STORMWATER MASTER PLAN PROGRAM

"Improving the Quality of Life in Griffin"

Prepared for:

City of Griffin
Public Works & Stormwater Department

May 2003

City of Griffin
StormWater Department

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Prelude

The U.S. Congress passed the Clean Water Act in 1972 with a stated objective to restore and maintain the chemical, physical, and biological integrity of the nation's waters through point source and non-point source controls. The method to achieve this restoration process is through the implementation of "Best Management Practices" (BMPs). An effective tool to achieve compliance with the Proposed Stormwater National Pollution Discharge Elimination System (NPDES) Phase I and Phase II Regulations is implementation of a Stormwater Utility. The NPDES program was created to ensure that permitted discharges meet applicable water quality requirements. The Phase I and Phase II permitting process involves primarily urban communities of a specific size and population. Phase I of the process requires cities (100,000 population or greater) to secure a NPDES permit. The Phase II process will require smaller municipalities and other urbanized areas to secure a NPDES permit. The City of Griffin is required to comply with the requirements of the Phase II permitting process based on its size and population. The City of Griffin decided to take a proactive approach to watershed management by addressing both Stormwater quantity and quality issues. The City of Griffin felt that the creation of a Stormwater Utility (the Utility) was one of the most important steps to take in order to ensure that the overall Stormwater Management Program could be successfully implemented. The Utility is an example of a non-structural BMP that has been implemented for the sole purpose of generating revenues for stormwater related improvements. This plan summarizes the important aspects associated with Griffin's successful effort to create and implement the first Stormwater Utility in Georgia.

1.0 Introduction

In 1997, the City of Griffin, Georgia established a formal Stormwater Management Program. As a result of the establishment of this program, the City immediately created the Stormwater Department. To fund this new separate department, a Stormwater Utility was implemented, the first in the State of Georgia. The purpose of the Stormwater Management Program is to manage its watersheds and to create an example for other cities to consider when evaluating possible management models to achieve compliance with the upcoming Phase II permitting process and to project total maximum daily pollutant loads (TMDL) for the creeks within the City. The Utility Action Plan consists of policy making; institutional planning; environmental review and planning; financial strategies; and public education and involvement. The Utility provides the City of Griffin with a financial mechanism from which to address both water quality and water quantity control issues that will be required as part of the Phase II permitting process. It will allow the City of Griffin to develop best management practices (stormwater management practices) to address nonpoint source pollution and flood control management (via infrastructure improvements) that, when implemented together, will ensure protection of the regions' water resources.

The Stormwater Utility, like a sewer or water supply utility, is user oriented with costs being allocated based on services received (Debo, 1995). Another way of saying this is, "you only pay for the demand you put on the system". Traditional structural BMPs typically consist of detention ponds, grassed swales, sand filters/filter strips, infiltration basins, associated stormwater practices, etc. Traditional non-structural BMPs include special zoning requirements, ordinances (such as erosion and sediment control ordinances), maintenance activities (such as storm drain cleaning and street sweeping), and education/outreach activities (Ogden. 1998). The City of Griffin considers the Utility to be a viable nonstructural BMP that will enable the City to generate revenues for stormwater related improvements.

Stormwater Utilities have been in existence since the 1970's and over 400 utilities are currently in operation across the nation. What makes Griffin's Utility special? Griffin's Utility will be the first in the nation to address the upcoming requirements associated with the Phase II permitting process, and the Utility will be generating revenues prior to issuance of the final permit in the year 2002. At this time, it is estimated that over 4,000 communities across the nation will have to comply with the NPDES Phase II permitting regulation. The City of Griffin has made the decision that implementation of the Utility is an

integral part of the Stormwater Management Program. The Utility will also be instrumental in meeting the requirements of the upcoming NPDES Phase II permitting process as well as addressing Total Maximum Daily Loads (TMDLs) in the watershed.

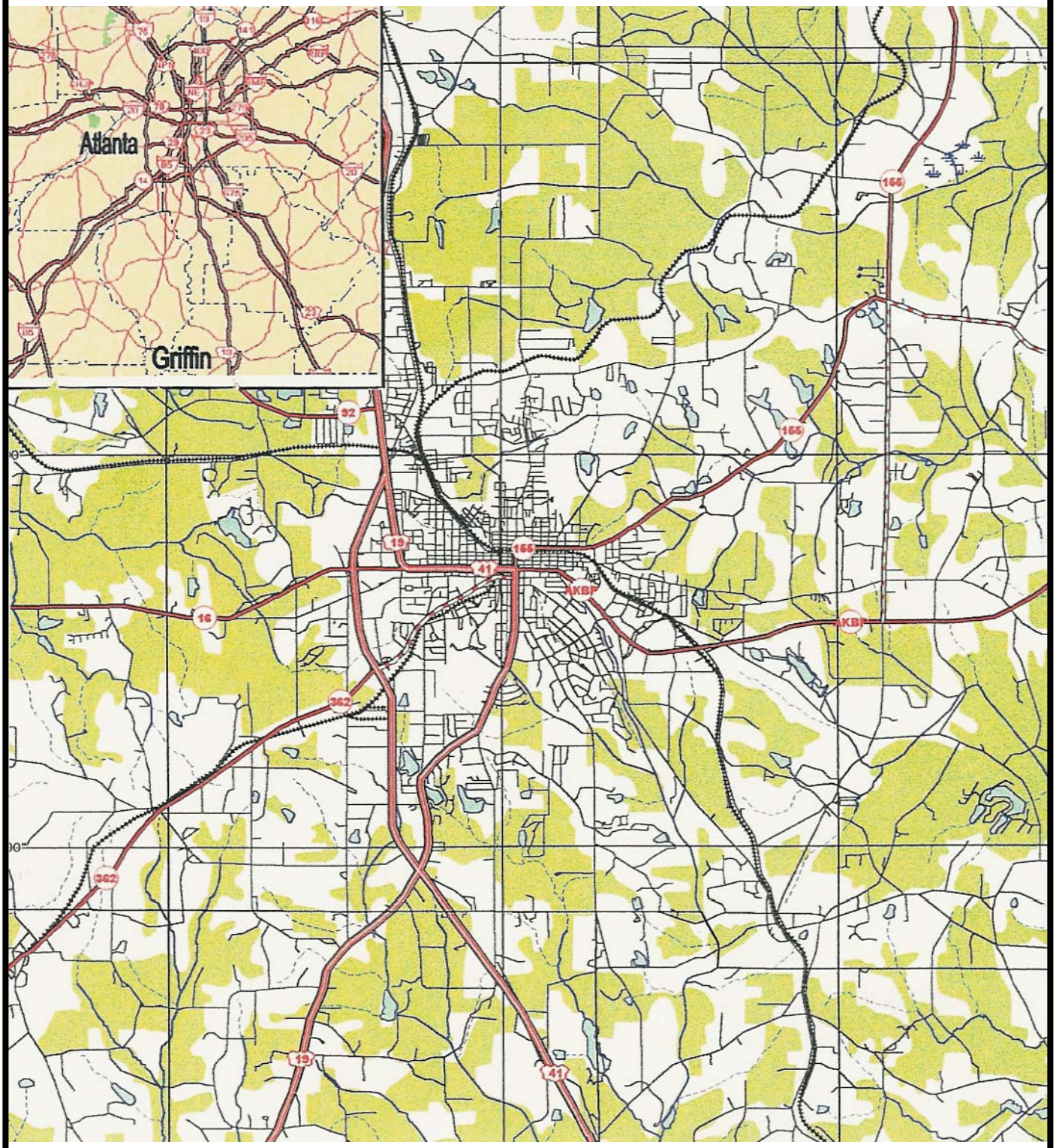

Figure 1 – City of Griffin Location Map

Stormwater Master Plan
City of Griffin, Spalding County, Georgia

May 1, 2003

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2.0 Overview Of The Plan

This Stormwater Master Plan provides an overview of integrated stormwater management, watershed and site level stormwater management, floodplain management, and technologies being utilized by the City of Griffin for implementing the stormwater management program. Additionally, this plan is designed to provide guidance for developers, contractors, and the general public based on the basic principals of effective urban stormwater management for the State of Georgia.

3.0 How To Use The Plan

This plan has been prepared to serve a variety of individuals involved in stormwater and watershed management, urban planning, property development, site design, and construction. The following provides a guide to the various sections of the plan.

- **What are the goals for the Stormwater Department?**

  The Stormwater Department has set numerous goals in the areas of water quality control, flood control, infrastructure management, stream corridor protection and comprehensive planning. These goals are covered in detail in Section 17.1.

- **What is the City doing to learn about the state of our Watersheds?**

  The Stormwater Department continues an on-going effort to assess the urban flood plains, chemical and biological integrity and health of the major watersheds in the City. These studies are covered in detail in Section 12.0.

- **What are some of the construction projects the Stormwater Department has completed?**

  The Stormwater Department has completed several major stormwater drainage system improvements within the last several years. These projects are summarized in Section 13.1.

- **What are the primary and alternate funding sources for the Stormwater Department?**

  The Stormwater Department is funded primarily through the Stormwater Utility, the first in the State of Georgia. However several alternative funding sources have been utilized with the help of supplemental stormwater functions. Summaries of these funding mechanisms may be found in Section 9.0.

- **What federal and state regulations does the Stormwater Department have to comply with?**

  The Stormwater Department for the City of Griffin was created directly to address federal and state mandates under the Clean Water Act, Georgia Water Quality Control Act and the Safe Water Drinking Act, and local stormwater issues. These regulations and others are covered in Section 5.0.

- **What is the Stormwater Department doing to maintain the City's stormwater pipes and drainage structures?**

  The Stormwater Department has initiated a major Operations and Maintenance program within the City to ensure the maximum longevity of the system. This program is covered in detail in Section 16.0.

- **How does the Stormwater Department communicate with the public?**

  The Stormwater Department communicates with the public through a variety of media concerning programs and findings within the Department. The Public Education and Information program is covered in detail in Section 15.0.

- **How does the Stormwater Department collect data on its Watersheds?**

  The Stormwater Department has developed a comprehensive monitoring program involving water quality testing and GIS mapping. This program is covered in detail in Sections 10.0 and 12.6.

4.0 Program Definition

4.1 General

The Stormwater Master Plan is a comprehensive planning and guidance process, and takes a holistic approach to stormwater management. The plan integrates decision-making tools, including policy criteria guidelines, watershed master plans, and financial programs used to collect stormwater service charges to fund the program. Implementation of services includes maintenance, public information and education, and capital improvement projects. The program will be an ongoing process of updating and upgrading these tools to improve the decision-making process and services provided to the City of Griffin customers within the stormwater service area.

The current physical issues facing the City of Griffin include the flooding of minor drainage systems, erosion of ditches and streams, water quality issues, and degradation of habitat. These issues are described in the following sections of this document.

The physical issues with stormwater management have been brought about by non-structured past development practices and lack of adequate resources to perform maintenance of the drainage system. Flooding occurs primarily as the result of the following:

- More water is flowing the in drainage system following urban development than the system was designed to handle;
- Structures are permitted to be located too close to streams;
- Pipes and channels have become clogged with sediment or debris; and
- Poor design.

4.2 Mission Statement

The mission statement of the City of Griffin Stormwater Department defines the long-term purpose of the stormwater management program. The mission statement is the foundation for the development of program objectives, goals, and policies.

This mission statement will promote the safety and well-being of the public, the protection of the environment, the encouragement commerce, and sound development decisions.

Typical basic mission and policy statements are normally designed to accomplish the following seven foundational goals:

- Protect life and health
- Minimize property losses
- Enhance floodplain use
- Ensure a functional drainage system
- Protect and enhance the environment
- Encourage aesthetics
- Guide development
- Manage watershed from a holistic approach

Based on the foundational goals the following mission statement was adopted by the City of Griffin staff:

> *"The mission of the City of Griffin's stormwater management program is to develop, implement, operate, and adequately and equitably fund the acquisition, construction, operation, maintenance, and regulation of stormwater drainage systems. The program shall safely and efficiently control runoff, enhance public health and safety, facilitate mobility and access to homes and businesses during and after storm events, protect lives and property, complement and support other City programs and priorities, eliminate the discharge of pollutants to receiving waters, and enhance the natural resources of the community."*

4.3 Program Priorities

Stormwater program priorities were developed to guide the program and are described in this document. The program priorities focus on developing and implementing a comprehensive, cohesive approach to stormwater management, with emphasis on immediate attention to correcting highly visible stormwater problems throughout the City of Griffin. The program priorities which have been completed by the City of Griffin are listed by each major stormwater functional area and are as follows:

<u>*Management and Administration*</u>

- Establish a stormwater utility as an administrative and financial focus.
- Identify stormwater problems and needs in the city.
- Adopt financial programs.
- Establish equitable, adequate, and stable stormwater program funding.

- Execute organizational and staffing changes.
- Implement public information activities in support of the program.
- Management and record keeping systems have been enhanced.
- Research interlocal agreements to optimize local government resources.
- Establish Geographical Information Systems (GIS) for the stormwater infrastructure.

Water Quality

- Identify potential NPDES stormwater quality permit requirements.
- Establish stormwater quality management strategy.
- Establish locally practical BMPs.
- Establish retrofitting opportunities for stormwater quality improvements.

Engineering and Planning

- Prepare a detailed stormwater system inventory utilizing GIS.
- Develop a stormwater master plan for capital investment.
- Design capital improvements for high-priority projects.
- Develop technical support resources for stormwater operations and regulation.
- Prepare a Comprehensive Stormwater Design Manual.

Operations

- Prepared a system condition survey.
- Establish the extent, scope, and level of routine maintenance services.
- Evaluate privatization of maintenance.
- Develop routine maintenance strategy and priorities.
- Establish remedial maintenance strategy and priorities.
- Establish expanded routine and remedial maintenance programs.

Regulation and Enforcement

- Upgrade City regulations, codes, and requirements.
- Evaluate inspection program to verify maintenance of key private stormwater systems.

Capital Improvements

- Address land acquisition, easements, and rights-of-entry for capital improvement and operating needs.

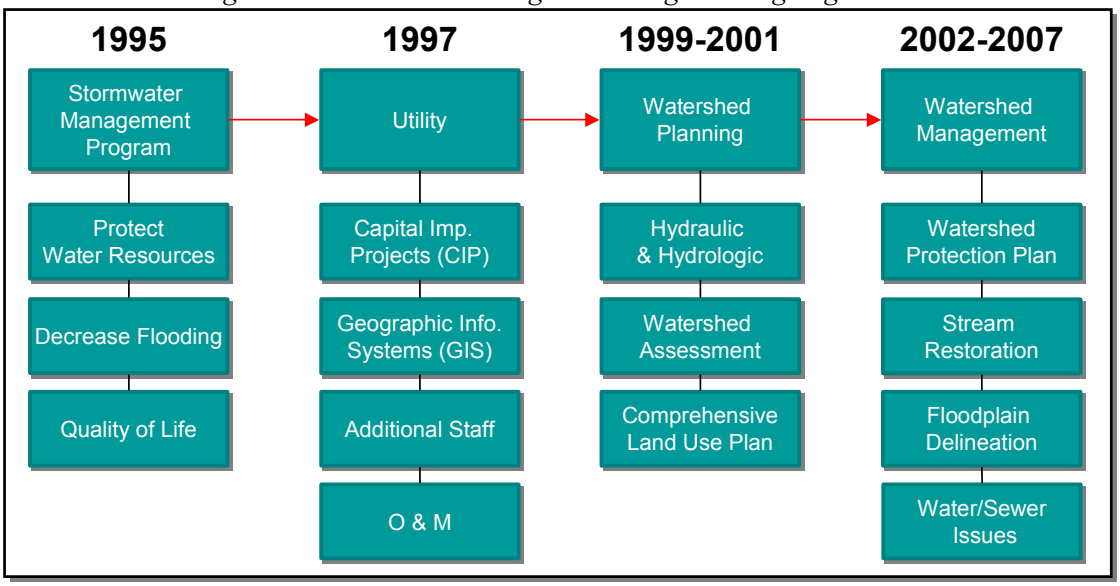
Three key factors were considered in order to develop the program priorities. They are:

- The type of drainage issues to be addressed;
- What solutions must be done to address the issue, including financial, legal and political obstacles; and
- The implementation steps and timing required for addressing drainage issues.

The program priorities focus on developing and implementing a comprehensive, cohesive approach to stormwater management, with emphasis on immediate attention to correct highly visible drainage issues throughout the City.

Figure 2 presents the ongoing work and future goals of the Stormwater Management Program.

Figure 2: Stormwater Management Program-Ongoing Work & Future Goals



4.4 Stormwater Quality Management

The City of Griffin's fundamental goal is two fold: address water quantity and quality issues within the City. The Stormwater Utility Department was developed as a result of several years of researching programs and alternative funding mechanisms to address the aging infrastructure issues of the City. The City created this program to address stormwater runoff/management issues throughout the City including culverts, ditches, detention ponds, water quality, and other associated drainage issues.

The City of Griffin Stormwater Utility Department is taking action to address the new regulatory requirements for the management of stormwater quality as required in the NPDES Phase II Regulations, including the use of BMPs to reduce pollutants from entering the stormwater system.

A stormwater quality management strategy has been initiated which includes watershed assessments for each of the six watersheds within the City. In addition to the biological assessments the City is evaluating the physical habitat of approximately 16 miles of streams within the City in anticipation of restoring and protecting degraded streams, while meeting the goals of TMDLs (Total Maximum Daily Loads).

The City has also initiated the development of stormwater master plans for the six watersheds and 39 sub-basins within the City of Griffin to prioritize activities for improving water quality. The City of Griffin has incorporated sound planning and design requirements into the plan to reduce the potential of pollution and meet regulatory requirements.

4.5 Engineering and Planning

In order to improve the flooding conditions and stormwater quality within the City of Griffin, the City has revised the policies and ordinances to better suit the goals of the Stormwater Utility Department.

The City is in the process of creating a comprehensive land use plan as a non-structural BMP. A geographic information system (GIS) for the stormwater infrastructure has been developed. Engineering analysis and improvement initiatives of the stormwater system within City limits have been started.

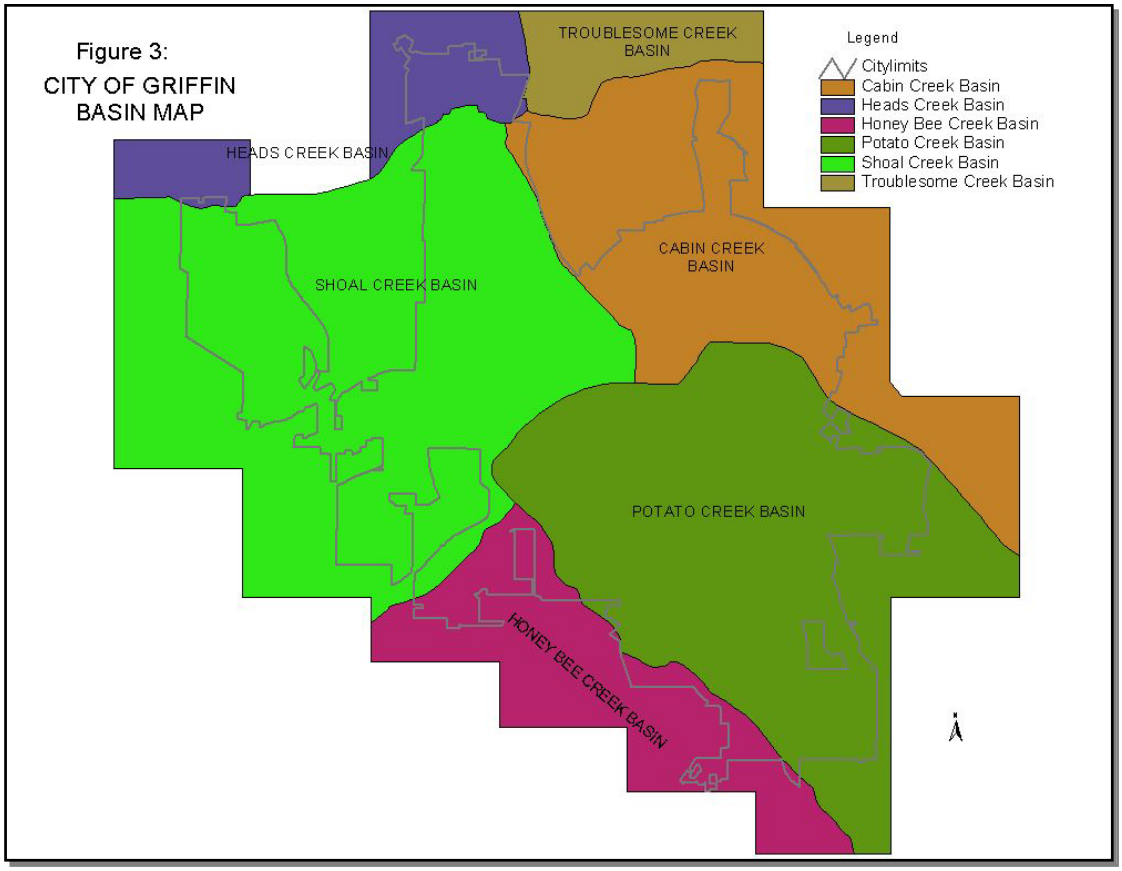
This plan is tailored to provide capital improvements for the stormwater system in the City. High-priority improvements have been completed to demonstrate the programs effectiveness as discussed in Section 11.3. Engineering policies are presented in the Policy Statements Manual.

