeted for are included in the Capital Improvements Plans recommended herein. Table 8-3 presents the projected financial forecast for the next ten-year period based on the recommended Capital Improvement Projects. A contingency amount of ten percent of the projected revenues is also included. This amount is required to adequately fund the necessary improvements in the light of recent significant increases in construction costs beyond historical increase amounts, potential, unforeseen changes to the scope of the improvements, or higher degrees of treatment that may be required by the regulatory agencies. Based on the tentative budget for FY2008, the Stormwater Utility Fund Balance and revenues will be insufficient.

8.4 Financing Alternatives

There are many alternative methods available to provide the capital required for the construction of stormwater utility system improvements. It is likely that impact fees, installation, and dedication by developers will be some of the financing tools. However, it is appropriate to discuss some of the other alternatives, which may also be available to the City. Some of the alternatives are:

- Stormwater Utility Fees
- Developer Installation
- Revenue Bond Issue
- State Revolving Funds

- Grants
- Loans from various sources
- Payment from Transportation Fees
- City General Fund
- Special Assessment

The most feasible methods of financing for the City of Casselberry include stormwater utility fees, grants, state revolving loan funds, revenue bond issue and installation by developer. A combination of methods may also be considered. These methods will be briefly discussed in the following subsections.

8.4.1 Stormwater Utility Fees

The Stormwater Utility Fee is used to fund both ongoing operating and maintenance programs and capital projects. Using stormwater fees directly to construct projects is a pay as you go system and requires a detailed evaluation system to determine the critical needs and priority of each project. However, the fees can be leveraged by a bond issue to generate funds: a) for a large project and/or b) a more concerted effort to accomplish renewal and replacement of the stormwater infrastructure and/or c) to construct projects that will increase water quality. As stated above, with current revenues and personnel and operation and maintenance expenditure levels, only approximately $230,000 is available annually for capital projects. However, the City of Casselberry's Stormwater Utility Fee of $2.90 per month is less than half of the Central Florida average of $5.91 per month. The current stormwater utility fees for Seminole and Orange County municipalities are shown in Table 8-4. Also shown are already approved fee increases for some municipalities to be effective October 1, 2007.

Table 8-5 presents the projected financial forecast with an assumed stormwater fee increase to $7.00 per ERU per month. This is the minimum fee required to adequately fund the projected O & M expenditures, recommended Ten-year Capital Improvements Plan (through FY2017) and a contingency amount. If significant variations in revenues or expenses occur prior to the end of that period, a more detailed rate study, could be completed.

8.4.2 Developer Installation

Oftentimes, a needed facility (pollution abatement pond or collection system) is constructed by a developer as part of his development, and dedicated to the City. On new development projects, the developer provides his or her own stormwater facilities and is not allowed to discharge more than the pre-developed rate. There is little or no impact to the downstream facilities and thus no impact fee is charged the developer. Per current City Code, on redevelopment projects, the volume required for retention may be significantly less than the difference between pre- and post-development depending on the amount of impervious area existing prior to redevelopment. Although this practice helps encourage redevelopment, it may be prudent to revise these minimum requirements or impose an impact fee related to the difference in the required redevelopment volume and what would be the volume if it was on a virgin site.

8.4.3 Revenue Bond Issue

A revenue bond issue generates capital by selling bonds based on net revenues that will be produced by the system. For stormwater facilities, the revenue bond can be backed up by gas tax revenues, general fund revenues, sales tax revenues and stormwater utility fees. A summary report is generally required, which describes the system history and improvements to be constructed. The report will include estimates on the operation and maintenance costs, the capital costs for the project, and the debt service requirements (principal and interest payments plus coverage). In general, the report provides assurances to prospective bond buyers that rates and charges are reasonable, and that pledged revenues will produce adequate revenue. Hence, debt service, and operation and maintenance cost can be paid with adequate coverage.

Proceeds from the revenue bond issue must be utilized for cost items of the project, or go into a fund established for debt retirement or other reserves. They generally cannot be used for operation and maintenance or other City purposes.

System revenues are generally limited to revenues that may be expected from normal monthly fees from existing customers, and a conservative projection of added new customers. Most fiscal advisors now also allow some revenue flow from growth impact fees, and other supplementary sources to be counted in determining the amount of bonds that can be issued.

