CHAPTER 2: TOWN OF CARY STORMWATER PROGRAM

This section details the evolution of the Stormwater Program for the Town over the last several decades. Beginning with the adoption of the first floodplain regulations and response to the passage of the Clean Water Act, to current changes related to NPDES permitting and nutrient sensitive water regulations, Cary has continued to lead and adapt to the ever changing regulatory environment. This section helps to lay the foundation for the current assessment of the Stormwater Program by providing historical perspective.

A. Program History & Success

Stormwater Program History

The following descriptive timeline shows how the Town of Cary has progressed its approach to stormwater management over the years and how many of these changes relate to State and Federal Regulations.

- 1972 – The Town adopted its first floodplain management ordinance predating the issuance of the first Flood Insurance Rate Maps (FIRMs) for the area.
- 1974 – The Town was one of the first communities to adopt a planning approach where drainage basins were used as a geographic basis for planning and land use.
- 1985 - The Town proposed its first ordinance to protect water quality in a water supply watershed (Swift Creek). The ordinance (adopted in 1986) required that development involving a change in zoning in a water supply watershed must provide on-site detention of stormwater to protect the receiving stream network. The Town also assumed responsibility for erosion and sediment control from the State in this year.
- 1988 – Affected Wake County communities developed and accepted the Swift Creek Watershed Land Management Plan which set development criteria within the watershed that became the basis for subsequent plans and ordinances.
- 1990 – The Town began to require a stormwater plan, erosion control plan, and a grading permit when more than 12,000 square feet of area is disturbed. *This exceeded the State standard requiring a sediment and erosion control permit when disturbances exceed one acre.*
- 1992 – DENR adopted the water supply watershed classification and associated rules, which must be incorporated into the drinking water protection management plan for all municipalities. Cary implemented these rules in 1993. This included areas within the Town's jurisdiction that are within 5 miles of the normal pool elevation of Jordan Lake and the Swift Creek Basin. This was approximately 49% of the Town's jurisdictional area at the time. The water supply watershed rules limit imperviousness with low density and high density options for suburban and urban land areas. Low density options have lower impervious limits while the high density option requires treatment of the first inch of rainfall, and 85% average annual TSS removal. The details for these watershed protection overlays are covered in Section E of this chapter.

- 1996 (adopted in 1998) - The Environmental Management Commission established the Neuse River Basin Nutrient Sensitive Waters Management Strategy, otherwise known as the Neuse Rules. The overall goal of this legislation was to reduce nitrogen loading to the Neuse River Estuary by 30%.
- 2000 – In general, the Town no longer allowed development in the floodplain as part of its Flood Damage Prevention regulations in Section 7.5 of the LDO. *This exceeded the requirements set forth by FEMA which will allow development in the floodplain under certain conditions*. Also, erosion control inspections became required for every single family home permitted to be built in the Town. In addition, the Town of Cary adopted its "Stormwater Management Program for Nitrogen Control in July of 2000.
- 2001 - The Town adopted Urban Transition Buffers (UTB) under the LDO – Section 7.2.14 that requires a 100 foot buffer on USGS mapped surface waters and 50 foot buffers on Soil Survey mapped surface waters in the Cape Fear River Basin. For the Neuse River Basin a 50 foot buffer on surface waters is required from the landward boundary of any existing Neuse River Riparian Buffer based on USGS mapping. *The UTB ordinance exceeded and predated the buffer requirements for both the Cape Fear and Neuse River Basins.* In this year a rule was also established that would not allow lots to be platted in urban transition buffers or floodplains.
- 2004 – Skimmer devices designed to withdraw water from the surface of a retention basin became required on all sediment basins regardless of surface area.
- 2005 - The Town of Cary received an NPDES Phase II stormwater permit. This required developers of properties with more than 24% imperviousness to control and treat stormwater volume leaving a project site from the 1-year, 24-hour storm. It also required an 85% removal of total suspended solids (TSS) from the annual average loading. Additionally, the Phase II permit required the Town to establish six minimum control measures, which included an education program, a public participation program, measures to identify and remove illicit discharges, construction site runoff control measures, pollution prevention/good housekeeping measures, and a post-construction stormwater management program. Separately, the Town conducted stormwater conveyance mapping through consultants Dewberry and Withers & Ravenel. This work is described in Chapter 3.
- 2006 - The Town developed Policy 35, a policy that provides an opportunity for cost sharing with citizens that have problems with structural flooding.
- 2008 – The Town adopted a detention ordinance for the 2-, 5-, and 10-year rain events. The Town also began to track impervious surface areas on single-family lots.
- 2008 - The Town limited mass grading to 25 acres at a time for residential developments with between 3 and 8 dwelling units per acre. The grading limit for residential developments with less than 3 dwellings per acre extends only to infrastructure (i.e., roads and utilities).
- 2009 – The Jordan Lake Nutrient Management Strategy became effective. The rules require the Town to develop a stormwater management plan for new development and for projects that disturb more than one-half acre of land, and a program that includes measures very similar to the Town's NPDES Phase II permit (education program, identify and remove illicit discharges, map the MS4

system). These rules are being implemented in a phased approach. The new development ordinance for the rule was reviewed and approved by Town Council on October 11, 2012.

- 2011 – The Town received its updated NPDES stormwater permit from the NC Division of Water Quality. This demonstrates that the Town has been fulfilling its obligations outlined in the first stormwater NPDES permit, including the six control measures. In the past five years, stormwater BMPs have been installed to the maximum extent practicable (MEP), which is a requirement for meeting Total Maximum Daily Loads (TMDL), such as the Neuse Estuary for nitrogen and Swift Creek for biological integrity. The Town has also successfully established a program to inspect and manage BMPs. Illegal discharges have been screened for and employees have been trained to identify them, as well as implement good housekeeping measures. A public education campaign has been conducted to inform citizens and contractors of how to better manage stormwater runoff. The Town has also established a pollution prevention and good housekeeping program for its own facilities and maintenance operations.