5.0 Background & Authority

5.1 General

Griffin's population is around 23,500 people and its size is approximately 13.9 square miles. The City has approximately 165 miles of roads, six drainage basins and 39 sub-basins equaling a total of 16,403 acres and 84,513 linear feet of stream segments. The City is 163 years old, and has an estimated 13,000 drainage structures. The City is responsible for the operation and maintenance of the entire drainage system. The size of this system requires a substantial operating budget. After reviewing all the alternatives, Griffin decided to help fund its Stormwater Management Program by creating a Stormwater Utility. Please see Attachment B for the Stormwater Utility Presentation Update created in 1998. Figure 3 below depicts the six watersheds.

Figure 3: City of Griffin Basin Map



5.2 Regulatory

5.2.1 General

The City of Griffin's policies must be consistent with the regulatory requirements of local, regional, state, and federal entities. Several of the entities are described in the following sections. The City of Griffin's drainage program is illustrated in Figure 2.

5.2.2 Clean Water Act

The Clean Water Act (CWA) provides the backbone for the national approach to water quality policy and action. The goal of this federal law is the total elimination of the discharge of pollutants into the nation's navigable waters. Two types of discharges are defined: point and nonpoint source discharges. The CWA has three main requirements as follows:

- Municipalities are required to effectively prohibit non-storm water discharges into the publicly owned or operated storm drain system.

- Municipalities are required to control discharge of pollution into the storm drain system to the maximum extent practicable.

- Municipalities are required to have one system-wide permit rather than individual discharge permits for each point.

Although pollutants entering storm and surface water systems are primarily nonpoint in nature, discharges from the storm and surface water systems have been defined as point sources (40 CFR Section 122.45). As a result, storm and surface water systems are subject to the permitting process of the CWA's National Pollutant Discharge Elimination System (NPDES). NPDES Permitting is described in Sections 5.1.3.

5.2.3 Georgia Water Quality Control Act

As a result of the federal CWA, the state of Georgia developed the Georgia Water Quality Control Act (GWQCA). The GWQCA was created to carry out the purposes and requirements of the CWA and the Federal Water Pollution Control Act Amendments of 1972, as amended.

5.2.4 NPDES Phase II Stormwater Permit

The NPDES Phase II Stormwater Permit focuses on small municipalities and is issued by the Environmental Protection Division (EPA). The program's main objective is to control nonpoint source pollution of waterways in urban areas to the maximum extent practicable. The Phase II Permit requires the community to prepare a Notice of Intent which describes the Best Management Practices (BMPs) to be implemented to fulfill the EPA's goal of public education and outreach on stormwater impacts, public involvement and participation, illicit connection and illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management in development and redevelopment, and pollution prevention and good housekeeping of municipal operations.

5.2.5 Erosion and Sedimentation Control Act

In April of 1975, the Erosion and Sedimentation Act of 1975 was signed into law. The Act states "It is found that soil erosion and sediment deposition onto lands and into waters within the watersheds of this State are occurring as a result of widespread failure to apply proper soil erosion and sedimentation control practices in land clearing, soil movement and construction activities, and that such erosion and sediment deposition result in pollution of State waters and damage to domestic, agricultural, recreational, fish and wildlife, and other resource uses. It is therefore, declared to be the policy of this State and the intent of this Act to strengthen and extend the present erosion and sedimentation control program to conserve and protect land, water, air, and other resources of this State."

According to the State Soil and Water Conservation Commission, approximately 4 billion tons of sediment eroded in the United States each year. Sediment is produced from sources such as farmland, roadside construction, and city streets.

Act 599 of the Erosion and Sedimentation Act requires that governing authorities in Georgia's 159 counties adopt comprehensive ordinances governing land disturbance activities within their boundaries. The law includes minimum standards but can be more stringent as deemed by the local ordinance.

Sediment is one of the primary reasons why streams fail to meet their designated uses. The EPA identified sediment and erosion as a primary component of successful water quality management. The City of Griffin is proactive in its approach to stormwater management and

water quality control including inspection programs, the Stormwater Design Manual, new ordinances, and the complaint database (GaSWCC, 2000).

5.2.6 Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) was created to provide accountability for all Federal emergency preparedness, mitigation, and response activities. FEMA is organized to strengthen the multiple use of emergency preparedness and response resources at the Federal, State, and local levels of government in preparing for and responding to the full range of emergencies and to integrate into a comprehensive framework activities concerned with hazard mitigation, preparedness planning, relief operations, and recovery assistance.

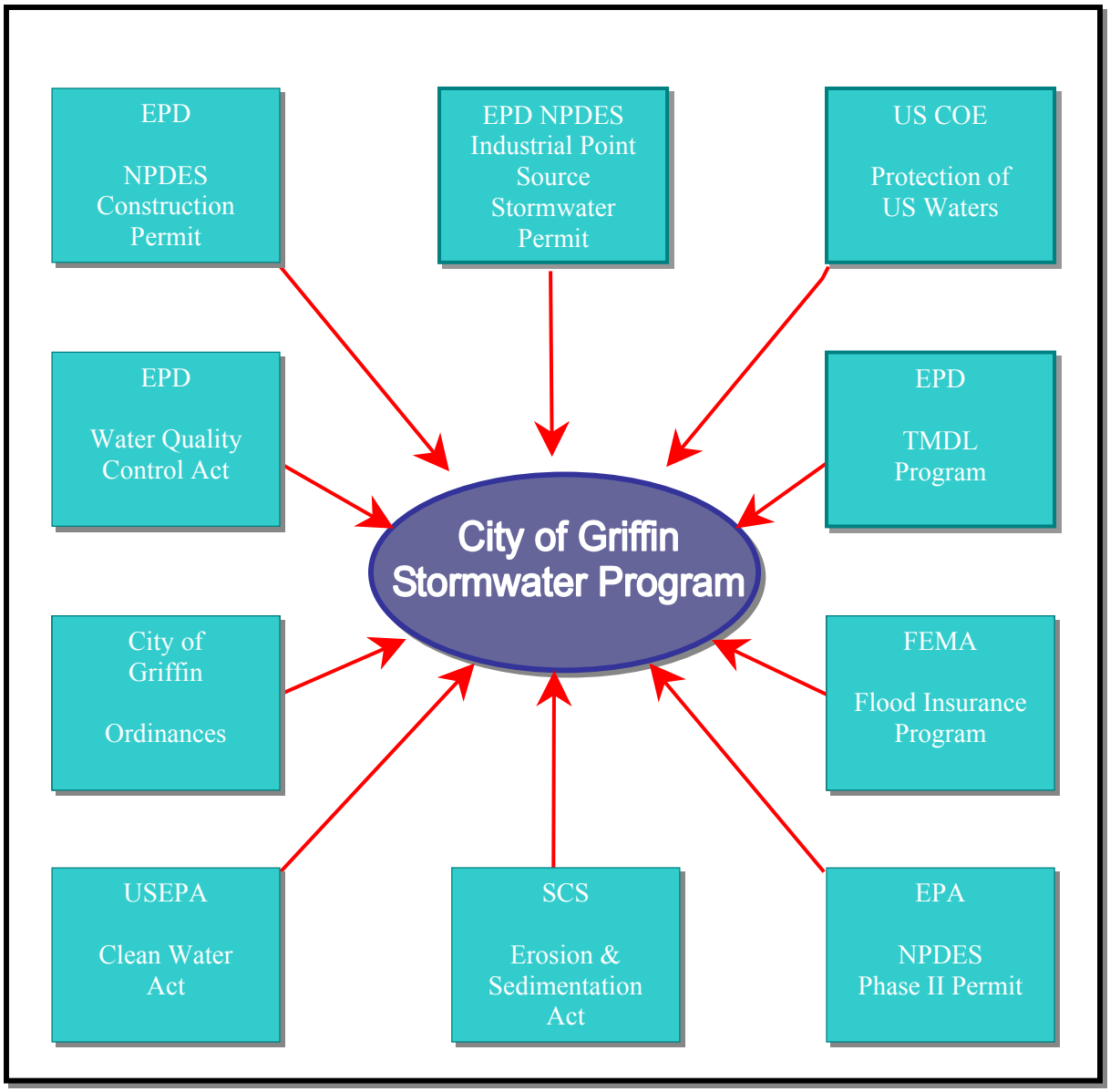
5.2.7 TMDL Program

A total maximum daily load (TMDL) is a written plan and analysis established to make sure that a water body will reach and maintain water quality standards. The TMDL takes into consideration existing pollutant loads and reasonably foreseeable increases in pollutant loads. The goal of a TMDL is to allocate pollutant loads and define a set of actions such that water quality standards can be achieved. Maximum allowable pollutant loads or loads needed to meet water quality standards are defined within each TMDL. The state has required that TMDLs be established for each water body on the list of impaired or threatened water bodies.

5.2.8 Protection of US Waters

The United States Army Corps of Engineers (ACOE) of the Department of Defense manages and constructs civil works programs which include research and development, planning, design, construction, operation and maintenance, and real estate activities related to rivers, harbors, and waters as well. ACOE administers laws for protection and preservation of navigable waters and laws for protection and preservation of navigable waters and related resources such as wetlands. ACOE's authority for protection of navigable waters falls under Section 404 of the U.S. Rivers and Harbors Act of 1899. Section 10 of that act prohibits any obstruction or alteration of navigable waters without an ACOE permit. The term navigable waters has a broad definition, which states that wetlands are included along with streams having average annual flows greater than 5 cubic feet per section. ACOE also assists in recovery from natural disasters.

Figure 4: Impacts on City of Griffin Stormwater Program

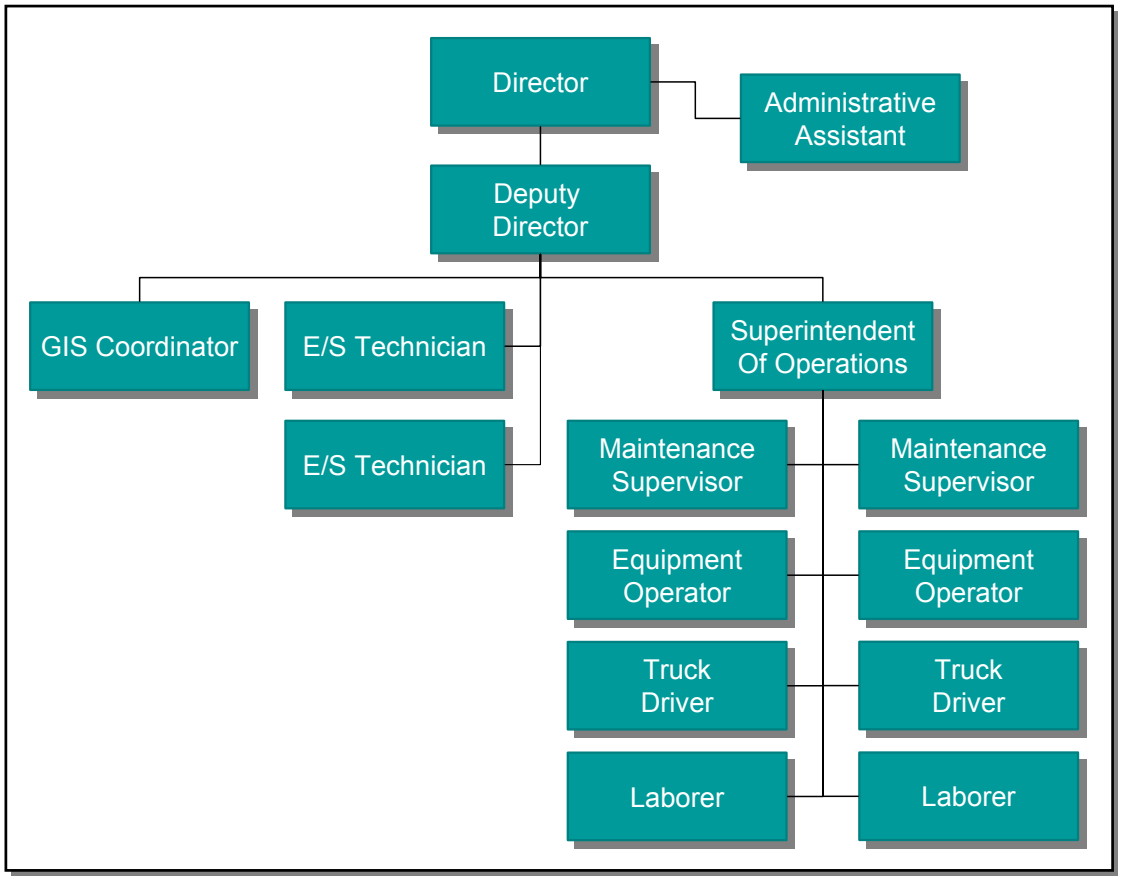


6.0 Administrative/Organizational

The City of Griffin Stormwater Program is managed by the Director of Public Works and Utilities Department. The Deputy Director of Public Works and Administrative Assistants provide support to the Director of Public Works and Utilities.

Below is an organizational flow chart representative of the organizational structure once all staffing has been completed.

Figure 5: City of Griffin Stormwater Department Organizational Chart



7.0 Watershed-Based Stormwater Planning

7.1 General

The purpose of this section is to provide an overview of the basics of planning for stormwater management as well as an approach to developing comprehensive watershed-based plans.

7.2 Stormwater Master Planning

Practicing onsite stormwater management controls alone does not fully protect against the impacts from the cumulative effect of multiple sites on receiving waters. Therefore, stormwater management also needs to occur at the watershed level in a manner that integrates and is consistent with the site level approach presented in the previous section. Receiving water degradation and downstream impacts can result even with modest levels of development within a watershed. Difficult management decisions that involve input from a broad array of stakeholders need to be made at the watershed level to optimize the interrelation between urban growth and water resource health.

Stormwater master planning is an important tool with which communities can assess and prioritize (in terms of impact and cost) existing and potential future stormwater problems, as well as alternative stormwater management solutions and options. Traditionally, stormwater master planning has addressed such subjects as peak rates of runoff and volumes for various return frequency storms; locations, criteria, and sizes of stormwater controls and conveyances; cost/benefit analyses, and risk assessments.

A multi-objective stormwater master plan seeks to broaden the traditional definition of stormwater management to include the following:

- Land use planning and zoning
- Water quality
- Habitat
- Recreation
- Aesthetic considerations, etc.

Under multi-objective stormwater master planning, land use planning is integrated with stormwater management and resource protection goals so that sustainable development may occur. Sustainable development is thought of as development that is economically feasible and attractive and at the same time recognizes the importance of the natural environment and takes necessary steps to protect it. This Stormwater Master Plan seeks to combine stormwater management and protection goals with land use planning.

Stormwater master planning is extremely broad and can cover a myriad of important issues. This section presents an overview of different types and levels of master planning. Emphasis is placed on how watershed planning so that both water quantity and water quality goals can be achieved. This section also presents the specific elements the City of Griffin will be addressing as presented in this plan.

7.2.1 Basic Types of Stormwater Master Planning

There are several reasons for a stormwater master plan. A master plan can focus on:

- Fixing existing problems in developed neighborhoods, or avoiding new problems in areas facing development.
- Solving many small drainage problems on minor systems, or solving major flooding along creeks and streams.
- Water quantity issues and/or water quality issues.
- Primarily technical issues or consideration of institutional issues as well.
- The development of computer and GIS based stormwater quantity and/or quality models.
- Develop watershed approach to ensure that land use and economic development will occur simultaneously while meeting the environmental concerns of the quality of life.
- Integrating public input for corroboration of drainage system.

There are several types of master plans that can be prepared. This master plan focuses on flood management, land use planning, and watershed protection. The following sections provide information concerning the specific elements of this master plan.

7.3 Flood Management Plan

A flood management plan is the simplest form of master planning, where only the essential components, alignment, and functions of a drainage system are analyzed. The focuses of these types of studies are on water quality control and flood prevention or protection. Flood studies might be performed to assess the nature of and determine solutions for out-of-bank flow events that adversely impact public and private lands. Frequently, a flood assessment study typically analyzes both existing conditions and projected future "build-out" discharges for selected return frequency runoff events. The selected events are based on the City of Griffin standards. The hydrology and hydraulics of the system are analyzed to determine surface water profiles and elevations. This provides information as to where impacts are expected to occur.

Examples of a flood assessment are examining the effects of detention on flooding and providing improved flood protection (e.g., flood proofing structures, levies, etc.). The City of Griffin has developed models for the hydrology and hydraulics of the watersheds for the purposes of estimating the full build-out floodplain and regulating new development on this basis rather than the ever-changing existing condition.

As part of the studies, cross-sectional data has been collected from the majority of waterways within Griffin. Using the cross-sectional data, the streams and waterways were analyzed under a full range of flow conditions. The model results were used to produce mapping of 100-year floodplains throughout the City. The floodplain maps provide one of the tools necessary for the City of Griffin to make decisions that balance the relationship between urban growth and water resource health.

7.4 Community Rating Program

The National Flood Insurance Program (NFIP) regulations require that new buildings and substantial improvements to existing buildings be protected from the base flood. Therefore, the City of Griffin is implementing a Community Rating System (CRS). The CRS is a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood

insurance. Detailed information about the NFIP and CRS may be found on FEMA's web site at http://www.fema.gov/nfip.

Several programs are being implemented by the City to receive credits that are awarded for implementing the following programs or activities:

- Flood Protection Assistance
- Open Space Preservation
- Higher Regulatory Standards
- Flood Data Maintenance
- Erosion Sedimentation Control Regulations (ESC)
- Water Quality Regulations
- Floodplain Management Planning
- Retrofitting
- Drainage System Maintenance
- Flood Warning Program
- Levee Safety
- Dam Safety
- Comprehensive Management Plan, etc.

The City is in the process of collecting the necessary data to submit to the Federal Emergency Management Association (FEMA) in order to receive stormwater credits. To receive credits, the city has developed a master plan with comprehensive reviews of watershed or basin hydrology to include regulations or set regulations standards to prevent new development from aggravating stormwater problems.

7.5 Comprehensive Land Use Management Plan

The City has developed a land use plan that will be helpful in managing growth and development. The land use plan helps to preserve sensitive areas, maintain or reduce the impervious cover within a given sub watershed, and redirect development toward sub watersheds that can support a particular type of land use and/or density.

7.6 Watershed Protection Management Plan

As part of the watershed protection management plan, the City has estimated the pollutant loads from stormwater runoff to calculate the Total Maximum Daily Loads (TMDLs) for the major watercourses within the city limits. This provides the foundation from which to

develop water quality assessments. Stormwater quality studies analyzed water quality impacts to receiving waters and groundwater if applicable and develop structural and nonstructural strategies to reduce or minimize the pollutant loads.

As part of the watershed protection plan, the City has conducted chemical and bacteriological sampling, biological and habitat assessments, and sediment sampling. The biological and habitat assessment focus primarily on the biological and fish communities within the specific watersheds.

Long term monitoring programs will be implemented to ensure that the City of Griffin continues to minimize impacts to receiving waters. This monitoring program will include chemical, biological and sediment sampling, as well as rainfall and stream flow quantity measurements.