8.4.4 State Revolving Fund Loans

The State of Florida Department of Environmental Protection has a revolving loan program for funding stormwater improvements (twenty-year low interest loans from the State). The City has used this program (in the wastewater sector) in the recent past and found it to be a worthwhile program. This Master Stormwater Plan can be used as the basis to request funding for needed improvements. Projects that will score well and ultimately receive funding are related to pollution abatement.

8.4.5 Grants

There are several sources of potential State and Federal Grants for funding stormwater and lake management projects. The FDEP's Bureau of Invasive Plant Management (BIPM) provides funding for aquatic plant control lakes with public access. The City currently receives a 50% grant for aquatic plant control on the Triplet Lake Chain (North Lake Triplet, Middle Lake, South Lake and Queens Mirror). Additional grants available to the City for capital improvements are:

- Section 319 Nonpoint Source Management Program Grant – The FDEP administers the grant money received from the EPA through Section 319 of the Clean Water Act. Funding is available for projects that reduce nonpoint sources of pollution. Types of projects that qualify for Section 319 funding that may be applicable to the City are:
    - Retrofitting urban developed areas where stormwater pollutants are adversely affect surface or ground waters;
    - Retrofitting areas where Onsite Sewage Treatment and Disposal Systems are adversely affecting surface or ground waters; and
    - Restoration of degraded wetlands.

Grants are available up to 60% of the project construction (only) costs, but the greater the percentage of local match, the higher the points awarded the project. These "point" totals determine the project's priority and chance for funding. Section 319 funds are targeted first to waterbodies with established TMDLs and waterbodies on the *Verified List* (Howell Creek and Lake Howell). Points are also awarded if the entity imposes a stormwater utility fee. A fee of $3.50 or greater per month doubles the points awarded for fees less than $3.50 per month.

- TMDL Water Quality Restoration Grant – Similar to the Section 319 Grant, these grants are available for projects that reduce pollutant loadings to waterbodies on the State's *Verified List*, or with proposed or adopted TMDLs. This funding requires a minimum of 50% matching local share. As opposed to Section 319 funding, these grant moneys come from State documentary stamp fees.

- U.S. Department of Agriculture Watershed Protection and Flood Prevention – Natural Resources Conservation Service Plant Materials provides funding for native plants to help reduce erosion of lakeshores and streambanks.

8.4.6 Other Loan Sources

In addition to SRF loans, there are loans available from other sources. Bank loans are similar to a bond issue, but shorter term. Bank loans have been used in the past by the City to finance acquisition of properties for civic purposes. Advantages of bank loans over bonds are lower up-front costs, no formal report requirements and quicker turnaround time for receipt of funds. The disadvantage is a higher interest rate, the amount of which is dependent on market conditions.

8.4.7 Payment from Transportation Fees

This option is available only where stormwater facilities are upgraded in conjunction with transportation projects. A new stormwater retention pond for Triplet Lake Drive just east of U.S. Highway 17-92 is being constructed in conjunction with the intersection improvements funded by the optional one-cent sales tax (Infrastructure Surtax Fund). That portion of Triplet Lake Drive including City Hall previously had no stormwater treatment. One programmed project using transportation fees is North Winter Park Drive Re-alignment. The project will include significant stormwater system improvements for that part of N. Winter Park Drive between Seminola Boulevard and Gee Creek, which currently has no treatment.

8.4.8 General Fund

The City of Casselberry maintains two types of proprietary funds. The enterprise fund is a business-type activity fund and often referred to as the Utility Fund because it conducts the business of the Water and Wastewater Utilities. The General Fund is a government activities fund, paying for services typically related to governments – police, fire, streets, parks, and the like. The Stormwater Utility Fund is accounted for separately, but often presented with the General Fund because stormwater activities are also funded by property taxes in some municipalities, and their efforts are often

intertwined. As such, transfers between the two funds for specific activities are not unprecedented.

8.4.9 Special Assessment

The concept of imposing a Special Assessment on a group of related properties for a specific, mutually beneficial project is another means of funding certain capital projects. For lakes without public access, a special assessment could be levied on lakefront property owners to fund aquatic plant control within the lake, or any other project that would benefit that lake and that lake only. Revegetation and fountain/aeration projects are other types of projects that could be funded by special assessment to surrounding homeowners.