Summary of Previous Studies

Over the years the Town of Cary has completed various assessments and studies that reflected where its stormwater program was at that point in time. These are summarized below to give the reader a perspective on the progression of the stormwater program.

1993 Stormwater Management Study

In 1993, William G. Daniel and Associates conducted a stormwater management study that evaluated the water supply protection measures used by the Town and what was needed to comply with amendments to those regulations at the time.

Actions taken by Town as a result of the 1993 Stormwater Management Study:

- Land Development Ordinance revisions were recommended in reference to the Watershed Overlay District regarding the High Density Option and for implementation of stream buffers (now referred to as Urban Transition Buffers). Elements of these ordinance revisions were implemented, but have since been modified to the current ordinance.
- The primary action recommended from this study was to build four (4) regional impoundments (ponds). A summary of these regional ponds is provided in the table and figure below. Two of the ponds, Morris Branch (Site 2) and Panther Creek (Site 4) have been constructed and are currently in use. The remaining two ponds are identified as Bachelor Branch Impoundment (Site 1) and Nancy Branch Impoundment (Site 3). The area recommended for Bachelor Branch Impoundment is currently owned primarily by the Town of Cary. However, there are no houses currently located within the FEMA floodplain and no drainage requests along this section of Bachelor Branch. As such, there does not appear to be any immediate flood reduction or property owner benefit from construction of this impoundment. The area recommended for Nancy Branch Impoundment is currently located immediately upstream of Yates Store Road. According to the study, the trigger for

the development of these impoundments is the amount of development coming into the watershed. It appears the other two impoundment areas have been slower to develop and therefore the impetus for development has not been there. In addition, the regulatory environment for permitting "in-line" retention facilities on streams has changed dramatically since this report. The requirements set forth by the EPA Region 4 memorandum, *Guidelines for Reconciling Stormwater Management and Water Quality and Resource Protection Issues (June 23, 2004)* make construction of regional impoundments extremely difficult to get permitted. NCDWQ has stated that no BMPs can be located on intermittent or perennial streams or COE 404 jurisdictional waters as a result of the EPA guidelines.

Table 2.1 - Recommended Regional Pond Sites - 1993 Stormwater Management Study

ID	Stream	Watershed Name	Normal Pool Area (Acres)	Cost (1993 Dollars)	Still Viable	Notes
1	Bachelor Branch	White Oak Creek	29	$1.7M	Yes	Town Owned Land; No current flooding issues or drainage complaints
2	Morris Branch	Northeast Creek	17	$823k	N/A	Currently in Operation
3	Nancy Branch	Northeast Creek	10	$721k	Yes	Private Land
4	Panther Creek	Northeast Creek	38	$2.7M	N/A	Currently in Operation

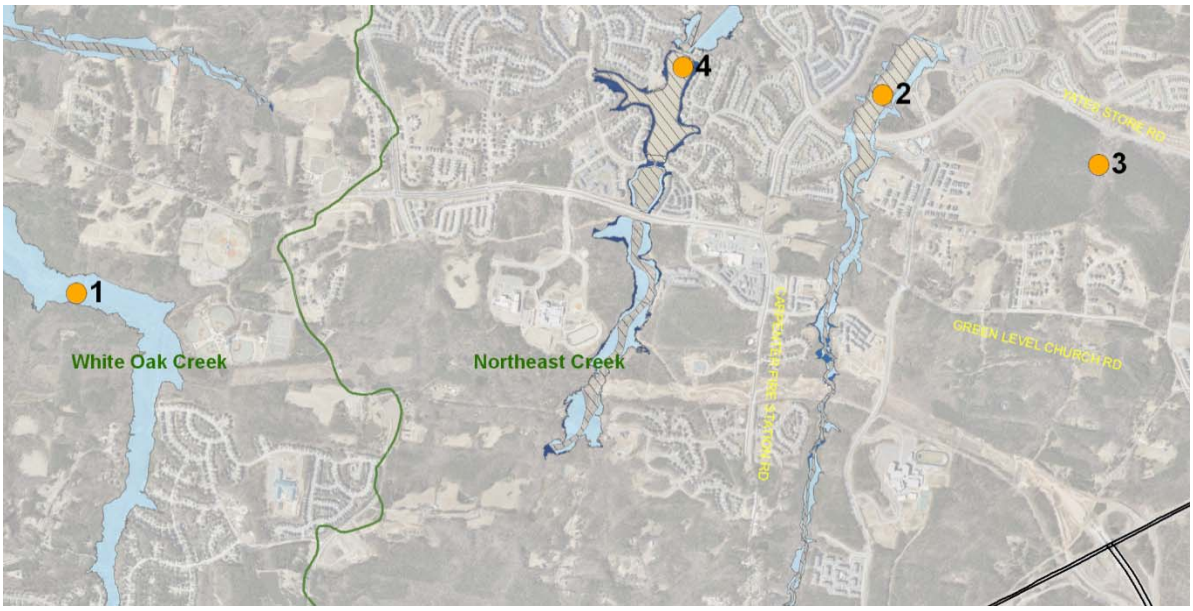

Figure 2.1 Recommended Regional Pond Site Locations – 1993 Stormwater Management Study

1995 Stormwater Management Program Overview

In 1995, an overview of the Town's stormwater management program was done by the Town of Cary Engineering Department in response to a request by the Planning and Zoning Board. It identified the main stormwater management issues as stream bank erosion, sedimentation in streams and lakes, increased stormwater runoff from new development, problems with private and public drainage structures, and protection of the environment and water quality. The document clarified the Town's responsibility in these areas.

According to this document, the primary tools available to the Town's stormwater program to address the aforementioned stormwater management issues had four main components: reservoir watershed protection, sediment and erosion control, flood damage prevention, and zoning regulations.