8.0 Policy Statements

8.1 General

The purpose of the Policy Statements Manual is to review existing policies, ordinances, and to establish proposed new and modified drainage policies. The review work focused on laws, ordinances, and plans that might impact stormwater in an effort to eliminate conflicts, and more importantly, to identify necessary new regulations. The newly established policies guided the development of the Stormwater Master Plan and the formation of the design criteria and standards to implement the program.

The major categories of policies include the following:

- Institutional
- Financial
- Engineering
- Operations and Maintenance

The policies listed in this plan are based upon the City of Griffin's goals and objectives for the stormwater management program as well as the requirements of regulatory agencies at the local, regional, state, and federal levels resulting in a unified approach to watershed management. The following sections detail each of the four policies listed above.

8.1.1 Institutional

This category pertains to the development and administration, service levels, intergovernmental/agency cooperation, public involvement, and regulation enforcement. The subcategories within this policy area include:

- Management
- Coordination with other programs
- Emergency preparedness/disaster control
- Development submittals
- Erosion and sedimentation control
- Floodplain management
- Land
- Records management
- Inspection
- Enforcement

- Customer (public response)
- Public information/involvement
- Research

8.1.2 Financial

The Financial category pertains to the customer billing systems and other financial programs, including funding for stormwater management. The specific policy areas include:

- General Policies
- Funding Options
- Rate Structure
- Billing Method
- Service Charge Credits and Exemptions
- Asset Management

8.1.3 Engineering

This category pertains to the technical management of the drainage system and facilities. Specific policy areas include:

- Planning and Design
- Construction of Public and Private Facilities
- Water Quality

8.1.4 Operation and Maintenance

This category pertains to the day-to-day insurances that the facilities are performing as intended. Specific policy areas include:

- General
- Inspection

8.2 Family of Documents

The work performed to develop and implement the Stormwater Master Plan (SWMP) and Storm Management Utility for the City of Griffin was comprehensive, varied, and required many tasks. The work resulted in the production of numerous documents. The significant documents that comprise the initial SWMP are collectively termed the Family of Documents.

8.3 Background

This document presents existing and proposed policies and guidelines for the City of Griffin and the participating local agencies to utilize relative to implementation of the Comprehensive Stormwater Master Plan. It is important that there be a unified approach for the Stormwater Program, however, it is likewise important to recognize that the City of Griffin does not have total control to impose and implement policies, standards and procedures to achieve the goals and objectives of the Comprehensive Storm Master Plan for the City of Griffin.

The authority and responsibilities assigned to the City of Griffin for managing the storm and surface water program are set forth in Ordinance No.99- (STORMWATER MANAGEMENT), Section 22-135 – Section 22-146.
Specific elements include:

- Scope of Responsibility for the City Drainage System
- Requirements for onsite stormwater systems: Enforcement Methods and Inspections
- Determinations and Modifications of Stormwater Service Charges
- Effective Date of Stormwater Service Charges
- Stormwater Service Charges
- Exemptions and Credits Applicable to Stormwater Service Charges
- Water Service Charges
- Stormwater Service Charge Billing
- Delinquencies, Collections
- Stormwater Utility Service Charges Billed in Common
- Appeals

The "Stormwater Management Systems" address the issues of drainage management (flooding) and environmental quality (pollution, erosion, and sedimentation) of receiving rivers, streams, creeks, lakes, ponds, and reservoirs through improvements, maintenance, regulation, and funding of plants, works, instrumentalities and properties used or useful in the collection, retention, detention, and treatment of storm water of surface water drainage for which the City of Griffin is responsible.

Under the State statute and the above-cited ordinance, the purpose of the City of Griffin Storm Water Program includes (for all public storm and surface water drainage facilities and systems within the City of Griffin Drainage Service Area):

- Drainage system possession, control, and domination.
- Drainage system maintenance, improvement, operation and repair.
- Effective management and financing.
- Improvement of the public health, safety, and welfare.
- Safe and efficient capture and conveyance of stormwater runoff.
- Correction of stormwater problems.
- Establishment and implementation of a storm drainage master plan which addresses design, coordination, construction, management, operation, maintenance, inspection, enforcement.
- Establishment of reasonable stormwater service charges based on contribution of runoff to the City of Griffin system.
- Facilitation of the use of urban water resources management techniques including detention/retention.
- Maximize the use of natural drainage conveyance systems.
- Enhancement of the environment.

8.4 Approach

The policy statements proposed in this document are organized around the City of Griffin's goals and formatted into four major categories:

- Institutional
- Financial
- Engineering
- Operations and Maintenance

The Institutional category pertains to the development and administration of a program for storm drainage including staffing, equipment, service levels, intergovernmental/agency cooperation, public involvement, and regulation enforcement. Financial pertains to the rate structure, mix of funding options, level of service charges, customer billing systems and other aspects of funding the drainage program. Engineering pertains to the planning, analysis, design, and construction of the drainage system and facilities. Operations and maintenance pertains to the day-to-day insurances that the facilities are performing as intended when built.

The relevant regulatory and jurisdictional requirements and proposed policies for the program are presented for each of the major elements

of the City of Griffin's Stormwater Program. For a program to be effective and progressive, its direction must be clearly stated and periodically refined. The mechanism for establishing program direction is the formulation and implementation of policies. Policies are based on goals of the organization as well as on the requirements of regulatory agencies at the local, regional, state and external impacts pertaining to policy making for the City of Griffin's Storm Water Program.

Where no policies exist, proposed policies have been developed. As such, this document is intended as a basis for discussion leading to formalization of the policy statements, which will effectively guide the City of Griffin's Program.

8.5 Proposed Policies

Policies provide the framework (philosophy, timing, direction) and set the boundaries for stormwater management services to be provide by the City of Griffin. The policies directly impact the need for labor, materials, equipment, and other capital investments, which in turn define the level of financial commitment required. The policies presented within this plan are designed to guide the development of the Stormwater Master Plan. The statements were developed to be compatible with existing policies, and to meet future needs based on analysis and interviews with elected officials, staff members, and local professionals in the City.

8.5.1 Institutional Policy Statements

Policy Area 1: Management

a) The City of Griffin's organization reflects the goals and objectives for storm, groundwater and surface water management with in the storm water management systems.

b) The program is long-term, comprehensive, and cohesive.

c) The City of Griffin establishes and maintains a budget for coordinating, planning, designing, constructing, operating, repairing, extending, and improving flood control and storm and surface water facilities, systems, and services.

d) The City of Griffin's responsibilities do not include those systems, facilities, and services that fall outside the Storm Water Management Systems. However, the City of Griffin

establishes cooperative agreements with other agencies or jurisdictions to ensure compatible storm and surface water efforts within the area or facilities draining to or through the City of Griffin Service Area.

e) The City of Griffin has authority to maintain, operate, reconstruct, review, and approve and to make additions, extensions, and betterments to the storm drainage system within/without the Service Area.

f) As necessary, the City of Griffin shall make and enforce rules and regulations including:

- Protection of the public health, safety, and welfare.
- Design criteria or level of service for stormwater facilities, systems, and service.
- Establishment and collection of fees including plan review and fees for regional facilities.
- Collection procedures, establishing drainage rates and timing of service charge bills.
- Protection of the drainage facilities, improvements, and properties controlled by the City of Griffin and prescription for their appropriate use.
- Requirements for drainage facilities associated with development or additions to property.

g) The City of Griffin issues, at least annually, a report to the City Commission regarding the status of flood control and storm and surface water drainage services and responds in a timely manner to drainage issues in the service area.

h) The City of Griffin's Director of Public Works and Utilities reviews policy at least annually for adequacy and completeness, and shall make recommendations to the City of Griffin Commission for modifications/revisions to present policy when necessary.

i) The City of Griffin develops and continues an ongoing program of drainage and flood control related in-service training for the City of Griffin staff. Topics vary in nature and shall continue to expand the knowledge/understanding of City staff involved in any aspect of storm and surface water management.

j) Responsibility is established through liaison with appropriate agencies for coordinating implementation of state and federal program requirements including:

- The National flood Insurance Program
- The Water Quality Act of 1987
- Georgia Water Quality Control Act
- Erosion and Sedimentation Control Act

k) The City of Griffin designates personnel responsible for interagency coordination.

Policy Area 2: Coordination with Other Programs/Plans

a) The City of Griffin provides, when appropriate, an opportunity for review of flood control, and storm and surface water drainage issues by the City of Griffin.

b) The City of Griffin coordinates with the local planning commission during periods of review and update of The Comprehensive Plan.

c) Plans prepared by the City of Griffin incorporate the zoning requirements developed by the City of Griffin Service Area.

d) Cooperation of agencies, jurisdictions, and other entities (including the land development industry), which impact or are impacted by the City of Griffin program, shall be sought to coordinate the requirements of external programs, new development and public works facilities with the basin wide plans.

e) The City of Griffin coordinates with affected Departments to incorporate surface water facilities into parks whenever appropriate and cost effective.

f) The City of Griffin coordinates stream monitoring and regulation enforcement with the County Health Department and the Georgia Environmental Protection Division.

g) As required, the City of Griffin meets regularly with the County Department of Public Works to ensure clear definition of program responsibilities and boundaries, and to resolve any conflicts in maintenance efforts.

h) The City of Griffin coordinates its floodplain management program with FEMA, particularly with respect to public information.

i) The City of Griffin coordinates storm and surface water impacts associated with agricultural activities with the Soil Conservation Service.

j) The City of Griffin coordinates with the appropriate agencies through the Fire Communications Bureau to ensure that emergency response plans to hazardous waste discharges are sufficiently protective of surface waters.

Policy Area 3: Emergency Preparedness/Disaster Control

a) Participate in development of plans for coordination or response to all types of emergencies which could affect the quality or quantity of water, including:

   - Flooding within Service Area Boundaries
   - Spills of Hazardous Substances
   - Major Pipeline Breaks
   - River Flooding

   The plans should include clear statements of roles and responsibilities for each of the federal state and local agencies involved in emergency response.

b) Annually conduct a full-scale implementation of the flood control works including road closures, media notification, detours, and all other aspects of the emergency response program.

c) The City of Griffin periodically reviews Hazardous Material Prevention Control (Hazmat) Ordinance and Hazardous Material Spill Preparation and Control Plan (HMPC) to ensure adequacy of measures to protect and prevent contamination of surface waters.

Policy Area 4: Development Submittals

a) All drainage plan submittals are prepared in accordance with the current edition of the City of Griffin Stormwater Design Manual and presented in digital format.

b) All persons or organizations proposing to construct new or alter existing drainage facilities must submit plans for these facilities to the City of Griffin for review and approval prior to construction.

c) Drainage facilities for new developments/site improvements should have capacity not only for the stormwater from the site, but also for the area draining to the site. Such drainage facilities shall discharge into a watercourse, drainage channel or other public stormwater facility.

d) New development will provide adequate drainage control measures to ensure that: a) no significant increase in flooding or erosion occurs as a result of the new development, b) peak stormwater runoff rates after development of the site do not exceed peak rates prior to development and c) stormwater runoff is not a significant source of water pollution.

e) Those who propose new development bear the costs of the public facilities and services made necessary by such development. When existing essential services are inadequate, the developer may be asked to make improvements to eliminate present inadequacies if such improvement would be considered appropriate at the proposed location.

f) The City of Griffin reviews and approves the portion of plans for new development that pertain to storm drainage, pollutant removal systems, erosion/sediment control, and the flood plain ordinance.

g) New Planned Unit Developments shall preserve natural features such as steep slopes, floodplains, erodible soils, and bodies of water. Drainage plans shall reflect these preservation requirements.

Policy Area 5: Erosion and Sedimentation Control

a) Developers are required to use best management practices for erosion and sedimentation control during and after site preparation and construction activities.

b) Construction projects are phased as needed to minimize the area of exposed soils at any one time.

c) Erosion/Sediment Control Plans are guided by the following principles consistent with the requirements set forth by the Soil

and Water Conservation Service and comply with all other federal, state, and regional programs.

- o Development should be fitted to the existing natural site drainage features.
- o Existing vegetation shall be retained wherever possible.
- o Immediate mulching and vegetation of denuded areas shall be encouraged upon completion of construction or in anticipation of storm events.
- o Runoff shall be diverted away from denuded areas.
- o Required retention basins and erosions/soil control shall be installed prior to the construction of other facilities to mitigate impacts during construction.
- o Sediments will be entrapped on-site to the greatest degree practical.
- o Erosion and sediment control measures shall be routinely inspected and maintained.

d) Lakes and streams will be buffered from the water pollution effects of site preparation, construction activities, on-lot sewage disposal and urban stormwater runoff.

e) Development on unstable, wet soils is allowed only if adequate measures are taken to prevent subsidence or slippage of soils or structures.

Policy Area 6: Floodplain Management

a) Development in the floodway of the 100-year floodplain is be restricted by; a) prohibiting the location or expansion of structures and storage areas in the floodway, except for rare instances when it is conclusively demonstrated that no increase in floodwater elevation and velocity will result and that no public hazards will be created and, b) allowing the modification or restoration of existing structures located in the floodway only in the structural alterations do not increase the elevation and/or velocity of the 100-year flood and if flood proofing measures are taken, c) other aspects of the National Flood Insurance Program.

b) Development in the floodway fringe of the 100-year floodplain is restricted by: a) prohibiting the location or expansion of development which would create a significant increase in floodwater elevations and b) elevating new or substantially improved residential structures above the 100-year flood level and c) providing adequate flood protection, through elevation

or flood proofing, for new and substantially improved non-residential structures.

c) Emergency access shall be provided for development located in flood-prone areas.

Policy Area 7: Land

a) Drainage easements are designed to: a) provide access for maintenance and repair of drainage facilities; b) place, to the extent possible, drainage facilities in common easements and c) minimize negative visual impacts. These easements are a minimum of 20 feet and permanent.

b) The City of Griffin requires publicly dedicated easements prior to accepting maintenance responsibilities for facilities on privately owned property.

c) When proposed improvements benefit the adjoining property easements are obtained without compensation unless the value of the easement exceeds the benefits received.

Policy Area 8: Records Management

a) The City of Griffin has developed, in conjunction with its automated mapping program, an ordered approach for management/organization/maintenance of its storm drainage and flood protection facilities.

Policy Area 9: Inspection

a) The City of Griffin inspects the construction of all new drainage facilities of modifications to existing drainage facilities as necessary to ensure quality control.

Policy Area 10: Enforcement

a) Enforcement of regulations are provided by agencies with regulatory authority. Wherever appropriate the City of Griffin shall work with enforcement agencies to ensure regulatory requirements are met. In particular, the City of Griffin shall work with enforcing agencies to meet the following requirements:

- No deposits of any matter that would in any way restrict or disrupt flow may be deposited in the floodways of any

stream unless the applicable permits have been obtained allowing such deposition of matter.

- No person shall directly or indirectly throw, drain, run, or otherwise discharge into any of the waters, or cause, permit or suffer to be thrown, drainage, run or otherwise discharges into such waters any pollutant, or any substance that shall cause of contribute to the pollution of state waters.

b) A one and one-half percent (1.5%) late charge shall be billed based on the unpaid balance of any storm water utility service charge that becomes delinquent. The stormwater utility service charge may be billed and collected along with other City utility services.

Policy Area 11: Customer/Public Response

a) The City of Griffin operates and maintains a complaint response system in order to assure effective and timely response to all surface and stormwater drainage complaints and shall issue an annual report to the city council as to the number and type of drainage complaints received and the response made to the complaints by the City of Griffin.

b) Customer/ public response is addressed in the City of Griffin's Customer Service Manual Dated July 21, 1998. The manual addresses the procedures to be followed when a call from a customer is of general nature.

Policy Area 12: Public Information Involvement

a) Public relations options is addressed in the City's Stormwater Utility Action Plan dated February 25, 1997 and provides the framework for carrying out the public awareness and education program.

b) The City of Griffin continues to inform the public through specific public awareness campaigns and ongoing "baseline" public information programs and activities. Specific activities include: presentations, information brochures, fact sheets, white papers, news articles, radio shows, informational meetings, testimonials, individual meetings, customer service, and project booklets.

c) The City of Griffin explores opportunities for public involvement in the maintenance of the drainage system and enhancement of water quality in the watershed.

d) The City of Griffin has initiated a complaint response outreach program, which will provide information to customers located in chronic problem areas regarding the history of the problem, actions being taken by the City of Griffin to mitigate the drainage problem and the timing of the corrective action.

Policy Area 13: Research

a) The City of Griffin develops a prioritized list of topics requiring further research and promote such research through Local funds and assisted with State and Federal grants. Topics could include:

- Effectiveness of stormwater management practices and their implementation.
- Development of an ongoing monitoring program to identify baselines and trends of pollutant loadings.
- Rain gauges, flow gauges, and watershed modeling.
- Real time control of stormwater control devices.
- Local involvement of general public for achievement of watershed management.

8.5.2 Financial Policy Statements

Policy Area 1: General

a) All monies collected through stormwater service charges authorized herein are separately identified and accounted for in the City of Griffin's financial records, and all expenses related to stormwater drainage, flood control, and pollution abatement shall be separately identified and accounted for by the City of Griffin.

b) In order to accomplish the purposes, goals and objectives of the City of Griffin storm water program, a stormwater service charge is made by the City of Griffin on all real property within the City included in the Drainage Service Area.

c) The City of Griffin's stormwater service charge is fair and reasonable and bear a substantial relationship to the cost of providing service and facilities.

d) The primary basis for the service charge shall be each property's contribution to runoff.

e) Service charges for all single-family residential property (including duplex living units) shall be uniform.

Policy Area 2: Funding Options

a) Funding for the City of Griffin's stormwater activities includes, but are not limited to:

- Storm Drainage Service Charges
- Bonds
- Special Service Charges
- System Development Charges
- Impact fees
- In-lieu of Construction Fees
- Developer Extension Fees
- State and Federal Funding
- Mitigation Banking

b) The City of Griffin may borrow money and issue negotiable revenue bonds to acquire, construct, maintain, add to, improve, and to perform necessary functions.

c) A detailed description of the above funding strategies is examined and documented in the "Policy Papers" and summarized in the Utility Action Plan dated February 25, 1997.

Policy Area 3: Rate Structure

a) Rate studies are be conducted biannually.

b) Service charges for residential properties of two or fewer dwelling units reflect the relatively uniform effect that residential development has on runoff and stormwater services and shall therefore be billed on the basis of a uniform schedule.

c) There shall be two classifications of property for determination of service charges:

- Class A: One family residential properties.
- Class B: Multi-family (3 families or more) residential property and non-residential property.

d) Rates for each property are computed by multiplying the number of Equivalent Residential Units (ERU – the amount of impervious area on a residential property) times a charge per ERU as follows:

   - The initial charge per ERU shall be $3.50
   - All Class A properties are billed as one ERU
   - All Class B properties are billed a service charge computed by measuring the amount of impervious surface on the property and dividing this figure by 2,200 square feet (the typical amount of impervious surface on a residential parcel). This quotient is then rounded to the next highest whole number and multiplied by the rate per ERU.

e) The City of Griffin is subject to the service charges except as noted in "Service Charge Credit" policies.

f) Single Family Residential properties will be charged based on the size of the house. If the house is less than 1600 square foot, the owner will be charged $2.32 per month. If the house is 1600 square foot or more, the owner will be charged $3.50 per month.

g) Non-single-family properties will be charged by the total number of ERUs found on the property. The Customer Service Representative should be the property owner or tenant shall pay the service charge based on which party pays the water use charge. For multiple occupancy properties, such as shopping centers, the City of Griffin may either allocate the drainage service charges among the occupants of the parcel or may deem that a single billing to the parcel's owners, agents, or associations is appropriate. The billed party is responsible for payment of the drainage service charges.

Policy Area 4: Billing Method

a) The City of Griffin bills and collects stormwater management fees. A utility billing system is utilized. Billing cycles shall coincide with the City's cycles of the City's Utility and shall be included in the billing cycle.

b) The appeal and service charge adjustment process shall be reviewed annually to ensure that recurring problems are identified and that adequate consideration is given to unusual circumstances.

c) Appeals to the service charge shall be submitted to the City of Griffin's Public Works and Utilities Director in writing. The City of Griffin's Public Works and Utilities Director shall provide recommendations to the City Manager for judgment. Subsequent appeal may be made to the City of Griffin Board within 15 days of the City Manager's judgment.

d) Service charges which remain unpaid for longer than 30 days shall be considered delinquent; the City of Griffin may cause to have public sewer, water and drainage services to the property terminated for which payment is delinquent, as well as pursue other legal remedies.