8.5 Financing Recommendations

It is recommended that the City make applications for available grants to reduce the overall impact of the needed projects and related expenditures. Although the increase required in the Stormwater Utility Fee to fund the proposed projects would appear significant, an immediate increase to $7.00 per month per ERU would not put Casselberry's fee out of line with the other fees in the Central Florida area. With an effective date of October 1, 2007, Casselberry's fee would be the same as Oviedo, and although the highest in Seminole County, but would be below Orlando, Winter Park and Ocoee in the Central Florida area. It is recommended to make that immediate adjustment and re-address subsequent increases based on receipt of grant funding and TMDL requirements. No single project or projects are that critical or of significant size or estimated cost to justify pursuing loans or bonds.

TABLE 8-1

Stormwater Utility Fund Operation & Maintenance Budget Accounts

Department/Division:	Public Works/Stormwater	(740)
Fund:	Stormwater Utility	(110)
Program:	Other Physical Environment	(539)

	Year-end Actual Totals				Projected	Proposed Budget
PERSONAL SERVICES	**2002-03**	**2003-04**	**2004-05**	**2005-06**	**2006-07***	**2007-08**
Regular Salaries and Wages	205,018	188,954	191,602	191,678	164,358	270,345
Regular Salaries and Wages - Miscellaneous Pays	8,655	9,175	8,321	9,117	11,241	11,800
Overtime	8,730	19,474	11,346	5,352	5,198	9,000
Special Pays	873	234	0	0	0	0
FICA Taxes	17,339	16,885	16,329	16,104	13,618	22,272
Retirement Contribution - State Plan	2,157	2,893	2,957	3,714	702	3,977
Retirement Contribution - City Plan	18,778	17,726	16,738	16,584	17,063	25,075
Health Insurance	21,412	20,117	22,394	25,499	25,450	47,850
Disability Insurance	532	567	780	1,016	769	1,660
Supplemental Pay - Health Insurance Waiver	1,090	460	340	0	0	0
Life Insurance	665	543	677	791	685	872
Workers' Compensation	6,957	7,984	9,603	13,875	13,226	17,534
Unemployment Compensation	0	0	0	11	75	1,439
Matched Annuity	5,832	5,903	6,770	6,508	4,383	5,332
Total Personal Services	**298,038**	**290,915**	**287,857**	**290,248**	**256,768**	**417,156**
OPERATING EXPENSES						
Professional Services	0	23,589	29,535	41,909	78,888	45,000
Other Contractural Services	27,312	28,909	32,790	17,460	34,199 **	45,000
Travel and Per Diem	944	2,999	785	1,907	2,654	4,000
Communications and Freight	75	592	984	1,012	409	2,000
Utility Services	1,849	1,736	1,801	1,963	2,105	4,000
Rentals and Leases	0	50	0	0	13,151	20,000
Repairs and Maintenance	23,382	47,168	38,821	35,055	26,408	45,000
Printing and Binding	333	563	0	0	336	500
Office Supplies	194	56	381	16	47	500
Operating Supplies	33,194	37,840	27,735	27,510	26,313	25,000
Publications, Subscriptions & Memberships	5,539	5,085	3,610	3,617	3,267	3,500
Small Tools and Minor Equipment	5,641	4,329	5,653	806	1,831	5,500
Total Operating Expenses	**98,463**	**152,916**	**142,095**	**131,254**	**189,606**	**200,000**

*Projected actual totals based on actuals as of July 31 - 92% of year elapsed
**Other Contractual Services also includes"Other Current Charges."