- Reservoir watershed protection was being addressed through the watershed overlay district that applied to the Swift Creek and Jordan Lake watersheds. According to the overview, the primary benefit of the overlay was to protect drinking water quality. Secondarily, it also controlled stormwater by reducing runoff through retention basins, limiting impervious cover, and provided stream and reservoir buffers. Crabtree Creek and Walnut Creek watersheds were not subject to the requirements of the overlay district.
- Sediment and Erosion control focused on stormwater velocity reduction and establishment of ground cover as a means to contribute to the reduction runoff from development.
- The Town's Flood Damage Prevention Ordinance is a valuable tool as it controls where development could occur in a floodplain, thereby minimizing impact from runoff. Flood studies were being required near streams that had drainage areas of 50 acres or more.
- The overview also stated that the Town could use conditional use zoning to potentially put restrictions on parcels of land that were up for rezoning to dictate how runoff was handled. These restrictions could be specific enough to address any issue confronting surrounding property owners.

In 1995, the Town maintained drainage structures on their property only (not private property). Public property included rights of way along roads maintained by the Town. The overview did state that a system was in place by which the Town could assist private property owners with maintenance of structures on their property.

The overview did refer to potential problem areas for drainage being the areas that were then older than 15 years. The document also correctly predicted that Cary would be subject to NPDES stormwater permitting in the future.

2005 Town Center Area (TCAP) Stormwater Management Plan Final Report

In 2005, Tetra Tech completed a plan for stormwater management for the Town Center Area. The Town of Cary adopted a Town Center Area Plan (TCAP) to guide development in a one-square mile area adjacent to the planned regional rail line. The plan promotes redevelopment of the area to highly urban, high density commercial and residential uses, which are expected to support regional transit and to provide for a more active urban environment. To achieve this and also protect the environment and meet State and Federal requirements, TetraTech's plan addressed the TCAP's potential hydrology and pollutant loading impacts, and proposes appropriate mitigation actions.

As a result of the alternative analysis, the final result of the Town Center Area Stormwater Plan was to pursue the following:

- Require use of onsite or shared BMP facilities to meet volume, TSS, and nitrogen targets.
- Require developers not to exceed the 10 lb/ac/yr commercial and 6 lb/ac/yr residential nitrogen caps; allow a "buy down" to 3.6 lb/ac/yr as needed.
- The Town will allow the development of shared or on-site BMP facilities for parcels that would be unable to meet the 10 lb/ac/yr limit. The Town would need to develop criteria for approving and evaluating such facilities and submit to NCDWQ for review. Once approved, the Town will need to amend its stormwater ordinance to incorporate the process for reviewing and approving shared facilities.
- The Town may pursue stream enhancement as needed to help meet water quality and quantity goals. (To date, several stream enhancement projects are being implemented in or around the TCAP area).

2006 Wake County Individual Needs Assessment

In 2006, CDM conducted an Individual Needs Assessment (INA) for municipalities in Wake County, including Cary. The purpose of the INA was to study the programmatic, operational, and funding options available for the development of a collaborative stormwater management program involving some or all of the thirteen local governments in Wake County, one of which is Cary.

Some of the key recommendations from the INA report to improve the program were:

- The Town should consider other program options such as reducing allowable density in water supply watersheds, collaborating in, or creating a water quality monitoring program, and identify the condition of all stormwater structures (e.g. storm sewer pipes, culverts, catch basins, etc.) within the Town's corporate limits. (The condition of the stormwater structures were evaluated as part of the inventories by Dewberry and Withers & Ravenel. In addition, ordinances were modified since the study to improve water quality in the watershed overlay district, including impervious area and density requirements.)

- The Town should consider transitioning to a more routine-based maintenance program which could eliminate or reduce O&M-related flooding, increase the life of the stormwater system, and reduce high-cost capital expenditures such as repairs to failed facilities, unscheduled labor overtime, and high administrative costs over the long term. (This is being assessed within this report. See Chapters 3 and 5.)
- H&H studies could be used to develop prioritized CIPs that will be used to address the most critical projects first and provide the Town with advanced notification of future CIP needs to ensure sufficient funding is in place.
- The Town could consider developing watershed plans to help assess the current watershed conditions, identify major causes and sources of watershed degradation, and identify key areas for restoration, enhancement, and preservation opportunities. These projects can also be included in the prioritized CIP. (While this has not been done on a Town level or for all watersheds, plans such as the stormwater management plan for the TCAP have been done.)

2006 Town Center Area Plan (TCAP) Basinwide Drainage System Analysis

In 2006, Dewberry completed an H&H study on the Town Center Area Plan (TCAP) called the Basinwide Drainage System Analysis and Water Surface Profile Determination. The study was developed with three primary goals; 1) to develop water surface profiles for the larger drainage area streams, 2) develop hydraulic grade lines for local channel and pipe systems, and 3) to provide recommended solutions for the identified problem areas.

The study included the floodplain analyses of Walnut Creek, Coles Branch, and Swift Creek Tributary 7; starting at the upstream limits of the effective FEMA study limits to the point that the drainage area of the stream was approximately 50 acres. Standard FEMA flow rates from the effective studies downstream were used for the floodplain analysis.

Based on the assumed benefit to cost and the number and value of structures determined to be at risk of flooding in the TCAP, Dewberry recommended that the Town should consider a number of actions to help alleviate flood risks. Based on the value of potential development, the Town should regulate development using the 100-year water surface elevations developed within the report, or the Town should consider including the 100-year floodplains on the FEMA DFRIMs. They also recommended that other studies of similar nature could be done throughout the town limits and ETJ to determine flood risk beyond the FEMA studies. Additionally, it was recommended that the Town consider modifying the existing development ordinances to require new development to include assessments of impacts to downstream stormwater infrastructure as part of the permitting requirements and to require the development to alleviate any problem areas that are created.