Policy Area 5: Service Charge Credits and Exemptions

a) The City of Griffin may give consideration to specific or unusual service requirements and general benefits accruing to or from properties as a result of providing their own stormwater management facilities.

b) The City of Griffin may reduce the service charge for certain properties is permanent detention facilities, designed, constructed, and maintained in accordance with the City of Griffin rules, regulations and standards, result in a reduction of actual contribution of runoff to the City of Griffin system. Sites with temporary facilities are not eligible for reductions in the service charge.

c) The City of Griffin has an educational credit for the public school system for teaching the "Water Wise" program to the entire student population along with other educational media.

Policy Area 6: Asset Management

a) The City of Griffin has established an overall asset control function within its management structure.

b) The asset manager defines the categories of assets to be monitored within the overall systems.

c) Criteria is established which set the utilization levels and replacement schedules for all assets.

d) Standards is documented for ensuring the security of all assets.

e) The City of Griffin, through its asset manager, prepares a plan for developing a centralized data base containing utilization, location and life cycle information on key assets including equipment, vehicles and facilities.

8.5.3 Level and Extent of Service Policy Statements

Currently under development.

8.5.4 Engineering Policy Statements

Policy Area 1: Planning/Design

a) The technical criteria and capital improvement portions of the Stormwater Master Plan (SWMP) shall promote sound development policies which respect, preserve, and (wherever possible) enhance the City's watercourses.

b) Drainage planning and design shall be based on the principle of not increasing or transferring detrimental drainage effects to other areas and where appropriate, the mitigation of existing problems.

c) The service level of drainage facilities developed during the course of the City of Griffin Drainage program shall be equivalent to the appropriate level of service standard. Level of service will be presented in the Griffin Stormwater Design Manual.

d) When in stream impoundments are constructed, the minimum release rate from such impoundments shall be the 7-day, 10-year low flow rate or adopted state requirement at the time of submittal.

e) Basement or subsurface living area or floor drains (with the exception of shower stall drains) conveying other than sanitary wastes which drain by any means may discharge into any existing storm sewer or onto a concrete splash block upon the surface of the ground.

f) As set forth in wastewater discharge regulations and stormwater illicit discharge ordinance, stormwater shall not be admitted to sanitary sewers designed and intended to be used exclusively as carriers of domestic sewage and suitable industrial wastes.

g) The City of Griffin has established and published criteria for drainage planning and design. Technical criteria for construction, operation and maintenance of drainage systems has also been developed relative to all public and private drainage facilities/requirements. Such criteria is reviewed and revised periodically, but at least every five years, to reflect new knowledge, changing circumstances, and adjustments in overall comprehensive goals and objectives.

h) The City of Griffin has prepared a Comprehensive Plan for Stormwater Management. The Plan will be updated at least every five years and shall address each major policy area addressed in this policy paper. The Plan provides the framework for program emphasis during the periods between plan updates including capital improvement program elements, priorities for detailed basin plan preparation, and identification of research needs. This plan partners with the comprehensive land use plan.

i) Preparation and update of basin wide master drainage plans shall be on a priority basis.

j) Drainage master plans include a full range of preventive and corrective approaches, including the following:

- Preservation of the integrity of existing drainage patterns.
- Prioritization of improvements to the existing drainage system.
- Recommendations for system maintenance.
- Identification of land acquisition for easement or right-of-way for facility requirements along major drainage routes.

k) The City of Griffin will, in cooperation with the City/County, prepare updates to the drainage master plan covering services, repairs, improvements, and maintenance. The plan will include plans for the acquisition, improvement, construction, inspection, development, installation, modification, management, operation, maintenance, repair, replacement, control, demolition, pollution abatement, abandonment, and regulation of:

- Public storm and surface water drainage services, facilities, and systems
- Collection, treatment, disposal or elimination of stormwater
- Control of stormwater drainage
- Storage and use of stormwater drainage

- Mitigation of pollutant through design and treatment systems.
- Storage of stormwater to regulate flows within drainage systems or facilities of receding waters
- Facilities to prevent overflow and flooding of stormwater onto real property
- Elimination or reduction of damage from flooding
- Correction of water conditions that may jeopardize public health, safety, or welfare

l) The City of Griffin has developed a comprehensive capital improvement program that: a) is based on recognized community needs and objectives, b) makes effective use of existing facilities or low-cost capital improvements that result in significant service improvements, c) supports revitalization efforts in older areas of the community, d) ensures essential services are available to an area within the same general time frame, e) provides service to undeveloped pockets of land within urbanized areas, f) considers combinations of structural and non-structural measures, and g) is consistent with the following prioritization criteria establish by the City of Griffin:

- Health and safety
- Property Damage
- Environmental Impact
- Cost Effectiveness
- Solvability
- Geographic Dispersion
- Affected Resources
- Economic Impact
- Long and Short Term Consequences
- Prior/Outstanding Commitments
- Public Awareness

m) Multiple uses of drainage facilities are encouraged provided the use does not adversely impact the functional design of the system.

n) Design of facilities incorporates the following considerations:

- Water Conservation
- Safety
- Disruption of Emergency Services
- High Groundwater Conditions
- Possible Impacts to Sanitary System
- System Security

- Access for Facilities Maintenance
- Mosquito Control

o) Stormwater facilities which require storage of water will be designed in a manner which does not promote conditions conductive to mosquito breeding, rats, pests or other conditions potentially harmful to public health.

p) Treatment methods proposed for control of mosquito breeding associated with any portion of the stormwater system will be reviewed with/approved by the Health Department.

q) Any work proposed within the right-of-way of the Flood Protection system including any improvement, excavation, construction or alteration will be reviewed and approved by the Army Corps of Engineers (that apply to their codes and regulations).

r) Setbacks from lakeshores for new structures will be studied and, if appropriate, shall be established by the City of Griffin.

Policy Area 2: Construction of Public and Private Facilities

a) All construction projects shall have and implement erosion/sedimentation control plans.

b) All construction within a floodplain shall be reviewed and permitted by the City.

c) Based on Section 404 of the Clean Water Act, Army Corps of Engineers Permits shall be obtained for the following activities:

- Dams or dikes in navigable waters of the United States (navigable waters, in its legal sense, may include any water body, including intermittent streams, ponds, and wetlands).
- Other structures or work including excavation, dredging, filing, and/or disposal activities in navigable waters of the United States.
- Activities that alter or modify the course, condition, location, or capacity of a navigable water of the United States.
- Discharge of dredged or fill materials into waters of the United States.

d) Projects requiring U.S. Army Corps of Engineers 404 permits shall also obtain State Stream Buffer Variance Approval.

e) The following practices shall be incorporated into construction of any facilities:

- Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected flows or cause the relocation of waters (unless the primary purpose of the fill is to impound waters).
- Minimize the adverse impacts on the aquatic system associated with the discharge of impounded waters.
- Avoid discharges into wetlands or breeding and nesting areas.
- Place heavy equipment working in wetlands on mats.

f) A comprehensive inventory of stormwater and flood control systems, pocket ponding locations, sink holes, flooding areas, developed areas lacking storm sewer systems, and storm system easements shall be prepared and maintained as a database for future capital projects and problem correction activities.

g) Prioritization of capital improvements from the projects identified in the SWMP will be as described in the current edition of the Capital Improvement Plan. Design and preparation of bid documents, financing, and construction of the projects shall be in accordance with the current edition of the City of Griffin Stormwater Design Manual.

h) Primary and backup systems will be constructed and maintained at the flood protection works. These systems will ensure that redundant capacity and power is available at critical locations and verify that conveyance capacity improvements made in the storm drainage system are matched by necessary capacity at the floodwall. Where funds are not available to provide backup systems, plans for such systems shall be prepared and interim plans incorporated into the emergency response program.

i) A conditional use permit shall be obtained for all excavation and filling operations in accordance with provisions contained in the current edition of the development code for all of the City of Griffin, Georgia.

j) Fill material shall be nonpolluting, inorganic noncombustible materials and soils. Standards for major excavation and filing include:

- o 50 foot setbacks from all property lines
- o Provisions for surface water disposal during and after completion of operation
- o No impacts on groundwater or surface water offsite

Policy Area 3: Water Quality

a) The following materials shall not be discharged or allowed to run, leak, or escape into any public storm sewer, or any appurtenance of waterway connected with any public sewer, except with the full knowledge and written consent of the permit holder and the Public Works and Utilities Director.

- o Greases, oils, and oil sludge from garages, repair shops, machine shops, industrial and other establishments
- o Paints and waste products from paint manufactories
- o Any petroleum product or other product which by reason of its nature or quality may cause a fire or explosion, or in any way be injurious to persons or detrimental to the system
- o Other deleterious materials as described in the City of Griffin Stormwater Ordinance.

b) Discharge of toxic pollutants shall be prohibited.

c) All discharges into a stormwater discharge system must either be covered by an individual NPDES permit or a NPDES permit of a system that directly discharges into a receiving water.

8.5.5 Maintenance and Operations Policy Statements

Policy Area 1: General

a) A detailed program strategy for the day-to-day operational and maintenance elements of the program is developed; the program is reviewed and updated annually.

b) The maintenance program is, wherever possible, be preventive and proactive in nature. As such, clear standards for maintenance service levels is established based on research, staff experience and established system priorities.

c) The property owner or developer shall be responsible for the maintenance of all drainage facilities including inlets, pipes, culverts, channels, ditches, and detention basins located on their land unless modified or dedicated and accepted for public use and responsibility by the subdividers agreement.

d) The City of Griffin operates and maintains the Flood Protection System to at lest the standards and requirements set by the U.S. Army Corps of Engineers and the "Manual of Flood Control Regulations – Maintenance and Operations of Flood Control Works".

e) Where appropriate and legally/financially sound, the City of Griffin assumes maintenance responsibilities for retention/detention facilities on private property to ensure ongoing effective operation of the facilities.

f) The City of Griffin maintenance agreements for pipes, ditches, and retention/detention facilities as well as easements is cross-referenced to the record plat and specify the following:

   - Vegetation should not interfere with facilities operation and vegetation should not be removed in a manner which exposes bare soil, unless there is an approved erosion control plan.
   - No obstructions should be over or within the boundaries of the facility.
   - No modifications to the facility shall occur without the City of Griffin's approval.

g) Common area associated with new developments, which are also used for stormwater management facilities must have clear maintenance plans submitted at the time of approval by the City of Griffin which include a delineation of the method for collecting maintenance costs.

h) Easements are provided for installation, maintenance and repair of stormwater management facilities on subdivisions in accordance with the City of Griffin Ordinance Section 22-128.

i) The City of Griffin monitors the design, operation, maintenance, inspection, construction, and use of all storm sewers, storm drains, and storm water facilities in the stormwater management service area, and has exclusive jurisdiction for the design, construction, inspection, operation

and maintenance of public stormwater facilities in the Stormwater Management Service Area.

j) The City of Griffin has a prioritized plan to inspect, maintain, repair, remove, construct, and operate the stormwater management facilities on all city or county streets, boulevards, alleys, viaducts, sidewalks, curbs, street crossing, grade separation, and other public ways and easements and all drains, ditches, culverts, canals, streams, levees, tunnels, detention/retention ponds and appurtenances thereof within the City of Griffin service area unless otherwise authorized by agreement with the City.

k) Every retention/detention basin is legally defined in either a deed of on a record plat and the entity responsible for maintenance specified.

9.0 Financial

9.1 General

The feasibility of various funding methods, both for basic utility fee and for secondary funding methods are presented within the contents of this master plan. A summary of the various funding methods are presented below:

- Continue to utilize the stormwater utility as a separate cost center, funding from user service charges.
- Utilize bonds only for capital improvements.
- Increase equity through the use of special service charges.

9.2 Stormwater Utility

The Stormwater Utility addresses the issue of stormwater pollutants and their removal or elimination before entering the stormwater system. Furthermore, the Utility provides the opportunity to integrate various technologies to manage stormwater, wastewater, and water using a holistic approach. The utility funding is being used to help fund the repair and maintenance of stormwater structures to help prevent flooding problems caused by rainfall that washes off roofs, parking lots, and other impervious surfaces. Impervious surfaces are those areas within developed land, which prevent or significantly impede the natural infiltration of stormwater into the soil. Common impervious surfaces include roof tops, solid decks, asphalt streets, driveways, patios, parking areas, brick or concrete pavements, swimming pools, and buildings.

All property owners are being charged a stormwater utility fee fairly and proportionately for the demand they put on the system. A utility is the most predictable, equitable, and stable source of revenue. The utility divides the fees equitably among property owners of developed properties so that each owner pays only for the demand they put on the system. The amount of impervious area on all properties for non-single family parcels is derived using aerial topography and field measurements. Aerial photography is used to determine that the median amount of impervious area. Owners of non-single-family-residential are eligible for a credit is they have and maintain a stormwater detention or retention facility on their property in accordance with the City's policies. Information concerning specific

service charges is presented in the Policy Statements section of this plan.

The objectives of the Stormwater Utility is to deliver a higher level of service in stormwater management through:

- Watershed Management
- Stormwater Quality
- Public Education, Public Involvement, and Public Participation

The stormwater user fee is calculated on impervious area only. The equivalent residential unit or equivalent runoff unit is 2,200 square feet. The charge per month is $3.50 per residence or per every 2,200 square feet of impervious area on non-residential properties. The user fee is estimated to generate $1.56 million dollars per year. The ERU break down is as follows: single family residence 6851, multi-family residence 1416, public/institutional 2660, light industrial/airport 1887, heavy industrial 2772, commercial 8872, undeveloped 396, roads 8872 totaling 36,422 ERUs. The current utility billing system (UBS) is used to deliver the stormwater utility fee to the stormwater customers.

9.2.1 Utility Application

The experiences of hundreds of communities over the past twenty years suggests that a fairly consistent process involving at least five phases, occurs from initial investigations and conceptual discussions through implementation of a Stormwater Department, Stormwater Utility and its service (user) charge, and achievement of an effective Stormwater Management Program.

Phase I - Preparatory. Phase I represents the basic idea that a change is needed in the way stormwater is managed and funded. The City of Griffin did not need a lot of investigative research to figure out what the needs of a 150-year old city are: flood control, failed infrastructure, erosion and sediment control and water quality issues with no program or funding source. A series of policy papers were assembled: 1) program mission and priorities, 2) extent, scope and level of service, 3) funding philosophy, 4) program/funding coordination, 5) funding methods, and 6) service charge rate structure.

Phase II – Concept Development. Phase II includes the assembling of information needed to evaluate the basic feasibility of various options followed by the selection of the most appropriate concepts. The City of Griffin, its staff and elected body accepted the fact that stormwater problems were real and solving them was a priority.

Phase III – Detailed Analysis. In Phase III the activities focused on policy and financial analysis required to establish a Stormwater Utility. Griffin's elected officials were committed from the onset, allowing development of a conceptual rate structure as well as a secondary funding method. We were able to develop a detailed cost of service, rate base, and revenue/expenditure analysis for incorporation into the final rate ordinance.

Phase IV – Data and Systems Implementation. Phase IV involves the data and system implementation for the City of Griffin Stormwater Management Plan. Griffin finalized the master account file, capability to bill service charges, receive and process payments and properly account for the utility service.

Phase V – Public Information & Education. Phase V is essential in successful implementation of the Stormwater Utility. Successful implementation of the Utility was the result of educating the public as to the benefits of the overall program. Some of the tools that were used and continue to be used are brochures, films, television presentation, public meetings, public presentations, etc.

9.3 Special Purpose Local Option Sales Tax (SPLOST)

Special Purpose Local Option Sales Tax (SPLOST) was voted on in 1997 and has help fund various capital improvements within the City of Griffin, including North Griffin Detention Pond Project. The sales tax has also provided funding for new computer stations being used for data integration.

9.4 Grants/Loans

9.4.1 Georgia Environmental Facilities Authority (GEFA)

GEFA is a state agency that provides low interest rate loans and grants to cities, counties, and other local government authorities for water, sanitary sewerage and stormwater improvements. GEFA provides these loans through the State Revolve Funds (SRF) program, a self-sustaining loan program, originally capitalized by grants from the Environmental Protection Agency (EPA) through the federal Safe Drinking Water Act and the federal Clean Water Act. The City of Griffin has utilized this funding program for projects such as MacArthur Drive Drainage Improvements, 5th Street and Wall Street Drainage Improvements, Oakdale/Evergreen Drainage Improvements, and Lyndon Avenue Flood Mitigation.

9.4.2 Georgia Emergency Management Agency (GEMA)

Section 404 of the Robert T. Stafford Disaster and Emergency Assistance Act of 1988 established the Hazard Mitigation Grant Program (HMGP). The purpose of the program is to provide funds to State agencies and local governments for projects that reduce or eliminate the long-term risk to human life and property from the effects of natural hazards. Eligible projects may be of any nature that result in protection of life and property. All proposed projects meeting the criteria established by GEMA are considered. Projects that merely identify problems are not eligible. Although hazard mitigation encompasses every aspect of emergency management from preparedness to response to recovery, the intent of the U.S. Congress in creating this program was to fund projects that eliminate the need to prepare, respond, and recover from natural disasters, thereby reducing Federal expenditures on future disaster events. In the City of Griffin, HMGP funds were utilized to assist in funding of the Lyndon Avenue Flood Mitigation Project, a project that sought to reduce flooding of North Expressway thereby increasing access of emergency services (fire/medical) to parts of northern Griffin during heavy rain events. Typical funding consists of a maximum GEMA share for HMGP projects of 75% with the remaining 25% provided by local contributions such as monetary contributions and in-kind services.

9.4.3 319(h) Grant

Section 319(h) of the federal Clean Water Act provides a yearly grant from the Federal Government to the Georgia Environmental Protection Division (EPD) to fund eligible projects that support reductions in nonpoint source pollution. These grants are administered by the EPA. Federal funds for eligible local projects, if available, are 60% of the project cost. The remaining funds (40%) can be either monetary contributions or in-kind services borne by local government. Funding priority is given to:

1. Projects that "encompass or support a watershed management approach and result in measurable improvements in water quality"

2. Proposals for work located in and benefiting watersheds identified in the 305(b) and 303(d) lists of impaired/threatened waters which are partially or not supporting beneficial uses due to nonpoint sources of pollution, and

3. Proposals that "implement Watershed Restoration Action Strategies in areas identified by the State's Unified Watershed Assessment as being 'in need of restoration', or those watersheds that 'do not now meet, or face imminent threats of not meeting, clean water and other natural resource goals'."

Section 319(h) grants may fund a list of specific eligible activities that include education, enforcement, training, demonstration projects, and other activities. Grants may not be used "to fund project proposals resulting in the update and refinement of nonpoint source management programs and assessments". Griffin projects that have been funded by the 319(h) Grant program include the North Griffin Regional Detention Pond and Water Quality Enhancement Project and the Oakview Drive Drainage Improvement Project.

9.4.4 TEA-21 Grant Fund

The Georgia Department of Transportation (GDOT) administers grant funds provided to the State under provisions of the Federal Transportation Equity Act for the 21st Century (TEA-21). Specifically included in this funding source are proposed projects dealing with "environmental mitigation to address water pollution due to highway runoff or reduce vehicle-caused wildlife mortality while maintaining habitat connectivity." According to the GDOT:

> *"All projects must have a direct and substantial linkage to the intermodal transportation system. Projects must also strengthen the cultural, aesthetic, and/or environmental aspects of the intermodal transportation system."*

TEA-21 grants typically fund 80% of the project with the remaining 20% being provided from local sources. Griffin has utilized this funding source to retrofit sections of the drainage system along parts of Taylor Street (Highway 16) with water quality mitigation devices to reduce the loadings of pollutants draining from downtown Griffin.