TABLE 8-2
HISTORICAL ANNUAL STORMWATER UTILITY FINANCIAL DATA

Fiscal Year	Personnel Costs	Operation & Maintenance Costs	Capital Outlay	Total Expeditures	Revenues	Annual Balance	Year End Fund Balance
2000	$236,661	$152,851	$163,439	$552,951	$657,306	$104,355	$104,355
2001	$247,411	$145,538	$141,614	$534,563	$679,117	$144,554	$248,909
2002	$280,089	$111,224	$22,968	$414,281	$665,620	$251,339	$500,248
2003	$298,038	$98,463	$15,255	$411,756	$668,441	$256,685	$756,933
2004	$290,915	$152,916	$236,213	$680,044	$671,158	-$8,886	$748,047
2005	$287,857	$142,095	$1,864	$431,816	$633,614	$201,798	$949,845
2006	$290,248	$131,254	$424,554	$846,055	$673,000	($173,055)	$776,790
2007	$256,768	$189,606	$102,275	$548,650	$724,118	$175,469	$952,259

NOTE: The FY 2006 Capital Outlay shown includes a $400,000 transfer to the General Fund.
FY 2007 Personnel and O&M Costs are projected totals based on actuals as of July 31, 2007 (92% of year elapsed)

TABLE 8-3
PROJECTED FINANCIAL FORECAST - FY2008 THROUGH 2017 WITH NO FEE INCREASE

Fiscal Year	Personnel Costs*	Operation & Maintenance Costs**	Capital Outlay	Contingency***	Total Expeditures	Revenues	Annual Balance	Year End Fund Balance
Beginning Fund Balance								$952,259
2008	$417,156	$200,000	$903,000	$72,412	$1,592,568	$724,118	($868,449)	$83,809
2009	$433,842	$210,000	$1,053,000	$72,412	$1,769,254	$724,118	($1,045,136)	($961,327)
2010	$451,196	$220,500	$851,000	$72,412	$1,595,108	$724,118	($870,989)	($1,832,316)
2011	$469,244	$231,525	$870,000	$72,412	$1,643,181	$724,118	($919,062)	($2,751,378)
2012	$488,014	$243,101	$917,000	$72,412	$1,720,527	$724,118	($996,408)	($3,747,786)
2013	$507,534	$255,256	$905,000	$72,412	$1,740,202	$724,118	($1,016,084)	($4,763,870)
2014	$527,835	$268,019	$872,000	$72,412	$1,740,266	$724,118	($1,016,148)	($5,780,018)
2015	$548,949	$281,420	$919,000	$72,412	$1,821,781	$724,118	($1,097,662)	($6,877,681)
2016	$570,907	$295,491	$915,300	$72,412	$1,854,110	$724,118	($1,129,991)	($8,007,672)
2017	$593,743	$310,266	$931,700	$72,412	$1,908,121	$724,118	($1,184,002)	($9,191,674)

*Assume 4% per year increase in costs - wages, insurance
**Assumes average cost increases of 5% - fuel, materials, utilities
***Contingency amount of 10% of revenues included for possible construction cost increases, additional agency requirements, unforeseen occuren

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TABLE 8-5
PROJECTED FUNDS FY2008 THROUGH 2017 WITH PROPOSED FEE ADJUSTMENT

Fiscal Year	Personnel Costs	Operation & Maintenance Costs	Capital Outlay	Contingency	Total Expeditures	Revenues	Annual Balance	Year End Fund Balance
Beginning Fund Balance								$952,259
2008	$417,156	$200,000	$903,000	$174,787	$1,694,943	$1,747,872	$52,929	$1,005,187
2009	$433,842	$210,000	$1,053,000	$174,787	$1,871,629	$1,747,872	($123,757)	$881,430
2010	$451,196	$220,500	$851,000	$174,787	$1,697,483	$1,747,872	$50,389	$931,819
2011	$469,244	$231,525	$870,000	$174,787	$1,745,556	$1,747,872	$2,316	$934,135
2012	$488,014	$243,101	$917,000	$174,787	$1,822,902	$1,747,872	($75,030)	$859,105
2013	$507,534	$255,256	$905,000	$174,787	$1,842,578	$1,747,872	($94,706)	$764,399
2014	$527,835	$268,019	$872,000	$174,787	$1,842,642	$1,747,872	($94,770)	$669,630
2015	$548,949	$281,420	$919,000	$174,787	$1,924,156	$1,747,872	($176,284)	$493,345
2016	$570,907	$295,491	$915,300	$174,787	$1,956,485	$1,747,872	($208,613)	$284,732
2017	$593,743	$310,266	$931,700	$174,787	$2,010,496	$1,747,872	($262,624)	$22,108

ERUs = 20,808
Proposed Fee = $7.00