Actions taken since the 2006 Study:

- Town Land Development Ordinance does require a Downstream Impact Analysis for sites that generate post development discharges greater than 10% of the pre-development discharges for the 2, 5, and 10-year events
- Projects have been implemented to reduce flood risk in the TCAP area such as the stream restoration project in the Pamlico Drive area.
- A more detailed risk analysis to determine impacted properties as a result of the flood studies will be completed in this report, see Chapter 3.

2006 – Silverton Lake Watershed Study

In 2006, Withers & Ravenel (W&R) completed a study on the Silverton Lake watershed, an approximate 440 acre area bounded by Cary Parkway, Maynard Road, Evans Road, and Chapel Hill Road. The purpose of the study was to investigate alternatives for mitigating potential flooding from future development within the watershed. In addition, the study provided consideration of how mitigation alternatives discussed for the Silverton Lake watershed could be applied to other watersheds in the Town.

The study also examined more programmatic flood mitigation approaches that could be applicable to other watersheds within the Town of Cary. Alternatives discussed included:

- Implementing low impact development (LID) techniques that focus on reducing impacts at the source by reducing impervious area and integrating design more with natural drainage, rather than using detention basins or other “end-of-pipe” management techniques.
- Requiring additional volume-based controls for storms larger than the 1-year 24-hour storm which is currently required. The study indicated that this may be a less feasible option due to potential land requirements and constraints.
- Requiring peak flow controls for the 25-year or larger storm events. Providing controls for the 25-year event would help reduce impacts on roadways which are often designed for this storm event. Controls for the 100-year would help mitigate flooding to structures, however, it may present more of a hardship to implement.
- Taking a watershed-based management approach rather than a site-based approach. This would entail developing watershed-specific models and/or requiring a downstream impact assessment for new developments. The type of required stormwater controls would be based on the calculated impacts at targeted assessment points.

A key policy change that occurred as a result of this report was the inclusion of detention requirements for the 2, 5, and 10 year events within the Land Development Ordinance for Peak Runoff Control.

B. Current Regulatory Environment

State and Federal Regulatory Considerations

Many aspects of the Town of Cary's stormwater program are based on Federal and State requirements. The USEPA and DWQ through legislation and regulations require the Town to monitor, document, and regulate activities that affect stormwater runoff, flooding, and pollution. These requirements are mostly expressed in the Town's LDO and are related to development. The Town also exceeds a number of these requirements. Virtually all of the Federal requirements have been transferred to the Town through or in conjunction with State requirements. As such, it is necessary to review the State and Federal requirements together. The requirements as they relate to the Town of Cary are:

- NPDES Phase II Stormwater Program
- Neuse River Basin: Nutrient Sensitive Waters Management Strategy (Neuse Basin Rules),
- Jordan Water Supply Nutrient Strategy (Jordan Lake Rules)
- Water Supply Watershed Rules
- N.C. Sedimentation Pollution Control Act of 1973 (SPCA)
- Swift Creek Watershed Land Management Plan
- Swift Creek Total Maximum Daily Load (TMDL)
- Flood Disaster Protection Act of 1973

The Black Creek Watershed Association Strategic Plan (BCWA Plan) is not technically a State or Federal requirement, but DWQ considers it to be important as a way to for the Town to avoid future State requirements (see below). Figure 2.3 shows the Town watersheds that are affected by the various State and Federal requirements described in detail in this Section.