9.4.5 Stream Mitigation Bank

The City is in the process of evaluating a Stream Mitigation Program to provide high quality stream and wetlands restoration within the jurisdictional limits of the City of Griffin. The City has examined the possibility of joining efforts with private enterprises to provide construction services for extensive restoration of these areas. Through this arrangement, a private enterprise would receive an opportunity to sell credits from a mitigation bank established as a result of their restoration efforts. In return, reconstruction of the streams is provided

to the City at no cost. However, the City would be responsible for ensuring that stream buffers and restoration areas are held in perpetual trust.

9.5 Revenue Bonds

Municipal governments in Georgia are authorized by state legislation and the powers of inherent in home rule authority to use bonding for capital improvements. A municipality may pay for capital improvements through annual budget appropriations or through bond sales, but annual revenues are sometimes insufficient to pay for major capital investments. Bonds are most commonly used to fund major capital improvements and acquisition of costly assets such as land and major equipment.

Two types of bonds are available, revenue bonding and general obligation bonding. General obligation bonding incurs a debt that has first standing with regard to the County's assets and is backed by its "full faith credit". All revenues, including various taxes, may be used to service a general obligation debt. Revenue bonding is not backed by the full faith and credit of the municipality, and thus typically incurs a higher interest rate in the bond market. Revenue bonds require a funding source that the bond market deems adequate and reliable. A legally established Stormwater Utility with a dedicated funding source or sources may elect to market revenue bonds to finance capital improvements.

10.0 Inventory Collection

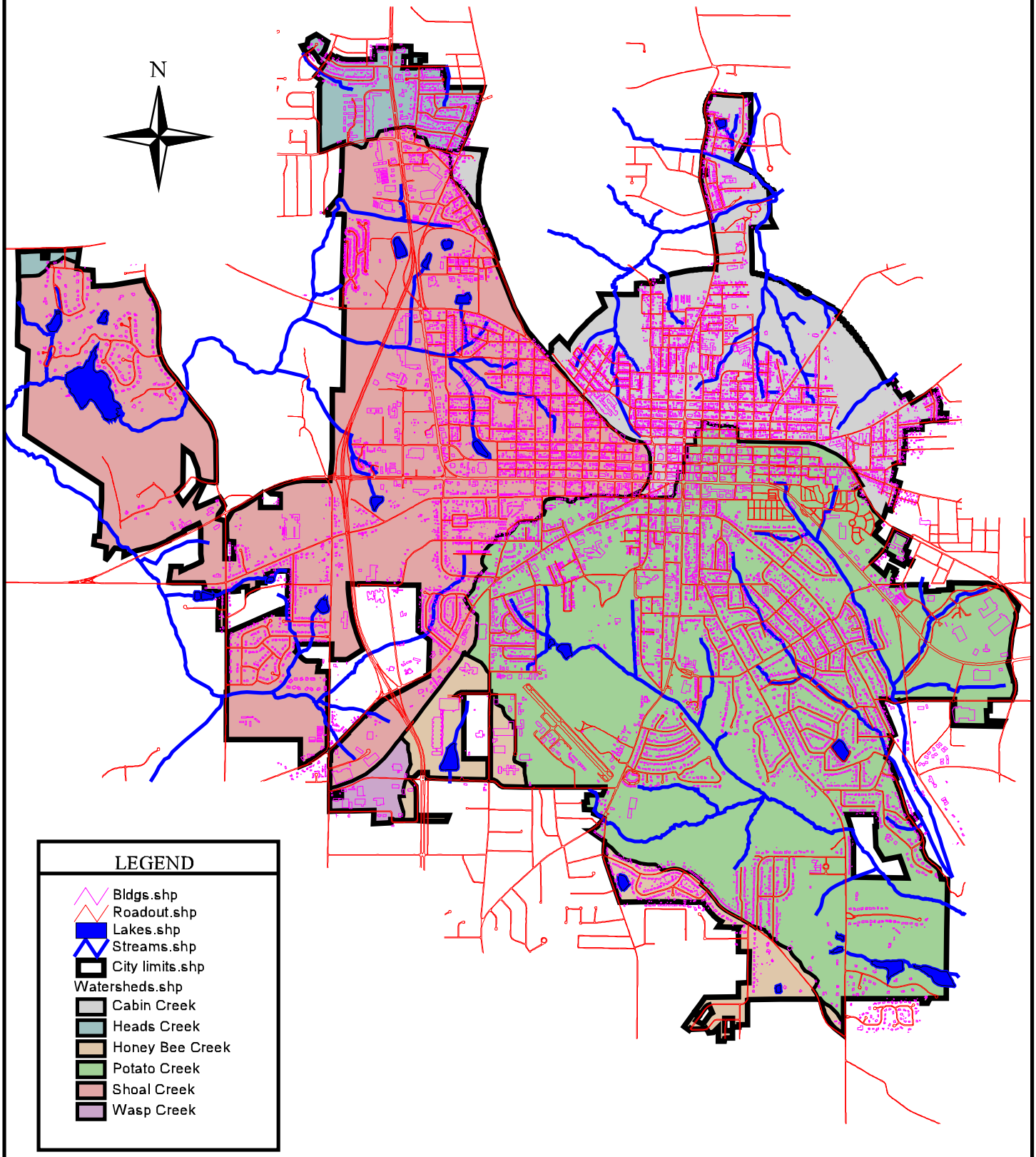
10.1 GIS Mapping

The City of Griffin is the first city in Georgia to develop a Geographic Information System (GIS) database by compiling an inventory of all stormwater drainage structures/features (both natural and manmade attributes) within the City limits. The GIS database contains information concerning the infrastructure system as well as tax parcel information, topographic information, land use information (March 2001), and aerial photography. A current project, which the City of Griffin Stormwater Division has under taken, is the Stormwater Inventory Program. The City has taken a physical inventory of the entire stormwater infrastructure both natural and man-made attributes of the city. This process includes taking measurements on structures such as curb inlets, grate inlets, junction boxes, headwalls and all associated pipes. Measurements include such data as the width of the grates found throughout the city as well as the shape, size and type of piping running between the structures. Following the measurement of the structure, the location of the structures are located based on state plane coordinates to centimeter level accuracy using the Global Positioning System.

The Global Positioning System or GPS is a surveying system in which a radio receiver mounted in a backpack reads signals from a constellation of Department of Defense satellites orbiting the planet every 12 hours and interprets these signals into an exact location on the earth. Finally having obtained attributes and locations on these structures, a digital photo is taken of each structure. Once the fieldwork is complete, the data is then converted into a Geographic Information System database. The Geographic Information System or GIS database is computer system in which information is displayed graphically by location. The City is currently in the process of using the GIS to identify existing problems as follows:

- Predict future problems;
- Evaluate opportunities for enhancement of stormwater use; and
- Develop cost estimates for construction as well as assigning priorities for infrastructure improvement.

The figures following this section present information obtained utilizing the GIS system inventory data.



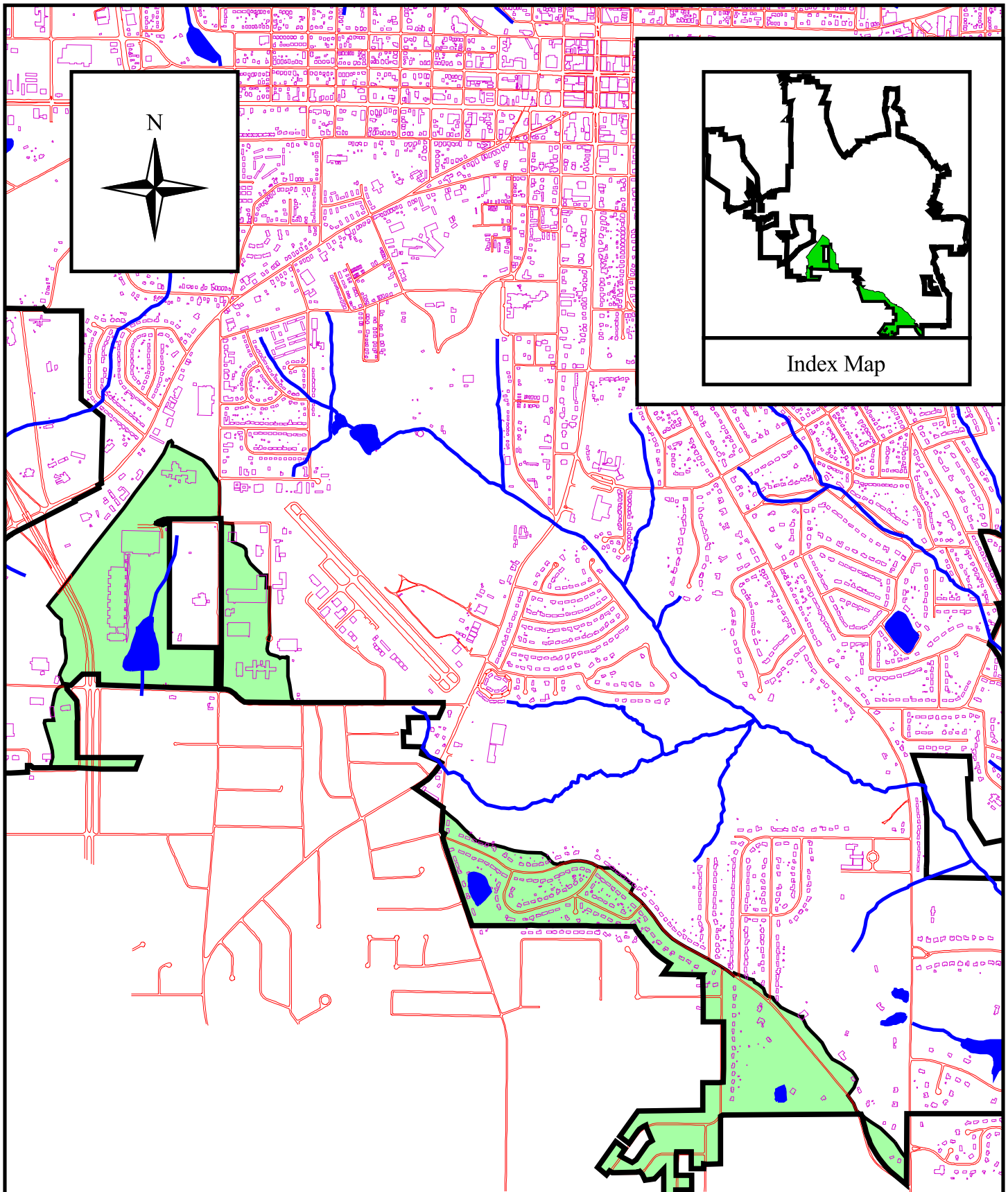
City of Griffin
StormWater Department

Figure 6

City of Griffin

Major Watersheds

Prepared by: Integrated Science & Engineering, Inc.



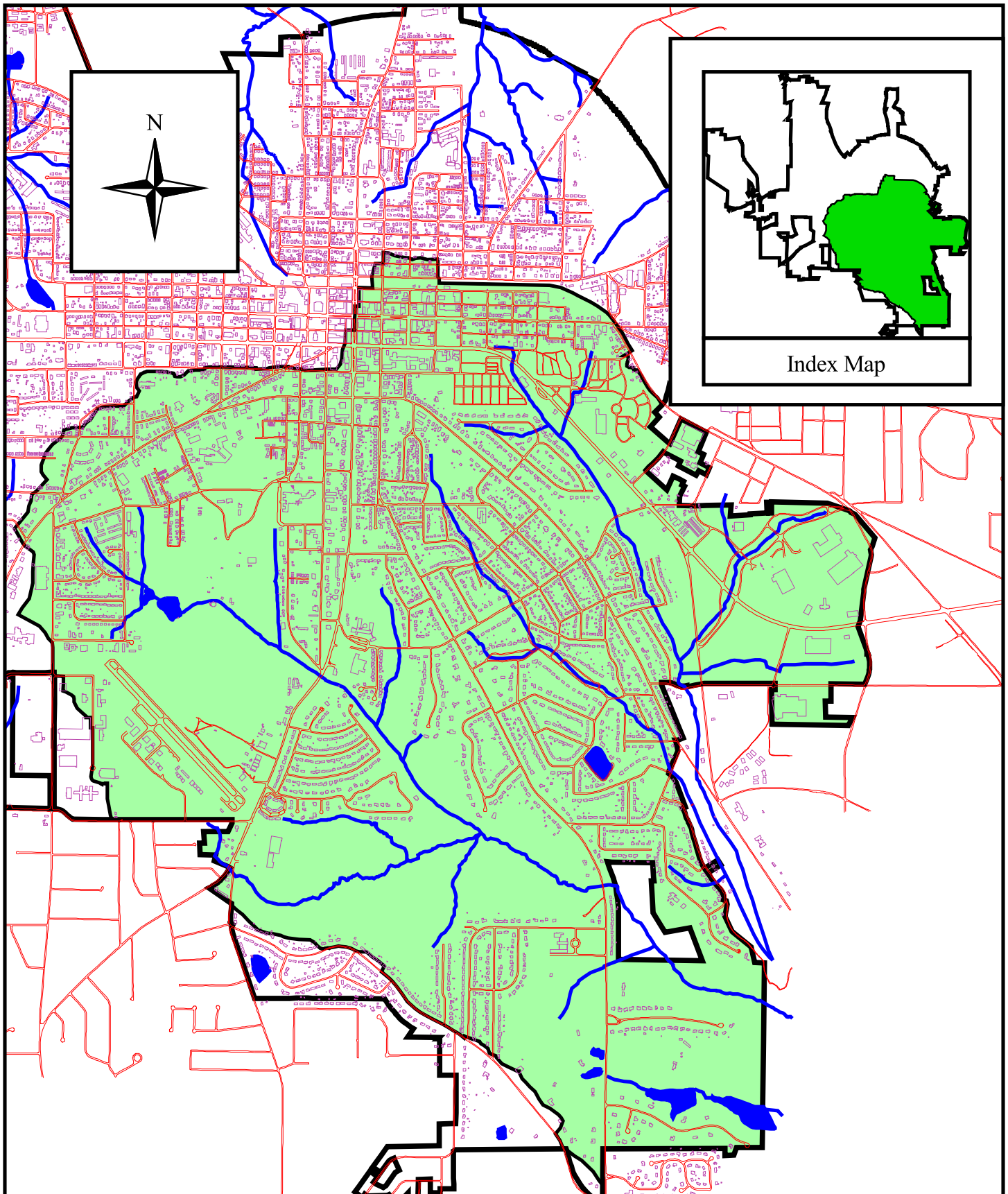
City of Griffin
StormWater Department

Figure 7

City of Griffin

Honey Bee Creek Watershed

Prepared by: Integrated Science & Engineering, Inc.



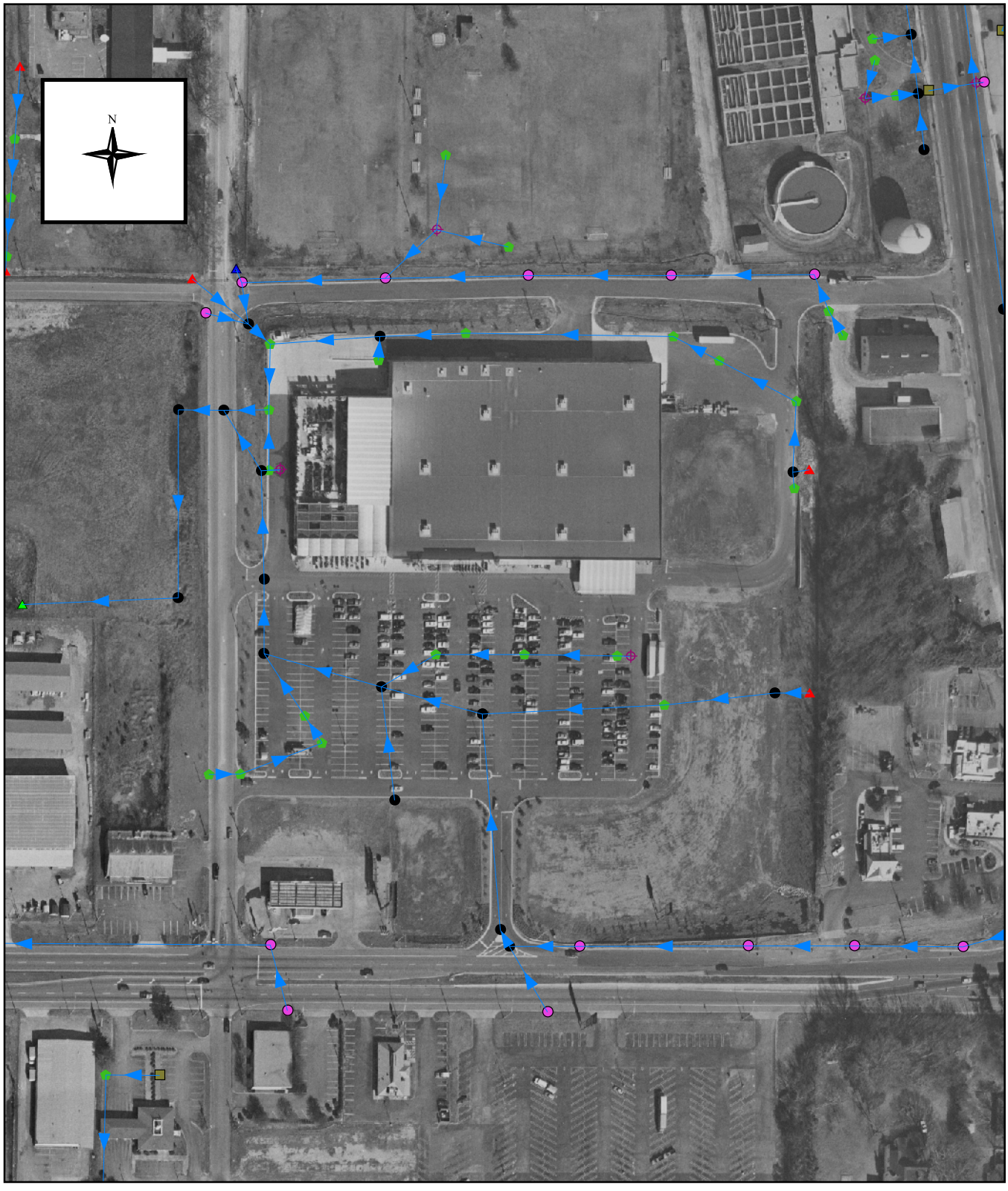
City of Griffin
StormWater Department

Figure 8

City of Griffin

Potato Creek Watershed

Prepared by: Integrated Science & Engineering, Inc.



City of Griffin
StormWater Department

Figure 9
City of Griffin
Stormwater Drainage System
Pipe Network Diagram

Prepared by: Integrated Science & Engineering, Inc.

11.0 Hydraulic & Hydrologic Master Planning

11.1 General

Hydrologic and hydraulic models such as HEC-1 and HEC-RAS are being used to determine flow elevations, velocities, distribution and pressures using flow rates and boundary characteristics as inputs. Hydrologic models are used to determine flow rates at various points throughout a watershed or pipe network given the typical inputs of rainfall, basin characteristics and basin structure. Survey information, such as cross-sectional information and ponding elevations are used to create models using HEC-RAS. Using the information obtained using HEC-1 and HEC-RAS the City is able to delineate basins and calculate times of concentration using curve numbers obtained by using zoning maps. The City is currently developing existing conditions models and future conditions models. Zoning maps will be utilized to determine the future curve numbers of a specific basin.

11.2 Drainage System Evaluation

The stormwater drainage system evaluation consisted of evaluating drainage facilities. Deterioration of drainage facilities will be noted during the evaluation. During heavy rain events, flooding conditions will be observed noting specifically any roadway flooding and structural flooding as well as non-structural flooding. The existing drainage system will be evaluated under existing and future land use scenarios and any problem areas identified (hot spots) for both scenarios. The needed improvements will be prioritized and preliminary cost estimates and benefit levels will be determined. The City of Griffin will be performing hydrologic and hydraulic modeling for each of the six basins within the city limits and 39 sub-basins. Figure 4 depicts the sub-basin boundaries within the City of Griffin.

At the completion of the master planning and watershed assessment activities, the City will have the 100-year floodplain mapped for all creeks in the city limits. The urbanized floodplain limits can then be submitted to the Federal Emergency Management Association (FEMA) for map revisions. As a result, the City of Griffin residents will benefit by having lower Flood Insurance Rates.

12.0 Watershed Assessments

As an integral part of the on-going Stormwater Management Program, and in an effort to prepare for future growth and redevelopment, the City has completed a comprehensive evaluation of all watersheds within its jurisdiction to determine the overall health of the City's streams, and to identify needed improvements to ensure the preservation of this vital resource for future generations. The comprehensive evaluation took place over a two year, four-month time frame, from August 2000 to December 2002.

The total effort included two specific tasks:

1. Water quality and biological quality sampling at 33 sample sites throughout the City with additional data examined from the North Griffin Pond, Oakview Pond, and initial TEA-21 sampling, and;
2. Comprehensive watershed management plans to address identified environmental issues.

The City will continue to monitor the quality and health of its streams as the future brings development and growth to Griffin.

12.1 Areas and Constituents of Concern

12.1.1 Primary

12.1.1.1 Biota Impairment

The biological/habitat monitoring data indicates that streams within the City of Griffin offer poor habitat and exhibit a low diversity of microorganisms. For the most part, the City streams can be classified as having "Very Poor" biotic integrity. The habitat studies indicate that there is sufficient cause for City streams to be currently on the 303(d) list for biota impairment. In addition, there is sufficient cause for City streams not currently on the list to be included due to biota impairment.

Much of the impairment can be attributable to sedimentation. A program of stream-bank restoration that has begun in the City can serve to improve the biotic integrity over time. There is some level of concern over random low measurements of dissolved oxygen throughout the Watersheds. It appears that some of this could be related to the drought occurring during portions of the field sampling

effort. However, it is clear a stream restoration strategy will serve to improve consistent oxygen levels and insulate the watershed from the severe effects of drought. A stream restoration effort will improve habitat and result in a healthier biological environment.

Urbanization increases stormwater runoff rates and stream velocities above that characteristic in pre-developed conditions. The increases accelerate erosion and generate increased sediment loads that contribute to the degradation of aquatic habitat and low oxygen levels in the receiving streams as evidenced by the habitat and biological data generated by the Watershed Assessments. Exposed soils from construction sites also contribute to the high-suspended solids loads that can be generated during heavy rainfall events. The existing condition of streams and associated riparian habitat within the City of Griffin are classified as highly degraded, resulting from streams being channelized and severely entrenched by high velocity runoff. Stream bank undercutting and collapses are common.

The poor biological habitat in the Cabin Creek Watershed may be related to elevated levels of some nutrients and dissolved solids. Nitrites, Total Phosphorus, and Total Kjeldahl Nitrogen were found at problematic levels. Salinity, specific conductivity, and copper were also found at elevated levels. Temperature is also a concern in some areas as the stream temperature was found typically to be comparable to, or greater than the high air temperature recorded for the same day. This condition was found nowhere else in the Griffin Watersheds. The headwaters tributary in the western section of downtown is another area where impairments appear to originate. These issues need to be addressed prior to instituting a program of stream restoration in Cabin Creek.

12.1.1.2 Fecal Coliform

Elevated levels of fecal coliform bacteria were found throughout the Watersheds. The sampling crews found isolated instances of sanitary system leaks near the sampling locations. The City was notified of leaks found during the sampling process. There is no absolute evidence that the elevated fecal levels were due to sanitary leaks. It is therefore prudent for the City to incorporate a bacterial source tracking effort in order to clearly define the source of high fecal levels.

12.1.2 Secondary

12.1.2.1 Elevated Nutrients in City Golf Course Area

Although not measured at critical levels, concentrations of phosphorus and nitrogen in tributaries draining the Golf Course were higher than other locations in the Potato Creek Watershed. The Golf Course Lake and upstream also appeared to be a source of elevated nutrients. The visual clarity of the Lake water indicated that water quality could be improved. Upstream areas draining into the Lake are also problematic with nutrients and suspended sediment. A limnological study of the Lake would be extremely useful in determining specific improvements that could be made in the Lake biology and habitat. Limnology is the study of inland waters, including lakes, streams, springs, puddles, ponds, etc. Limnology includes the study of physical and chemical aspects, as well as biology.

This Lake presents an opportunity for a Georgia EPD 319(h) grant or similar type funding for a BMP implementation. Potentially, a limnological habitat assessment of the Lake and surrounding area could be conducted to determine what water quality improvements could be made. The Lake, visually, appears at first glance to be somewhat sterile biologically. The murky nature of the water was discussed in the Potato Creek Assessment report. The Lake may be an opportunity for a showcase project on water quality improvement in an urban/golf course environment.

12.1.2.2 Elevated Metals in the Downtown Area

The Assessments and the TEA-21 ancillary project indicate that elevated metals are generated in the runoff from the downtown area. The TEA-21 Project has installed BMPs that should help to reduce metals from the runoff coming from the downtown area. This problem will also eventually need to be addressed in downtown runoff to the Cabin Creek Watershed.

12.1.2.3 Low Dissolved Oxygen downstream of Griffin Country Club

There were consistently low levels of dissolved oxygen measured downstream of the Griffin Country Club Lake. This could be due to low-level discharge from the lake through the outlet structures. Potentially, a structural entity could be incorporated into the outlet structure that would entrain oxygen to the discharge flow. There should be additional dissolved oxygen readings obtained along this

portion of Shoal Creek so that the Lake can be definitively identified as the cause of low dissolved oxygen. The City already has the equipment to take these readings so it would be a relatively inexpensive process to isolate the specific low dissolved oxygen problem.

There were also marginally low averages in headwater sub-basins throughout the City. These could be related to the drought conditions during the sampling time frame. A stream restoration program would help to increase average dissolved oxygen in headwater areas by providing shading and other vegetative benefits to the stream corridor.

12.1.2.4 Elevated Zinc in the Oakview Area

The average level of zinc at the sample site was marginally above the State acute level impact criteria. This could be attributable to some of the stormwater originating from large shopping center parking lots. The incorporation of the retrofitted Oakview Detention Pond for processing some of the stormwater draining to the site should have an impact to decreasing the zinc levels in this sub-basin. Additional monitoring will be conducted associated with the 319(h) Oakview Project, so that a determination of the BMP effect on zinc can be assessed.

12.1.2.5 Wet Weather Turbidity in Shoal Creek

Elevated wet weather turbidity levels were measured at two sample locations in the Shoal Creek Watershed. These two sub-basins contain almost all of the limited level of development that is occurring in the Griffin Watersheds. An increased level of construction site permitting and inspection may help to reduce these wet weather results. The stream restoration program will also help to alleviate this condition by reducing stream velocities and therefore the sediment load produced by bed-load and stream bank sediment transport.

In addition, the Potato Creek Wastewater Treatment laboratory can be outfitted to handle suspended sediment analysis. In conjunction with the extensive Turbidity database, correlations can be developed such that stream sediment loading estimates can be quickly made. This will be an essential tool for the City to use in dealing with not only development runoff issues, but to deal with the TMDL regulatory issues as well.

12.2 Current Watershed Management

In addition to the Watershed Assessments the City has completed, there are a variety of Best Management Practices (BMPs) the City has implemented and is implementing in addressing water quantity and quality within its jurisdiction:

- Sewage Collection and Treatment System
- GIS Mapping / Inventory Collection
- Stormwater Design Manual
- Floodplain Mapping
- Stormwater Infrastructure Maintenance
- Stormwater Utility Ordinances
- Stormwater Utility Service Charge Credit
- Development Ordinance
- Tree Preservation Ordinance
- Soil Erosion and Sedimentation Control Ordinance
- New Development Process
- Inspection and Enforcement
- Public Education and Outreach Programs
- Classroom Education
- Web Page
- Flyers and Brochures
- Media Notifications
- Stormwater Newsletter
- Complaint Database
- Road Signage Program
- Erosion and Sediment Control at Construction Sites
- Hazardous Material (HAZMAT)/Recycling Programs

12.3 Recommended Watershed Management

The water quality assessments have yielded additional BMP options that are recommended for implementation in the watersheds. The BMPs are based on enhancing existing conditions conducive to good stream quality and implementing development controls, both structural and non-structural, for controlling pollutant runoff. The focus of the recommended BMPs is to enhance conditions conducive to good stream quality.

12.3.1 Watershed-Wide Stream Restoration Strategy

The Army Corps of Engineers (ACOE) Mobile District office, in partnership with the City of Griffin, has developed a Preliminary Restoration Plan (PRP) for the Shoal Creek Watershed. The PRP is an application for funding under Section 206 of the federal 1996 Water Resources Development Act. If approved, the project could potentially help to fund up to 7 million dollars of stream restoration in the Shoal Creek Watershed, of which approximately 30% would be derived from local participation. The Potato and Cabin Watersheds are also under application to the ACOE for development of a PRP. Shoal Creek has been selected first because it offers the most cost-effective economic impact to areas within the Watershed and is also not currently under additional regulatory control from the Clean Water Act 303(d) impairments listings. Participation by Spalding County is a vital component of this approach as the Corps wishes to extend stream restoration beyond the City boundary to the County boundary for all three Watersheds.

Part of the focus on habitat restoration involves the City's participation in removing sediment from Shoal Creek as it enters the Griffin Country Club Lake.

The problems found in the Cabin Creek Watershed would need to be addressed prior to implementing a stream restoration program. The ACOE would be unwilling to fund stream restoration for an area that had this many identified water quality concerns, all potentially effecting the viable stream biological environment. This will have to be a staged process, with the first constituent addressed identified as fecal coliform. Addressing fecal coliform may also reduce some of the nutrient levels. It is not known at this time how metals and temperature issues can be successfully addressed in Cabin Creek. It will certainly require a consensus from all users of the Cabin Creek water resource before complete pollution mitigation can be successfully implemented.

12.3.2 Elevated Fecal Coliform Bacteria

The incidence of elevated fecal bacteria levels throughout the City is cause for concern.
A sound approach to addressing the problem is to first identify the particular source or sources of elevated fecal levels. Once the source(s) is identified, specific and cost effective measures can be implemented. Identifying the source will allow targeting of BMPs to the activity producing the elevated fecal coliform levels.

Bacterial source tracking, or BST, is an approach now being used in many parts of the country to identify the source or sources of bacterial pollution in a specific waterbody. The City of Griffin is participating, through the McIntosh Trail Regional Development Center, in a 319 Grant Project to develop this technology in the entire Potato Creek Watershed. The Project will be a practical application of the BST technology in conjunction with a fecal coliform TMDL Implementation Plan. Additional participation by Spalding County, Lamar County, Pike County, Upson County, and the City of Thomaston is facilitating matching funding for the Project. A Project partnership with the University of Georgia Crop and Soil Sciences Department, a pioneer in the development of BST, has been formulated to facilitate a practical application of this technology. The practical experience gained from the Project will eventually be used within the City of Griffin to identify Citywide sources of bacterial pollution, and can also be applied to other bacterial pollution issues within the RDC region. The BST program incorporates analysis for e-coli instead of fecal coliform, as e-coli is more indicative of a human sourced bacterial input.

12.3.3 Secondary Concerns

Addressing the secondary environmental problems has been previously described previously in this document. The specific recommended action for each is as follows:

- *Elevated Nutrients in City Golf Course Area*. Clean Water Act 319(h) Grant, limnological study, structural BMP implementation.
- *Elevated Metals in the Downtown Area*. Addressed by TEA-21 Project, in progress.
- *Low Dissolved Oxygen downstream of Griffin Country Club*. Additional investigation through monitoring, Feasibility of air-entraining structure.
- *Elevated Zinc in the Oakview Area*. Addressed by 319(h) Grant, in progress.
- *Wet Weather Turbidity in Shoal Creek*. Upgrade Potato Creek Lab, Enhance Inspection and Construction Monitoring.

12.3.4 New Policies and Regulations

In order to improve water quality and restore habitat in the watersheds, changes should be made to existing city policies and ordinances and/or new ones established to improve regulation of stormwater runoff, stream buffers and sediment controls. Once these ordinances are updated, they must also be enforced through careful plan reviews, regular inspections and penalties, if needed:

- Site-Specific BMP Design
- Floodplain Management/Flood Damage Prevention Ordinance
- New Urbanized Flood Zone Policy
- Ordinance for Post-Development Stormwater Management For New Development and Redevelopment
- Stream and Wetlands Buffer Ordinance
- Illicit Discharge and Illegal Connection Ordinance
- Litter Ordinance
- Other Model Ordinances
- New Development Requirements
- Enhanced Public Education and Outreach Activities

12.4 Long-Term Watershed Monitoring

The purposes of a long-term monitoring program are multifaceted and involve not only identifying water quality impairment/improvement but also monitoring the effectiveness of the management plans and recommended BMPs. The long-term chemical, biological, and hydrological data will provide valuable information on the increasing or decreasing health of the Watersheds. Based on the monitoring data collected, experience gained in implementing the Watershed Management Plans, and other factors, refinements will be made in the future to the Watershed Management Plans.

The recommended monitoring strategy contains the following components:

- Rainfall Measurements
- Stream Flow Monitoring
- Water Quality Monitoring
- Biological Monitoring
- Sediment Monitoring
- Stream Walks

12.5 Roles and Responsibilities

Now that the City watersheds have been assessed and water quality status is known, specific enhancement and protection strategies will be implemented. Several tools and methods have been described above as ways in which water quality within the city's watersheds can be improved and maintained. It is the City of Griffin's responsibility to ensure the preservation and enhancement of water quality within its city limits through this assessment process and smart development and land use decisions. With this responsibility, the City of Griffin has developed City Ordinances to ensure protection of its water resources. Continued amendments and new ordinances are expected as a tool to implement growth strategies, which protect water quality. Through this process, there are several avenues of Public Information and Education, as presented in Section 12.0, to empower citizens through this decision making process. The citizens of the City of Griffin which ultimately decide how and when water resource preservation and enhancement occurs, through public education, the election process, public hearings, and voting.

13.0 Capital Improvement Projects

The City of Griffin is in the process of identifying land, easements, and rights-of-entry for capital improvement and operating needs. The City of Griffin Stormwater Utility has implemented several projects to improve the stormwater issues within the City of Griffin. These completed and future capital improvement projects are described briefly in the following sections.

13.1 Completed Capital Improvement Projects

13.1.1 North Griffin Detention Pond

The City of Griffin completed construction on the first phase of the North Griffin Detention Pond in 1998, which is located within the 180-acre North Griffin Drainage Basin. The pond provides detention for approximately 90% of the upstream basin thus eliminating downstream flooding (particularly within the Waterford Subdivision) while at the same time utilizing a natural wetland system to provide water quality enhancement for approximately 95% of the basin. Flooding conditions prior to construction of the detention pond are shown to the right.

The second phase of this project involved construction of a bioengineering system (spring of 1999) within the pond itself and within the existing forested wetland area downstream of the pond. The bioengineering system phase of the project is detailed in the section entitled "North Griffin Basin Water Quality Enhancement".

Several funding mechanisms have assisted the City of Griffin in the design and construction of this project. Revenues from the SPLOST funded construction; a grant from the Georgia EPD Section 319(h) Grant Program funded the bioengineering phase of the project; and funds from the City of Griffin's Stormwater Utility are being used for detention pond maintenance. A photo of the completed detention pond is shown to the left.

13.1.2 5th and Wall Detention Pond

The objective of this project was to correct an improperly operating stormwater drainage system. The existing piping system was undersized which results in inadequate operation and flooding of areas between Taylor Street, Solomon Street, Fourth Street and Fifth Street. The proposed design called for the rerouting of stormwater beginning at the intersection of 5th Street and Wall Street and continuing east to an existing creek. The proposed design included the installation of a 72-inch aluminized corrugated metal pipe that replaced the existing undersized storm piping system. Additionally, a detention/water quality pond was constructed at the outfall of the pipe to reduce the flooding and non-point source pollution impacts downstream of the project. A photo of the conditions prior to construction is shown above. Shown to the right is a photograph of the completed detention pond.

The Georgia Environmental Facilities Authority (GEFA) State Revolving Fund (SRF) Loan was used to fund the design and construction of this project.

13.1.3 Lyndon Avenue Flood Mitigation Project

The purpose of the Lyndon Avenue Flood Mitigation Project was to alleviate flooding along North Expressway and at the Wal-Mart Shopping Center. The project involved replacement of the two undersized 66-inch pipes by the City under the shopping center property. The project was funding through Hazardous Mitigation Grant Program (HMGP) from the Georgia Emergency Management Association (GEMA) and the Federal Emergency Management Association (FEMA) as well as GEFA and State Revolving Funds (SRF). A photograph of the completed project is shown to the right.

13.1.4 MacArthur Drive Drainage Improvements

The objective of the MacArthur Drive Drainage Improvement Project was to improve the flow of stormwater runoff through a residential area. In the past, stormwater runoff flowed over land through an earthen channel with minimal slope. During moderate to heavy storm events, the channel overflowed causing flooding to the surrounding residential areas. The earthen channel was replaced with a properly sized storm pipe system. The outfall of the new piping discharges in the same location as the earthen channel did in the past. A photograph of the completed project is shown to the right. This project was funded through GEFA SRF.

13.1.5 Carriage Hills Subdivision

The objective of the Carriage Hills Subdivision Project was to improve the existing pavement conditions while also improving the drainage system along Carriage Hills Drive and Carriage Trace. The asphalt throughout the two streets had extensive damage and was in need of significant repairs. Shown to the right is a photograph of the damaged pavement within the subdivision. The cause of the damaged pavement was the result of poor soil conditions and inadequate surface drainage. The drainage problems exacerbated the pavement damage by allowing surface water intrusion into the pavement section and underlying subgrade. This condition resulted in degradation of the underlying fill materials and damage to the surface pavement.

The pavement has been repaired to correct the damaged pavement and correct the drainage problems. Additional inlets were added to help the poor drainage. Additionally, the slope of the roads was increased to compliment the storm design. Shown to the right is a photograph of the completed project.

13.1.6 Oakdale/Evergreen Drainage Improvements

The objective of this design was to improve the flow of stormwater runoff through two residential subdivisions. The existing drainage system is a combination of pipes and open earthen channels. Several of the pipes and channels are undersized and selected drop inlets have not been constructed at the proper elevation. The resulting effect is that the entire drainage system does not function properly and periodic flooding of certain areas is common. The design replaced several areas of undersized pipe networks with a new multi-barrel High Density Polyethlyene (HDPE) system. Additionally, areas of erosion due to high exit velocities associated with the undersized pipe systems were rehabilitated. The design eliminates a majority of the open channel flow except for the portion that connects the two subdivisions, and the

existing channels were replaced with a properly sized piping system. Several raised lid inlets were added at the correct invert elevations in selected locations to improve the overall drainage throughout the area. Some drop inlets and catch basins were replaced with double wing catch basins. Funds secured from GEFA were used for design and construction of this project.

13.1.7 Oakview Drive Drainage Improvements

The Heads Creek Basin within the City of Griffin consists of 178.6 acres of primarily commercial and medium to high-density residential development. The project site is located in the northwest quadrant of the City approximately one-third of a mile northwest of the intersection of State Route 92 and US Highway 19/41. The Oakview Drainage Improvement Project consisted of retrofitting an existing stormwater detention pond that provided detention for 55 acres of commercial and multi-family residential development located within the City of Griffin. The anticipated non-point source pollutants originating within the project site would fall under the category of urban runoff. Land use studies for the project area indicate that the impervious area accounts for approximately 75% of the basin. The detention pond was undersized and did not provide the desired level of flood control for the downstream property owners that are located in both the City and Spalding County. As a result, the City of Griffin and Spalding County jointly undertook the task of re-designing the existing pond and the downstream drainage network to the appropriate engineering standards. At the same time, the City saw an opportunity to incorporate a water quality enhancement component into the re-designed pond that ultimately resulted in a comprehensive design that addresses both flood control and water quality protection. Finally, protection of this watershed is in the best interests of both the City and the County. This is based on the fact that the Heads Creek Reservoir is located approximately three miles west of the project area and provides drinking water for all of Spalding County and the City of Griffin.