Figure 2.3 - Current Watershed-Based Regulations and Requirements

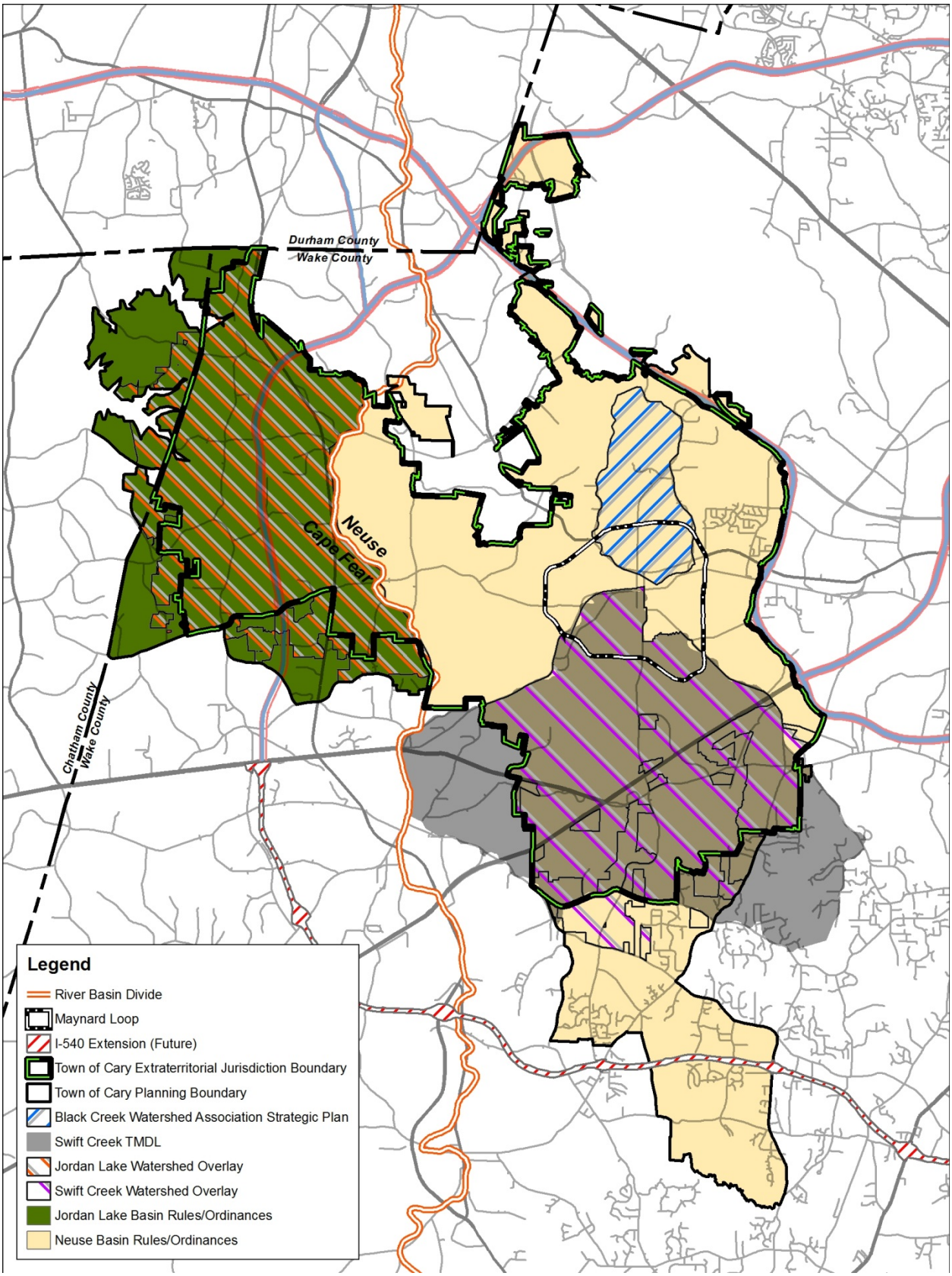

Table 2-3 - Current Federal and State Stormwater Program Requirements

Rule	Federal Rule/Law	State Rule/Law	USEPA Approved TMDL
NPDES Phase II Stormwater	40 CFR Part 122	Session Law 2006-246, Permit No. NCS000427, 15A NCAC 02H .0126	N/A
Neuse Basin Rules	1972 Clean Water Act, Section 303(d)	SL 1995-572, 15A NCAC 2B .0200	Neuse Estuary TMDL
Jordan Lake Rules	1972 Clean Water Act, Section 303(d)	HB 515, SL 2005-190, SL 2009-216, SL 2009-484, 15A NCAC 2B .0200', SL 2012-200 and 201	Jordan Lake TMDL
Water Supply Watershed Rules	N/A	GS 143-214.5 and 143-214.6, 15A NCAC 2B; SL 2012-200	N/A
SPCA	40 CFR Part 122	SPCA, 15A NCAC 04	N/A
Swift Creek TMDL	1972 Clean Water Act, Section 303(d)	(Part of Neuse Basin)	Swift and Williams Creeks TMDL
National Flood Insurance Program (NFIP)	Flood Disaster Protection Act of 1973, National Flood Insurance Reform Act of 1994	Adopted Program in 1997	NA

*See "Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions (October 12, 2006)" DWQ website.

NPDES Phase II Stormwater

NPDES Phase II Stormwater Permits are required by the USEPA through DWQ for larger municipalities in North Carolina. The State of North Carolina elected to "assume" the entire NPDES program from the USEPA including the stormwater components as allowed under the 1972 Clean Water Act (CWA). DWQ's web site succinctly summarizes the State's assumption of the Federal Program as follows: "In 1972, the National Pollutant Discharge Elimination System (NPDES) program was established under authority of the federal Clean Water Act and delegated to the Division of Water Quality for implementation in North Carolina. Phase I of the NPDES stormwater program was established in 1990. It focused on site and operations planning to reduce pollutant sources. Phase I covered industrial activities in 10 categories, construction activities that disturbed five or more acres, and municipalities with populations of 100,000 or more that owned or operated a municipal separate storm sewer system (MS4) (North Carolina had six). Phase II of the program expanded permit requirements to construction disturbing an acre or more and smaller communities (< 100,000 population) and public entities that own or operate an MS4. Phase II also expanded the option of the No Exposure Exclusion beyond the 'Light Industry' category." (DWQ Web Site)

The NPDES Phase II Rules define a stormwater management program for a small MS4 as a program composed of six elements that, when implemented together, are expected to reduce pollutants discharged into receiving water bodies to the maximum extent practicable (MEP). These six program elements, or minimum control measures, are:

- Public education and outreach on stormwater impacts.
- Public involvement/participation.
- Illicit discharge detection and elimination.
- Construction site runoff control.
- Post-construction stormwater management in new development and redevelopment.
- Pollution prevention/good housekeeping for municipal operations

The State mandated that the Town acquire an NPDES Phase II Stormwater Permit in 2005, requiring the Town to pass ordinances that addressed the six elements described above. The Town already had ordinances and programs in place that address the vast majority of those elements so the changes and impacts to the program were minimal. Many of the requirements in the renewed permit issued November 2011 are continuations of current requirements; however, there are some requirements that include an implementation schedule.

Neuse Basin and Jordan Lake Rules

The Neuse and Jordan Lake Rules were implemented as the result of the Neuse Estuary TMDL and the Jordan Lake TMDL, respectively. The most pertinent stormwater requirements of these Rules to the Town are the protection of riparian buffers and requirements for nutrient reduction. When the Neuse Rules were established, the Town was required to provide ordinances to implement a nutrient removal program for new development and redevelopment. The Town proactively extended those ordinances to the Jordan Lake watersheds as well. The nutrient reduction requirements result in most developments projects being required to install stormwater BMPs that remove the nitrogen in the Neuse Basin and nitrogen and phosphorus in the Jordan lake watershed. Additionally, the Town also adopted its own riparian buffer programs for both the Neuse and Jordan watersheds (prior to the State requiring them in the Jordan) based on and in addition to the State requirements. The State buffers are measured 50-feet out from stream banks as shown on the USDA Soil Survey and 1:24,000 USGS Topographic Maps. The Town also adopted 100-foot buffers (now referred to as Urban Transition Buffers or UTBs in the Town's LDO) as part of its Inter-basin Transfer Certificate (1989) with DWQ (see below). When the Jordan Lake Rules riparian buffer requirements were enacted in 2009, the Town reverted to its standard UTBs (50 feet from the stream bank to 100 feet from the stream bank) in the Jordan and was required to implement the the now State mandated 50 foot Jordan riparian buffers.