13.1.8 Tea-21 Project – BMP Implementation

The TEA-21 project is a stormwater quality improvement study to assess stormwater quality in an urban highway corridor, engineer and emplace stormwater quality improvement technologies (best management practices), and re-assess stormwater quality after those technologies have been implemented into the study area. The project is jointly funded through the City of Griffin Stormwater Utility, and a Georgia State Department of Transportation (DOT) grant. The TEA-21 project location selected was Georgia State Highway 16. The study

area spans from Hill Street to the City of Griffin Library, along the Highway 16 corridor (Taylor Street). The results of this study will allow the DOT to provide the selected technologies as alternative technologies for reducing stormwater pollution in future highway development projects for the State of Georgia. Stormwater quality will be assessed to provide the baseline data for the study. Once that data has been analyzed, the specific pollutants of concern within the study area will be known. At that point, the City of Griffin will select the technologies which best reduce the pollutants of concern for Highway 16. These technologies will be engineered and constructed within the highway stormwater infrastructure. Subsequent rain events will be monitored to demonstrate the reduction of the identified pollutants of concern. This data will be published in a technical report and presented to the DOT. The ultimate goal of the study is the improvement of stormwater quality entering our rivers and streams. The City of Griffin identified a project area along Georgia Highway 16 (Taylor Street) for TEA-21 funding. The project falls under the category of Transportation Aesthetics Project, specifically, Mitigation of Water Pollution Due to Highway Runoff. The purpose of the project is to provide quantitative data regarding the effectiveness of various water quality improvement Best Management Practices (BMPs) for stormwater runoff that originates along highly developed and urbanized highway corridors. Based on empirical evidence collected and analyzed using both traditional and high-tech methods and procedures, the City of Griffin will endeavor to show the effectiveness of the proposed BMPs. Successful implementation of stormwater BMPs should result in improved water quality, reduction in pollutant loadings in downstream receiving waters, improved wildlife habitat, and other associated environmental benefits.

The project is comprised of three phases of work. Phase 1 of the project involved the collection and laboratory analysis of stormwater samples originating along Georgia Highway 16, within the Potato Creek sub-watershed, followed by analysis of the stormwater quality data. The project area lies within the headwaters area of the watershed along the urbanized highway corridor. Phase 2 of the project involved the evaluation of the water quality data compiled in Phase I and implementation of the selected BMPs in an attempt to enhance the quality of stormwater runoff originating within the roadway. Phase 3 is currently underway and involves the evaluation of the effectiveness of the BMPs implemented to establish the potential for future application. Based on the findings, a comparative analysis will be performed and compiled into a report to demonstrate the effectiveness of the various BMPs implemented.

The City incorporated this project into its ongoing Potato Creek Watershed Assessment project. A significant amount of the TEA-21 project data was utilized in the watershed assessment modeling effort resulting in a more cost effective assessment program. More importantly, several of the BMP strategies implemented as part of the TEA-21 project have been incorporated into the Potato Creek Watershed Protection Plan for the headwaters area of the basin. Additionally, the National Sanitation Foundation (NSF) Environmental Testing Verification (ETV) Protocol Program contacted the City of Griffin and Integrated Science & Engineering (ISE) regarding the unique nature of this project. NSF contracted with ISE to expand the TEA-21 testing program to include protocols established by the United States Environmental Protection Agency (USEPA) regarding BMP pollutant removal efficiency. ISE developed a comprehensive test plan, which outlined the rigorous testing protocols that would be followed under the NSF project. The testing program is currently underway and will likely continue for a one- to two-year period. Ultimately, the data compiled as part of this project will be incorporated into the USEPA's national database regarding pollutant removal efficiencies for stormwater BMPs.

13.2 Future Capital Improvement Projects

13.2.1 North Lyndon Basin Improvement

The purpose of this project is to improve the stormwater drainage through the entire 138-acre basin. The drainage basin conveys stormwater via a combination of open earthen channels and a piping network. Most of the existing piping network will be replaced due to its existing poor condition and selected pipes will be upsized to handle the volume of runoff.

13.2.2 Terracedale Drainage System Improvement

The purpose of the Terracedale Project is to provide bank stabilization along the unnamed drainage system that flows parallel to Terracedale Road. Several options have been evaluated to address this issue. These options include bank stabilization and restoration in place. This method would be the most ecologically sound approach, however it would take a significant amount of time to see improvements. The second method involves backfilling the drainage channel. This method would cause the least amount of impact to adjacent properties. The channel would be backfilled with suitable material and the drainage path rerouted to discharge into the natural low area. This approach would reunite the flow to the natural channel identified on

the quad map thus recharging the natural floodplain and wetland systems as well as improving water quality. The last method will involve evaluating the drainage channel to identify the optimum location for installation of a pipe system. The drainage channel would have to be modified for installation of a pipe system.

13.2.3 DOT Box Culvert

This project involves increasing the capacity of the existing double 6-foot by 6-foot concrete box culvert under North Expressway by the adding two additional 6-foot by 6-foot barrels to the system. The existing structure currently conveys runoff from an unnamed tributary to Shoal Creek, a tributary of the Flint River. The primary purpose of enlarging this structure will be to reduce the risk of water encroaching into or over topping the roadway and causing upstream flooding by reducing the headwater elevation of the structure. Currently, no flood plain elevation data has been established by the Federal Emergency Management Agency (FEMA) for the creeks/rivers that lie within the city limits of Griffin, Georgia. It is the understanding of this report that any additional barrels constructed at this site will be standard Georgia Department of Transportation (GDOT) 6-foot by 6-foot concrete box culverts. Additionally, all barrels of this system will be lengthened to accommodate a future roadway-widening project by the GDOT. For the purpose of evaluating the limits of the flood plain, this study examined the stream of interest from US Highways 19/41 to Melrose Avenue in Griffin.

13.2.4 Stream Mitigation Bank

The goal of this project is to improve stream quality and wetland restoration within the boundary limits of the City of Griffin. This project will enhance water quality within the city's watershed and to restore streams and associated riparian corridors from their current degraded condition.

Mitigation has long been a need for many development projects. The need will become even greater with the recent changes in the Department of the Army Corps of Engineers' (ACOE) Nationwide Permits for working within wetlands and streams. To summarize, most impacts to open waters (streams, rivers, etc.) will now require compensatory mitigation in an effort to achieve a no net loss of functions or acreage of streams and wetlands. Furthermore, most impacts that exceed 0.1 acre of any wetland will now require mitigation. Stream mitigation can be especially expensive because of the required ecological and engineering studies and designs, and because of construction costs.

The existing condition of streams and associated riparian corridors within the City of Griffin would be classified as highly degraded. The streams have been channelized and severely entrenched by high velocity runoff. Stream bank undercutting and collapses are common through many reaches reviewed during the past weeks. The implementation of corrective measures for servicing storm water runoff was an impressive step forward in returning water quality and biological functions to surface waters; however, years of erosive flows and man induced alteration of the watershed requires a Phase II step. Phase II would be the physical restoration of the features within the watershed.

The City will be required to hold a conservation easement on all lands involved in the restoration effort, which would prevent future development from impacting the areas that have been rehabilitated. Conservation easements mean a legally binding, recorded instrument, approved by the Department of the Armies Office of Council, that conserves a site While the easements seem restrictive, the City could wisely prepare the easement to allow for future trail systems and other desired projects that have insignificant impacts. Trails provide many passive and active recreational uses, and are much desired by many that enjoy getting out of the car and enjoying a natural setting. The conservation easements could provide a green corridor that provides non-automotive access through the city limits.

13.3 Stormwater Quality Research & Development

13.3.1 Long Term Watershed Monitoring

The purposes of a long-term monitoring program are multifaceted and involve not only identifying water quality impairment/improvement but also monitoring the effectiveness of the management plans and recommended BMPs. The long-term chemical, biological, and hydrological data will provide valuable information on the increasing or decreasing health of the Watersheds. Based on the monitoring data collected, experience gained in implementing the Watershed Management Plans, and other factors, refinements will be made in the future to the Watershed Management Plans.

The recommended monitoring strategy contains the following components:

- Rainfall Measurements
- Stream Flow Monitoring
- Water Quality Monitoring
- Biological Monitoring
- Sediment Monitoring
- Stream Walks

14.0 Stream Mitigation Program

Urban growth and development has adversely affected the water quality, stability and biotic integrity of the streams within the City of Griffin. The implementation of comprehensive watershed protection strategies to address stormwater runoff is an integral part of the City's Stormwater Management Program. The program objective is to improve water quality and biological integrity of the watershed by incorporating structural and non-structural BMPs. The Stream Bank Restoration Program is a structural BMP that includes physical restoration and enhancement of features within the watershed in order to facilitate the water quality improvement process.

The City has expressed an interest in restoring the streams and associated banks /wetlands that have been degraded over the years. Financial alternatives have been evaluated to proceed to the next level. Specifically, the City searched for funding to address impacted flow patterns and biological habitat within streams; to restore and stabilize stream banks and riparian habitats; and to rehabilitate wetland systems to utilize the natural functions (i.e. detention and water quality improvement) of wetlands. The search for funding created the opportunity for a partnership with the Army Corps of Engineers (ACOE), Mobile District to achieve the ultimate goal of restoring degraded streams within the City. The ACOE study authority is under Section 206 of the Water Resources Development Act of 1996 (P.L. 104-303) – Aquatic Ecosystem Restoration.

The existing condition of streams and associated riparian corridors within the City of Griffin would be classified as highly degraded, thus resulting in streams have been channelized and severely entrench by high velocity runoff. Stream bank undercutting and collapses are common through many reaches reviewed. During the phase I stream investigation all streams within the City of Griffin were assessed for inclusion in the mitigation bank. Primary stretches for consideration includes systems on city-owned property; secondary stretches consist of systems located on private property. The initial investigation will generally classify all streams within the City based on the following:

- *Restoration*. Highly degraded, acceptable for full streambed and stream bank restoration.
- *Restoration or Enhancement*. Moderately degraded, acceptable for restoration of stream bank or streambed.

- *Enhancement*. Slightly degraded, acceptable for enhancement of aquatic habitat.
- *Preservation*. Intact streambed or riparian corridor acceptable for permanent preservation.

All stream classifications are located on a map and incorporated into the City's GIS database for mitigation potential. Because not all streams in need of restoration are located on City property, it is likely that some form of public coordination will be required. The goal of restoring streams and riparian corridors is most effective if the full reach of a stream is the focus of restoration, rather that discontinued section separated by degraded reaches.

A total of 84,514 linear feet (16 miles) of streams within the city limits have been visually assessed and preliminarily categorized for enhancement, restoration and preservation. The Watersheds are located south of the Atlanta Metropolitan Area and occurs entirely within Spalding County. Only the uppermost reach of the Watersheds are located within the City of Griffin.
Implementation of corrective measures for addressing stormwater runoff was an impressive step forward in returning water quality and biological functions to surface waters; however, years of erosive flows and man induced alteration of the watershed requires a Phase II step. Phase II would be the physical restoration of the features within the watershed.

Watershed restoration can be an expensive endeavor; an endeavor where many partnerships with state and federal agencies may be developed, though financial support is scarce. While the Phase I solution should move toward abating continued water quality degradation, Phase II is imperative to a timely restoration of water quality and biological function. This restoration could occur through natural processes, though the return of many biological functions would occur over a greatly extended period of time. By physically implementing efforts to restore the systems, and by protecting vegetated buffers, the efforts would serve as a catalyst to return water quality and biological functions to approaching pre-impact levels.

Because the Phase II level does include extensive costs, a public/private joint venture effort was evaluated. The private participation would provide the design, regulatory coordination, and construction of the improvements. By doing so, he would arrange with the regulatory agencies to have a mitigation-banking instrument developed. The banking instrument would provide a certain number of mitigation credits based on the quality and quantity of improvements conducted within the watershed. The private partner

would than be allowed to sell credits to applicants in need of compensatory mitigation for Section 404 permits.

The purposes of the proposed aquatic ecosystem restoration project consists of stormwater detention facilities, a sediment collection basin, stream restoration, and low impact recreation facilities. Stormwater detention facilities will be constructed at selected locations within the Watershed to reduce high stream velocities and peak discharges that are damaging the aquatic ecosystem. A sediment collection basin will be constructed at the upper end of an existing lake that is providing stormwater detention. The proposed plan also includes two levels of stream restoration: (1) high level stream restoration on stream segments that are highly degraded and in need of full streambed restoration and stream bank stabilization; and (2) medium level restoration on stream segments that are moderately degraded and need streambed enhancement and stream bank stabilization. Both levels also include restoration, enhancement or preservation of stream buffers. Where appropriate, low impact recreation facilities will also be provided in the stream buffers. Such recreation facilities would be ancillary to and compatible with the stream restoration measures.

14.1 Stream Restoration Segments

Urban growth and development has adversely affected the biological integrity and water quality of streams within the City of Griffin and in Spalding County. Griffin is 159 years old and covers approximately 15.5 square miles; has approximately 165 miles of roads; three major drainage basins and 202,401 linear feet of stream segments. The Watersheds haves been extensively developed within the City of Griffin, but most of its area outside the City limits would be classified as rural.

Between 1990 and 2000, the City of Griffin and Spalding County experienced population increases of 9.9% and 7.3%, respectively. This reflects significantly slower growth rates than most cities and counties in the Atlanta Metropolitan Area. Nevertheless, both City and County populations are expected to increase more rapidly in the future as the Atlanta Metropolitan Area expands to the south. The increased population will generate more households in the watersheds, with the growth trend indicating that almost half of the future population of Spalding County continuing to reside within Griffin.

The watersheds are highly developed in its headwater region within the City of Griffin. However, outside the City, the watersheds are composed primarily of forest and agricultural land with some low

density housing near the City. Future land use projections are not available for the City, Watershed, or Spalding County. Due to the relatively moderate rate of growth that has been experienced over the last 30 years, it is not believed significant changes in land use patterns will occur in the immediate future in the rural portions of Spalding County. However, within the City of Griffin, additional infilling of existing developed areas should be expected as urbanization continues.

The City of Griffin is required to comply with Clean Water Act, National Pollution Discharge Elimination System Phase II (<100,000 population) Regulations and has been very proactive in addressing stormwater quantity and quality issues. In 1997, the City established a formal Stormwater Management Program including the creation of a Stormwater Department and a Stormwater Utility to fund the new department. The Utility will be instrumental in meeting the requirements of the Phase II permitting process as well as addressing total maximum daily pollutant loads (TMDL) for Watersheds within the City. The deadline for submitting the Phase II permit application is March of 2003. To date, no TMDLs are required for Shoal Creek since it is not on the EPD's 303(d) List.

Urbanization of undeveloped land accelerates stormwater runoff rates and peak discharges that increase velocities above natural levels. The increased discharge peaks and velocities accelerate erosion and generate increased sediment loads that contribute to the degradation of aquatic habitat in the receiving streams as evidenced in the habitat and biological data. Exposed soils from construction sites also contribute to the high suspended solid loads that can be generated during heavy rainfall events. The existing condition of streams and associated riparian habitat within the City of Griffin are classified as highly degraded, resulting from streams being channelized and severely entrenched by high velocity runoff. Stream bank undercutting and collapses are common.

The City of Griffin has been very proactive in addressing stormwater quantity and quality issues by implementing corrective measures to address stormwater runoff to assist in abating water quality degradation problems. However, years of erosive flows and man-induced alterations of the Watershed have caused severe physical damage to the stream channels. Recognizing the stream channel degradation problems created by urbanization, the City is implementing a comprehensive watershed protection strategy to address stormwater runoff as an integral part of their Stormwater Management Program. The objective of the program is to improve biological integrity and water quality of watersheds within Griffin by incorporating both structural and non-structural Best Management

Practices (BMPs). Griffin's Stream Bank Restoration Program is a structural BMP that includes physical restoration and enhancement of features within the City's watersheds. The Stream Bank Restoration Program uses a phased approach. Phase I includes stream investigations and characterizations. The assessment resulted in the streambeds, stream banks and buffer zones being generally classified with the following restoration needs.

Phase I investigations have been completed for the City's watersheds, with all its tributaries (i.e. streambeds, stream banks and buffers) being visually assessed and categorized. Stream classifications have been mapped and incorporated into the City's GIS database. That information was used to define the high and medium restoration categories used in this PRP. Stream segments that were classified as needing streambed restoration were placed in the high restoration category and segments needing streambed enhancement were placed in the medium restoration category. None of the streambed segments were classified for preservation so there is no low level restoration category. The information collected by the City was used to project the restoration needs for the County's portion of the proposed project since detailed site-specific information is not available for the Watershed.

Based on the Watershed Assessment work conducted in Phase I described above, the City is preparing to initiate Phase II work that will be directed toward the physical restoration of features within the watersheds. The physical restoration of habitat conditions is imperative to a timely restoration of biological function and water quality within the City's watersheds and its affected tributaries. The restoration efforts, to include the protection of vegetated buffers, should help return biological function and water quality to levels that existed prior to the intense urbanization and development of the City. The City of Griffin is interested in developing a project under the Corps' Section 206 Aquatic Ecosystem Restoration Authority to accomplish a portion of their Phase II restoration work within the City's watersheds.

For the purposes of the proposed restoration project would provide medium level restoration to 7,500 feet and high level restoration to 2,000 feet of the most degraded stream segments within the watersheds. These improvements would be in addition to the four detention basins, the sediment basin, and four existing ponds that would be retrofitted at selected locations within the headwater tributaries in the Watershed. It is believed the modified hydrological conditions and reduced suspended solids loads that will be created within the stream segments downstream of the proposed detention

basins and retrofitted ponds will contribute to the long-term improvement and recovery of most of those stream segments that will not receive habitat restoration work.

If stream restoration is not taken to reduce stream velocities, repair eroding banks, and enhance stream vegetation buffers, the aquatic ecosystem will likely continue to degrade. The North Griffin Stormwater Pond is an example of an existing project that is already contributing to an improvement in downstream habitat and water quality. Construction of the proposed stormwater detention facility at Lyndon Avenue and other detention facilities will continue that trend. However, full recovery of the ecosystem is not possible without the proposed ecosystem restoration project.

The proposed aquatic habitat restoration project is consistent with the City of Griffin's Stormwater Master Plan Program and Stream Bank Restoration Program that is under development. The environmental improvements would result in an improved quality of life for City and County residents.

For the purposes of this project, the following alternative measures were considered.

No Action. Under the "no action" alternative, the existing conditions would remain unaltered, resulting in a continuation of the increased discharge peaks and velocities that accelerate erosion and generate increased sediment loads. That would continue the degradation of aquatic habitat and biological resources. The habitat degradation trend would be expected to continue in the future if no direct action is taken to correct the problems.

Construct Additional Stormwater Detention Facilities. Detention facilities for stormwater runoff could be constructed at strategic locations within the watersheds. Such facilities could be sited to control runoff rates and reduce suspended solids and other non-point source pollutants. These facilities would contribute to the overall improvement in the aquatic habitat as well as diminishing the downstream delivery of sediments and other pollutants. The City of Griffin has already constructed a stormwater detention facility (i.e. North Griffin Stormwater Pond). A limited field inspection of the Watershed identified other suitable locations for stormwater detention facilities at Lyndon Avenue, Pine Hill Road, and downstream of Oakdale Drive. These and other locations will be evaluated in the ERR phase of study.

Streambed/Stream Bank Restoration. Sediments from the degradation of streambeds and the erosion of stream banks are being moved downstream and impacting aquatic habitat. The channel instability is the result of high velocities and peak discharges created by accelerated stormwater runoff rates. Engineering measures would be used to provide a more stable channel cross-section in adversely affected channel reaches. Measures such as gabions, riprap, and grade control structures would be used to keep the affected channel reaches from further widening and deepening. These measures would reduce in-stream channel degradation of habitat, assist in the restoration of alternating pool/riffle conditions, and reduce the downstream transport of sediments. Varying levels of restoration would be implemented at appropriate locations within the Watershed based upon the level of degradation occurring within a particular stream reach.

Increased Enforcement of Stormwater Management Ordinances, Regulations Governing Development, and Application of Best Management Practices. The City of Griffin and Spalding County have requirements for onsite detention and the control of offsite peak discharges to pre-development levels. This alternative would explore needs and opportunities to strengthen the existing situation. Such improvements could further improve the quality of stormwater runoff and reduce the timing of discharges from developed sites to more resemble natural runoff rates. While these measures could certainly improve future conditions within the watersheds, they would not correct the existing aquatic habitat degradation problems caused by past actions.