Water Supply Watershed Rules

The State Water Supply Watershed Rules (15A NCAC 2B .0200) took effect in 1986 in order to protect the State's surface water supplies used for potable water. These Rules allow for municipalities to assume the

program from DWQ by adopting their ordinances that are equal to more restrictive than the Rules. The Town assumed the program and adopted a Watershed Protection Overlay ordinance for its Water Supply Watersheds. The ordinance includes the Swift Creek and Jordan Lake watersheds within the overlay boundaries. A primary aspect of this ordinance is the requirement to establish maximum allowable development densities in certain watersheds. The Swift Creek watershed has more stringent than usual density limitations, as originally established in the Swift Creek Land Management Plan. Additionally, the Town is required to adhere to the requirements of the Swift and Williams Creek TMDL (Swift Creek TMDL) developed by the USEPA that uses an impervious cover limit of 9% in the watershed as a surrogate for the impairments caused by urbanization. Limiting new development densities provides one means of meeting the TMDL impervious cover requirement. Recently, new legislation (SL 2012-200) allows an applicant to average development densities between two non-contiguous properties in the same watershed. Other limitations apply, but the new legislation does create the ability for the Town to have higher densities within the Downtown Core or TCAP (See Section 6E).

Sediment and Pollution Control Act (SPCA)

The North Carolina Sediment Pollution Control Act (SPCA) was passed in 1973 to address soil loss and sedimentation from construction sites. The SPCA and subsequent regulations allow for Counties and Municipalities the choice to “assume” or establish their own ordinances to implement the SPCA and associated NPDES Construction Stormwater Permit. The Town assumed the program from the State in 1985 to review site plans and inspect construction sites. Since 1990, the Town’s program has gone beyond that of the State rules primarily by requiring grading permits for all sites with greater a disturbed area greater than 12,000 square feet as opposed to the 1 acre (43,560 square feet) threshold of the State. The stormwater program established in 1990 further required a stormwater plan be developed for all sites greater than 12, 000 square feet of disturbed area as opposed to the 1 acre (43,560 square feet) threshold of the State. Over the next eight years, from 2001 to 2009, the Town improved and updated several of its ordinances related to sedimentation. New features include: requiring skimmers on all sediment basins and regulating stormwater detention for the 2-, 5-, and 10-year storms.

The Town’s sediment control program has been improved as recently as 2010, when the minimum amount of time land could remain uncovered without activity was shortened from the State’s (then) 21 day limit to 15 days.

Swift Creek Watershed Land Management Plan (LMP)

The Swift Creek Watershed Land Management Plan (LMP) was developed in 1988 by a joint committee of Apex, Cary, Garner, Raleigh, and Wake County officials to help the Swift Creek Watershed achieve a water supply watershed WS-III Classification. The LMP recommended achieving the WS- II Classification through prohibiting all point source discharges within the watershed, establishing minimum critical buffer areas around bodies of water, limiting impervious cover and new development in critical areas. The LMP included a current land use assessment and recommended performance standards for future development to protect water quality in the Swift Creek Watershed. Finally, the LMP recommended further areas of study that would ultimately enhance the water quality of the watershed and its ability to maintain a WS – II

Classification. However, it is important to note the Swift Creek and Williams Creek watersheds are actually classified as WS – III which carry less stringent development requirements than do WS- II watersheds.

Swift Creek Total Maximum Daily Load (TMDL)

Many TMDLs, such as those for Jordan Lake and the Neuse Estuary, have resulted in the State developing Rules to reduce the targeted pollutants in the watersheds that drain to the areas under the TMDLs. The respective examples are the Jordan Lake Rules and the Neuse Rules that are discussed above. The Swift and Williams Creek TMDL is different from these TMDLs in that there are no comprehensive Rules currently proposed by DWQ to address the TMDL requirements; however, the Town has developed a Water Quality Recovery Program (WQRP) for the Swift Creek watershed. The TMDL includes rudimentary waste load allocations (WLAs) and a surrogate 9% impervious cover (IC) WLA. The impervious cover WLA is unusual in that it does represent a numeric Water Quality Based-Effluent Limit (WQBEL), but is not a pollutant that can be measured in stormwater runoff. Impervious cover is considered a surrogate for typical urban stormwater pollutants that were identified in the Swift Creek TMDL as causing the impairments. Additionally, the watershed is subject to WS-III requirements (15A NCAC 2B .0200) which already have more stringent impervious cover limitations than those of most Water Supply Watersheds in urbanizing areas (typically WS-IV and WS-V). (See Section 4E for more information.) Future TMDL and Category 4b issues are discussed in Section 2B above.

Other Potential TMDLs and Category 4bs

The Town of Cary contains and is surrounded by many streams that are listed as impaired on DWQ's 303(d) Impaired Waters list. The Town's ordinances that pertain to the Jordan Lake watershed and Swift Creek watershed, in part, seek to meet the respective TMDLs. As discussed in Section 4E, the Town is also surrounded by a number of 303(d) Listed Streams which could be subject to the development of a TMDL (or Category 4b plan) in the future. The Town's proactive stance to protect water quality via its ordinances and related programs can lower the prioritization to develop a TMDL by demonstrating that factors causing impairments will be addressed through the existing program.

Black Creek Watershed Association (BCWA) Plan

The Black Creek Watershed Association Strategic Plan (BCWA Plan) was developed in 2006 by the combined effort of the Town, the Black Creek Watershed Association, and Watershed Education for Communities and Officials (WECO). Based on discussions with DWQ, this cooperative effort will prevent Black Creek from becoming a priority for the development of a TMDL or Category 4b plan (see section 4C for more information on impaired watersheds). This means that it is important to support the pertinent goals and objectives of the BCWA by preventing the Town from having formal requirements to address the impairment issues in Black Creek. As part of the BCWA Plan and as part of this Master Plan, the Town has identified specific BMP retrofit locations in the watershed (See Section 6B Potential BMP Retrofits). For more details regarding the BCWQ, see Section 4E.

Flood Disaster Protection Act of 1973

Hurricane Agnes in 1972 caused devastating flooding in the Mid-Atlantic and is credited with the establishment of the Flood Disaster Protection Act of 1973. Basically, this Act established the flooding insurance program and the Federal Emergency Management Agency (FEMA). Subsequent flooding disasters revealed that additional legislation was needed to protect the public resulting in the National Flood Insurance Reform Act of 1994. This Act, strengthened flood insurance requirements, requires updates to NFIP (National Flood Insurance Program) maps every five years, and requires the distribution of Letters of Map Change to the public among other items. In 1997, FEMA developed a plan to modernize the FEMA flood mapping program. The goal of FEMA's Map Modernization Plan is to upgrade the flood map inventory to improve map accuracy and completeness, map utility, map production, and public awareness and customer service. In 1997 FEMA expanded the program to allowing states to assume FEMA's responsibility of updating the Flood Insurance Maps (DFIRMs). North Carolina adopted this program and ultimately implements FEMAs programs in the state (NC Flood Maps website).

Part of the requirements of this program is to require local governments to issue permits for impacts within the regulated 100-year floodplain. The Town has taken on this requirement and established additional ordinances to further protect the public both in FEMA regulated and unregulated floodplains (floodplains upstream of FEMA regulated floodplains. This latter is of particular importance since Cary is located along a river basin divide between the Cape Fear and Neuse Rivers which means that many of Cary's streams have drainage areas that are below the FEMA threshold of Typically 1 square mile. Because of this the Town regulates subdivisions with drainage areas of 50 acres and larger and requires that residences within the 100-year floodplains of such streams be protected from flooding (also, see below). In 2000, the Town of Cary restricted all development in FEMA designated 100-year floodplains and began requiring erosion control inspections for new home permits. One year later, the town imposed 100 foot buffers on all USGS streams and surface waters with the stipulation that future lots could not be platted in the stream buffers. At the same time, the Town also established an additional 1 foot of freeboard (for a total of 2 feet) above the FEMA requirement of 1 foot of freeboard for finished floor elevations above the 100-year flood elevation. In addition, the Town also has a flooding cost share program for its citizens.

North Carolina Surface Water Law

One concern that often arises for Town citizens is who is responsible for flooding and what would be the implications of the Town taking responsibility for private drainage systems. The following excerpt from a legal opinion to Town Staff is provided below that summarizes how stormwater management is viewed statewide in North Carolina (Summary of North Carolina Surface Water Law – August 7th, 2003).

"In 1977, North Carolina resolved any ambiguities resulting from prior court decisions and adopted the reasonable use doctrine in the case of Pendergrast v. Aiken, 293 N.C., 201, 236 S.E. 2d 787 (1977). The application of the "reasonable use" doctrine for twenty-five (25) years reveals several general points:

- *If a property owner undertakes no management of surface water, he has no liability.*
- *If a property owner has or controls stormwater devices (such as pipes, catch basins, etc.), he has a duty to maintain them.*
- *Although liability is limited to only "substantial damage," this limitation has little impact. Typically, damage triggering litigation has been treated as "substantial" by juries and the courts.*
- *Proving causation (showing the actions or inactions of a particular property owner caused the alleged damage) is the most important aspect of a surface water case.*
- *If a property owner proves that a particular owner caused any part of the damage, then this individual is liable for all of the damage.*
- *Surface water litigation can be completed. In urban areas, numerous changes undertaken by numerous property owners above or below the damage will occur between major storm events. In a rapidly developing area, new impervious surfaces and redirection of surface water is a daily event.*
- *Other than proving damage and causation, the damaged property owner has the duty to prove that the weather event was "reasonably foreseeable." Typically, proving foreseeability is not difficult…*
- *A municipality is liable for damage caused by municipally owned surface water devices and systems.*
- *A municipality is liable for damage caused by surface water devices or systems when the municipality has control of these devices or systems.*
- *A municipality does not have governmental immunity for negligent maintenance of surface water devices and systems it owns or controls.*
- *A municipality is not liable for damage caused solely by a malfunctioning private devise attached to a municipal system.*
- *A municipality is not liable for damage when the municipality unclogs a private storm drain at the request of the private owner because such activities are environmental."*
- *Given studies based upon projected 100 year and 500 year floods, it appears that very few events will be characterized as unforeseeable. Therefore, a municipality's liability for basin-wide devices or systems could be significant when major storm events occur."*

The above should be considered when addressing citizen concerns regarding flooding, sedimentation, and erosion resulting from offsite runoff. It is also not in the interest of the Town of Cary to take ownership or responsibility for private drainage systems based on the above points. However through Policy 35 and Policy 146 the Town will assist private owners financially with improvements or repairs to their drainage systems if they meet the policy requirements.