Create Artificial Wetlands. Artificial or constructed wetlands could be created to assist in filtering suspended solids and other non-point source pollutants from stormwater runoff. Artificial wetlands could help to slow the velocity of runoff and encourage the deposition of sediments at desired locations. The wetlands plants would also assist in the removal of nutrients and other contaminants from the water column.

Vegetative Stream Bank Buffers. The existing state law requires a 25-foot buffer along streams in Georgia. The width of this minimum buffer requirement could be increased along the mainstem of City Creeks and its major tributaries to improve the ability of riparian areas to filter the overland contribution of sediments and non-point source pollutants from stormwater runoff. The buffers would also provide additional protection from stream bank erosion as well as help to moderate stream temperature and providing wildlife habitat. This could be accomplished through implementing additional development restrictions for the 100-year floodplain by acquiring restrictive

easements or by the public purchase of floodplain lands. The City of Griffin and Spalding County currently require a 25-foot buffer between development and the streams but the City is considering going to a variable buffer that would offer increased protection.

Construct Passive Recreation Facilities. Low-impact recreation facilities such as walking/jogging paths, nature trails, etc. could be included in the vegetative stream bank buffer strips. This type of development has proven to be desirable in other urbanized locations and to be compatible with stream restoration. Incidental recreational benefits would result from this measure.

Combination of Measures. A number of alternatives could be developed by combining several of the above and other measures to form diverse plans. It is very likely that the eventual plan recommended in the ERR will be a combination of the above and other measures. For example, the proposed project combines stormwater detention, streambed and stream bank restoration, and passive recreation.

An Environmental Assessment and Section 404(b)(1) Evaluation will be prepared during project development phase. Coordination with the EPA and the Georgia Environmental Protection Division will also be maintained to assure that all water quality issues are appropriately considered. If required, water quality certification will also be obtained from the Georgia Environmental Protection Division prior to project implementation in compliance with the Clean Water Act. The FWS will be consulted in accordance with the Fish and Wildlife Coordination Act and the Endangered Species Act to avoid any adverse impacts to any threatened and/or endangered species that may occur within the study area and to identify potential measures that could be incorporated into the recommended project to promote their recovery if any are present. The Georgia State Historic Preservation Officer will also be coordinated with to satisfy appropriate statutory requirements. Lastly, all other permits and environmental compliance clearances will be obtained prior to project implementation.

15.0 Public Information & Education

The continuing degradation of water bodies in urban and urbanizing watersheds remains one of the most serious environmental issues facing Georgia today. The non-point source pollutant loading of these streams, rivers, and lakes has not only affected the water quality, but has also adversely affected the quality of life of the citizens of Georgia. By not viewing these streams, rivers, and lakes as a resource to be protected, we have forfeited numerous economic and recreational benefits that could have otherwise been enjoyed.

The City of Griffin initiated an aggressive and proactive approach to water quality preservation and restoration within its city limits. The first step in this initiation was the assessment of water quality within the city limits of Griffin. Now that the first step is completed, water quality issues can be addressed through best management practices, public education, and land use planning and development strategies to ensure the future enhancement, and preservation of our water resources.

This Stormwater Master Plan is the cornerstone of efforts to protect and restore water quality in the City of Griffin. It encompasses all the tools necessary to accomplish this objective. The processes within, will involve all aspects of the community. It is the community of Griffin, which will benefit from improving urban stream environments and water quality. There are eight groups who should be aware of the problems of water quality impairment, and what they can do to contribute to the solution. The eight groups are as follows:

- General Public
- Environmental Interest Organizations
- Civic Associations
- Business Associations
- Educators
- City Government
- County Government
- State Government

In order to ensure a broad audience is reached during this process, several avenues of communication will be used. Sources of information on the process of managing the City of Griffin's stormwater include:

- *Classroom Education*. Local educators will present various information topics at city schools classrooms and colleges (i.e. Water Wise).
- *City of Griffin Stormwater Web Page*. The web page presents a forum for information and community feedback directly to the City Stormwater Department at www.griffinstorm.com.
- *Flyers*. Utility bills and mail-outs will incorporate information flyers with information on pollution prevention, current city projects and information on citizens' responsibilities and efforts they can take to improve water quality.
- *Stormwater Newsletter*. This locally produced information letter will present information and updates on stormwater utility management projects and ongoing system upgrade and maintenance efforts.
- *Brochures*. Through the chamber of commerce and local city government offices, project profiles and updates will be available.
- *Stormwater Resident Surveys*. Utility bills and civic actions (automobile registration, utility hook-up, etc.) will present opportunities for citizen feedback through surveys.
- *Complaint Database*. Maintained by the City of Griffin Stormwater Department, a "drainage complaint hotline" may be used to help identify complaint areas and quickly address infrastructure issues.
- *Stenciling Programs*. Illicit Discharge Program
- *Road Signage at Named Tributary Crossings*. At tributary crossing locations, water protection and project information will be communicated.
- *Hazardous Material (HAZMAT) Recycling Programs*. Griffin's comprehensive HAZMAT recycling programs will present opportunities for program results to be displayed and new program information to be presented.
- *Georgia Adopt-A-Stream Program*. This established and effective State program has been implemented within the City and will continue to be a curtail water quality preservation program supported by Griffin.
- *Local Media Notifications*. Local newspaper, radio, and television stations will be forums for the presentation of program status and results.

It is vitally important to keep political leaders, stakeholders and the general public abreast of the concept and development of the stormwater utility and specific decisions that are made. There are eight groups who should be aware of the problems of water quality impairment, and what they can do to contribute to the solution. The groups are as follows:

- General Public
- Environmental Interest Organizations
- Civic Associations
- Business Associations
- Educators
- City Government
- County Government
- State Government

In order to ensure a broad audience is reached during this process, several avenues of communication will be used by the City. The local media, city forums, and educational institutes will be a source of information during this assessment. Questions and information can be exchanged through the City Government.

16.0 Operations & Maintenance Program

16.1 General

As a result of an extensive stormwater system condition assessment, the City has determined that a remedial maintenance program is necessary in order to restore the system to its original capacity. The growth of the maintenance operation is managed and controlled based on a priority list. The operation and maintenance program is responsible for keeping the stormwater system functional. City maintenance crews clean catch basins and inlets, clear and open ditches, clear debris, and repair stormwater infrastructure (culverts, pipes, etc.). We distinguish two types of maintenance: routine and remedial. Routine maintenance involves cleaning and clearing the existing system. Remedial maintenance involves repairing the existing system to its normally constructed condition.

The current maintenance program in Griffin spends about 50% of its efforts responding to citizen complaints and 50% of its efforts in performing routine maintenance chores not triggered by complaints. The complaints are funneled to the Stormwater Department office where they are logged in and given to one of the staff for investigation.

The maintenance staff is dedicated to 50% drainage work. The crew consists of two drivers, two heavy equipment operators, and two part-time laborers. An additional labor crew works about 10 to 15% in cleaning of catch basins and ditches. Maintenance Operations are described in the Policy Statements Manual.

The City has developed and implemented a plan to clean the storm drain lines using a JetVac truck purchased in 1999. The City is in the process of constructing new vehicle wash racks at City facilities that will minimize contact with stormwater.

16.2 Inspection

The City has developed a program of periodic routine inspection and maintenance of the stormwater system.

17.0 Related Data

17.1 Results Data

Over a period of five years, Griffin will add two five-man work crews, add an environmental science team to the staff, and establish a capital construction program. In addition to the items listed above, the City has contracted an engineering consultant to inventory the City's stormwater drainage network into a GIS database using state-of-the-art GPS equipment. The consultant will utilize the GIS database for its overall master planning effort.

17.2 Keys to Success

Developing and successfully implementing a Stormwater Utility is unique to each community because "each and every community is different". The City of Griffin's approach is summarized below:

- Griffin solicited support of important officials early in the process and discussed the City's needs, the overall approach as well as the expected results.

- We retained a consultant with a proven record of accomplishment in Stormwater utilities and management.

- The City developed a truthful and direct approach with the general public and key stakeholders.

- Griffin sold the utility as one key part of overall Stormwater management program, but not the 100% solution to all Stormwater related problems and issues.

- Griffin developed a viable program and a solid sales strategy then we followed the prescription through the tough times and good.

- The elected officials put one person in charge of all aspects of the work and became the focal point and major cheerleader for the Utility's development and eventual success (Ogden, 1997).

18.0 Conclusion

The City of Griffin is no different than any other community, or business, by trying to do more with less, down sizing in-house staff, out-sourcing certain tasks while at the same time trying to provide the essential services to the citizens. The City of Griffin feels that the "user charge system" concept is the most dependable and equitable approach available to local governments for financing Stormwater management. The term Stormwater management provides euphoniums for a broad range of related topics such as erosion control, flood plain management, wetlands mitigation, detention/retention, and drainage facility design.

The City of Griffin's successful implementation of the Utility has proven that a community can take a proactive approach to overall watershed management. Implementation of a Stormwater Utility (as a non-structural BMP) can provide a community the financial mechanism, to fund the design and construction of structural BMPs, to address both water quantity control and water quality issues. Design and implementation of effective BMPs can result in the following:

- Decreased flooding;
- Improved water quality;
- Improved habitat for wildlife;
- Land preservation due to erosion control measure;
- Reduction of pollutant loadings in downstream receiving waters;
- Reduction in water treatment costs; and
- Protection of wetlands and other jurisdictional areas.

The Georgia EPD and USEPA have stressed the importance of individual communities becoming stakeholders to protect our regions' water resources. As additional communities develop and implement effective BMPs, the entire region will realize the benefits. The City of Griffin feels that successful implementation of a Stormwater utility can be the first step towards better overall management of our regions' watersheds.

18.1 Goals

The purpose of this section is to provide an integrated approach for addressing stormwater quality and quantity management goals at the site development level. Integrated stormwater management site design involves the integration of site design practices and procedures with

the design and layout of stormwater infrastructure to attain stormwater quantity and quality management goals.

18.1.1 Water Quality

Stormwater ordinances and regulations are used by the local government to control and manage urban stormwater systems. It also is also used for floodplain management, onsite detention and retention, erosion and sediment control, development regulation, and water quality control and enhancement (Debo, 1995). The EPA requires municipalities to comply with water quality regulations related to the Clean Water Act. Another factor includes the Erosion and Sedimentation Act of 1975, which required each county and municipality in Georgia to adopt a comprehensive erosion and sedimentation ordinance pertaining to land disturbance activities. Because of these activities, numerous municipalities have adopted ordinances, regulations, and policies related to stormwater management.

18.1.2 Infrastructure System Specifications

The stormwater infrastructure for a site should be designed to integrate drainage and water quality control, water quality protection, and downstream channel protection (ARC, 2000). The efficiency of the inlet depends on the pipe material (Debo, 1995). The City of Griffin requires using reinforced concrete pipe (RCP) or high-density polyethylene (HDPE) pipe for stormwater system piping. All storm structures shall comply with the State and Griffin Stormwater Design Manual Standards in order to provide builders and developers consistency and continuity across the state.

18.1.3 Land Disturbance Activities

All land disturbance activities do not fall under the intent of the suggested performance goals. The following activities are suggested as potential exemptions for the performance goals:

- Additions or modifications to existing single-family structures
- Developments that do not disturb more than 5,000 square feet of land
- An individual single house (Single family houses that are part of a subdivision or phased development project should not be exempt from the recommended requirements)

Development in critical or sensitive areas may be subject to additional performance requirements, or may need to utilize or restrict certain structural controls in order to protect a special resource or address certain water quality or structural problems identified for a drainage area.

18.1.3.1 Performance Goal #1

Site designs should strive to preserve and utilize natural drainage systems and reduce the generation of additional stormwater runoff to the maximum extent practicable.

- Encourage use of better site design practices and techniques to reduce impervious areas, hydrologically disconnect impervious areas so that they drain to vegetated areas, utilize natural site features for stormwater management, and incorporate onsite bioretention areas through landscaping practices.

- Prevent unnecessary stripping of vegetation and loss of soils, especially adjacent to lakes, streams, watercourses, and wetlands.

- Where feasible, conserve forested and undisturbed vegetated areas, and establish and maintain riparian buffers.

18.1.3.2 Performance Goal #2

Stormwater runoff generated from new development should be adequately treated and controlled prior to discharge into a jurisdictional wetland or waters of the state.

For all new development sites, stormwater management systems (which can include both structural stormwater controls and better site design practices) should be designed to remove 80% of the average post-development total suspended solids (TSS). Acceptable structural controls should be limited to those practices that have a demonstrated ability to meet this performance criterion. It is presumed that a structural control complies with this performance standard if it is:

- Sized to capture the prescribed water quality treatment volume, which is defined as the volume resulting from the first 1.2 inches of runoff from a site;

- Designed to meet the design requirements presented in this plan;

- Constructed properly; and

- Inspected and maintained on a regular basis.

18.1.3.3 Performance Goal #3

Local communities should require, as necessary, additional or site-specific management measures to control and treat stormwater runoff from certain types of development and areas draining to sensitive receiving waters.

- Redevelopment, defined as any construction, alteration or improvement exceeding 5,000 square feet in areas where existing land use is high density commercial, industrial, institutional, or multi-family residential, should be governed by special stormwater sizing criteria depending on the amount of increase or decrease in impervious area created by the redevelopment.

- Where onsite stormwater management facilities are not practical, fee in-lieu of treatment may be required.

- Stormwater discharges from land uses or activities with higher potential pollutant loadings, defined as hotspots (ex. gas stations, convenience stores, auto-recycling areas, etc.), may require the use of specific structural controls and pollution prevention practices. In addition, stormwater from a hotspot land use should not be infiltrated without effective pretreatment. For example, hotspots might be required to prepare and implement stormwater pollution prevention plans that minimize pollutant generation and contact of rainfall with pollutants.

- Stormwater discharges to critical areas with sensitive resources (i.e., cold water fisheries, shellfish beds, swimming beaches, recharge areas, water supply sources, river corridors) may be subject to additional performance criteria, or may need to utilize or restrict certain structural controls. For example, if phosphorus loading is a receiving water concern, specific phosphorus load reduction mandates may be warranted.

Adequately treated means that the designated water quality volume has been treated through one or more of the approved stormwater controls and/or site practices that are detailed in this plan. The 80% removal goal is a management measure developed by the Environmental Protection Agency (EPA). It was selected by EPA for the following factors:

- Removal of 80% is assumed to control heavy metals, phosphorus, and other pollutants
- Data show that certain structural controls, when properly designed and maintained, can meet the 80% removal performance level.

18.1.3.4 Performance Goal #4

Stream channel protection should be provided by adopting three general approaches:

- Upland sources control and detention

- Bank protection measures such as energy dissipation and velocity control; and

- Riparian corridor preservation and conservation.

This goal may not be necessary for sites draining to large water bodies such as lakes, marshes, or major rivers.

- Provide extended detention storage for the 1-year frequency storm event.

- Establish well-forested and undisturbed vegetated riparian buffers. It is recommended that 100-foot vegetated buffers be established, where feasible.

- Energy dissipation should be provided at all stormwater outfalls to ensure discharges exit at non-erosive velocities.

18.1.3.5 Performance Goal #5

Over bank flood protection should be provided for by all sites discharging water to a stream or river.

- Provide control of the post-development peak discharge rate to predevelopment rate for 25-year return frequency storm event.

18.1.3.6 Performance Goal #6

All habitable structures and major transportation arteries (roads, railroads, etc.) should be protected from flooding to at least the 100-year flood level for the expected life of the structure from all flooding sources, major and minor.

- The increase in runoff volumes and peaks should be minimized and kept to predevelopment levels as possible.

- The full *build-out* floodplain should be established and development restricted in these areas. Already existing flood susceptible development should be acquired or protected from flood damage.

- Citizens should be informed and warned about the flooding potential of property prior to purchase and development.

18.1.3.7 Performance Goal #7

Local communities should require effective short and long-term maintenance of all of the drainage system and structural stormwater controls.

- All structural controls and stormwater facilities should have an enforceable operation and maintenance agreement to ensure the system functions as designed.

- The condition of the drainage system should be known and maintenance decisions should be proactively made on the basis of inspections rather than solely on the basis of complaints of flooding, erosion, or pollution.

18.1.3.8 Performance Goal #8

Regional stormwater management facilities should be evaluated as an alternative for onsite water quantity and water quality controls. Regional stormwater management refers to facilities designed to manage runoff from multiple projects and/or properties through a local jurisdiction-sponsored program, where the individual properties assist in the financing of the facility, and the requirement for onsite controls is either eliminated or reduced.

- Master plans and hydraulic and hydrologic models, sufficient to provide regional information, can be used to evaluate regional stormwater facilities.

- Institutional mechanisms supporting the regional concept should be evaluated.

18.1.3.9 Performance Goal #9

To the maximum extent practicable, development projects should strive to implement non-structural pollutant prevention practices such as material use, exposure, disposal, and recycling controls, spill prevention and cleanup, illegal dumping controls, illicit connection controls, and conservation and preservation measures.

- Require a pollution prevention plan, detailing the use of specific pollution prevention practices, for all development as part of the overall stormwater management concept plan for a site.

- Develop and enforce local ordinances or regulations as necessary to support non-structural pollution prevention practices and land use controls.

- Provide opportunities and institute public education programs to inform citizens and commercials and industrial landowners about relevant pollution prevention practices.

18.2 Related Benefits

The City of Griffin used the momentum gained through the successful implementation of the Utility to secure additional funds to address Stormwater related issues. Specifically, the City of Griffin secured: $750,000.00 Hazard Mitigation Grant from the Georgia Emergency Management Agency (GEMA) to address flooding along a major urban roadway in a commercial and retail area of the City; $1.0 million from Spalding County's Special Purpose Local Option Sales Tax (SPLOST) Program to construct a regional stormwater detention facility in North Griffin, $358,000.00 Section 319 (h) Non-point Source Implementation Grant from the Georgia EPD and USEPA; $2.6 million State Revolving Fund (SRF) Loan from the Georgia Environmental Facilities Authority (GEFA) for non-point source projects and equipment and TEA-21 for $40,000. The loan was the first granted in the State of Georgia specifically to address non-point source issues; The City plans on going to the revenue bond market in 2001, backed by Stormwater Utility revenues

19.0 References

Atlanta Regional Commission. *Georgia Stormwater Management Design Manual.* Ogden Environmental & Energy Services, Co., Debo & Associates, Center for Watershed Protection, and Jordan, Jones, & Goulding. Atlanta, Georgia. 2000.

Debo, Thomas N. and Andrew J. Reese. *Municipal Storm Water Management.* Lewis Publishers, Boca Raton, Florida. 1995.

Feldner, Ronald A. *Storm Water Utility Presentation Up-Date*. Integrated Science & Engineering, Inc., Griffin, Georgia. 1998.

Georgia Soil and Water Conservation Commission. *Manual for Erosion & Sediment Control in Georgia.* Georgia Soil and Water Conservation Commission, Athens, Georgia. 2000.

Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, I.J. Schlosser. *Assessing Biological Integrity in Running Waters, a Method and its Rationale.* Illinois Natural History Survey Special Publication 5. 1986.

Ogden Environmental and Energy Services. *City of Griffin Stormwater Utility Action Plan.* Ogden Environmental and Energy Services, Inc. and Water Resource Associates, Inc. Marietta, Georgia. 1997.

Ogden Environmental and Energy Services. *City of Griffin Stormwater Utility Rate Structure Analysis.* Ogden Environmental and Energy Services, Inc. Marietta, Georgia. 1997.

Ogden Environmental and Energy Services. *City of Griffin Storm Water Utility – Stormwater Utility Service Charge Credit Technical Manual.* Ogden Environmental and Energy Services. Marietta, Georgia. 1997.

Ogden Environmental and Energy Services, Inc. *City of Griffin Customer Service Manual.* Ogden Environmental and Energy Services, Inc. Marietta, Georgia. 1998.

Ogden Environmental and Energy Services, Inc. *City of Griffin Georgia Stormwater Utility – NPDES Stormwater Permitting Phase II Action Plan.* Ogden Environmental and Energy Services, Inc. Marietta, Georgia. 1999.

Radtke, Dean B. *National Field Manual for the Collection of Water-Quality Data Chapter A8 Bottom Materials.* United States Geologic Survey, 1997.