Summary of Town's Land Development Ordinance (LDO) Related to Stormwater and State and Federal Requirements

The Town of Cary Land Development Ordinance (LDO) has expanded as the Town has grown and stormwater related needs have changed. Historically, the industry standard approach to addressing stormwater with new development was to convey it as rapidly as possible to natural drainage ways. This often resulted in downstream flooding and erosion. This was addressed by requiring on-site stormwater detention to reduce peak flows as well as restrictions to development in floodplains. Additionally, pollution in stormwater was identified as a source of impairment to many of the State's waterways. As a result, both the USEPA and DWQ established requirements for municipalities to address such issues. Many of the stormwater components of the Town's LDO are required to meet (and often exceed) these State and Federal regulations. A number of these Federal and State rules specifically require local governments to implement new ordinances to protect and improve water quality. Most of these requirements are unfunded. The Town received an NPDES Phase II Permit from NCDWQ in 2006 and recently received a renewed permit in November 2011. The Town was not required to update most aspects of its existing LDO with the Permit, since, most of the Phase II requirements were already addressed by existing Town ordinances. For instance, the Town already had a sedimentation and erosion control program, a post construction stormwater controls ordinance (both for quantity and quality), an illicit discharge ordinance, and a riparian buffer protection ordinance that met or exceeded the Phase II requirements prior to the issuance of the Permit in 2005. Cary is seen as a leader in addressing and exceeding State and Federal stormwater requirements in order to protect needs and concerns of its citizens.

The LDO addresses stormwater runoff (including State and Federal requirements) under five overlapping categories:

- Water quality,
- Runoff quantity and flooding,
- Erosion and sedimentation control (E&SC),
- Riparian/urban transition buffers (UTBs),
- Enforcement.

A brief description of these five categories as they relate to the Town's LDO is provided below. Table 2.4 details the category, purpose and benefits of each of the relevant ordinances in specific detail. Detailed descriptions of the drivers for the development and implementation of the stormwater related ordinances are provided above, as well.

Table 2-4- Summary of the Town's Land Development Ordinances Relating to Stormwater

#	Ordinance Name	Category	Department Responsible	Basins	Potential Benefits	Purpose	Ordinance Drivers
3.12	Development in flood hazard areas	▪ Flooding ▪ Runoff Quantity	▪ Engineering	All	Reduces risk of structural and yard flooding	Prevent lots and development in flood-prone areas	Flood prevention, buffer protection, & water quality
3.13	Grading Permits	▪ E&SC	▪ Engineering	All	Reduces erosion, sedimentation, & property loss	Permits for grading and development activities	Compliance with State Erosion Control Law and NPDES Phase II Permit
3.15	Certificates of Occupancy	▪ Enforcement	▪ Inspections and Permits	All	Can be used as a mechanism to proactively require compliance with ordinances	Issued by the department stating that the building complies with the Ordinance	Public Safety, protection with secondary compliance benefit
3.17	Vested Right	▪ UTBs	▪ Planning	All	Prevent hardships for property owners	Prevent hardships for property owners	Equity and fairness
3.22	Tree clearing certificate	▪ UTBs	▪ Planning ▪ Inspections and Permits	All	Water quality & aesthetics	Prevent loss of trees	Ensure that trees are not mistakenly removed
3.22.4	Required Buffers and Vegetation Protection Areas	▪ UTBs	▪ Planning	All	Water quality & aesthetics	Areas where vegetation is to be protected and buffers are required	Addresses all buffers, not just UTBs
4.4.6	Watershed Protection Overlays	▪ Water Quality	▪ Planning	Swift and Jordan	Protects water quality of potable water supply	Ensures the availability of water supplies at a safe and acceptable quality	DWQ requirement for WSW (15A NCAC 2B.0200
7.2.5	Tree Protection During Construction	▪ UTBs	▪ Planning	All	Reduces accidental removal & damage of trees & buffers	To protect trees from damage prior to and during construction	Protection of trees, sometimes required by DWQ
7.2.8	Screening (A) Stormwater Devices	▪ Water Quality	▪ Planning	All	Better public acceptance of BMPs	Improve BMP aesthetics	Public acceptance of BMPs
7.2.14	Urban Transition Buffer Regulations	▪ UTBs	▪ Engineering ▪ Planning	All	Water quality, flood prevention, & aesthetics	Protect riparian buffer and protect water quality	15A NCAC 2B.0200, but Town exceeds minimum requirements
7.3	Stormwater Management	▪ Water Quality ▪ Flooding ▪ Runoff Quantity	▪ Engineering	All*	Water quality, flood prevention, & stream erosion	Protecting water quality by controlling nutrients, attenuating peak stormwater discharges, and requiring use of BMPs	15A NCAC 2B.0200, FEMA requirements Protection of Public
7.3.2	Nutrient Reduction Requirements	▪ Water Quality	▪ Engineering	All	Water quality	Limits the amount of pollutants in the stormwater runoff	15A NCAC 2B.0235, 15A NCAC 2B.02665, SL 2009-216, SL 2009-484
7.3.3	Peak Runoff Control	▪ Flooding ▪ Runoff Quantity	▪ Engineering	All	Flood prevention and stream erosion	To minimize damage to subject streams caused by storm flows	NPDES Phase II Permit
7.3.4	Allowable Best Management Practices	▪ Water Quality	▪ Engineering	All	Assures use of effective treatment strategies	A list of practices that can be utilized for nitrogen reduction	15A NCAC 2B.0235/.0265, SL 2009-216, SL 2009-484
7.3.5	Maintenance of Best Management Practices	▪ Water Quality	▪ Engineering	All	Assures proper maintenance of BMPs	BMPs require complete legal documentation and a maintenance plan	NPDES Phase II Permit
7.3.6	Illegal Discharges to the Storm Sewer System	▪ Water Quality	▪ Engineering ▪ Public Works & Utilities	All	Reduces sources of pollutants entering streams and ponds	Regulates non-stormwater discharges to the storm drainage system	NPDES Phase II Permit
7.3.7	Post Construction Runoff Controls for Walnut, Middle, & Crabtree Creek Watersheds	▪ Water Quality	▪ Engineering	All	Reduces pollution, reduces erosion and sedimentation, increases public awareness	Ordinance to comply with NPDES Phase II Permit	NPDES Phase II Permit
7.4	Soil Erosion and Sedimentation Control	▪ E&SC	▪ Engineering	All	Reduces sedimentation of streams and ponds, reduces property and soil loss	Regulates land disturbing activities to control erosion and sedimentation.	State Erosion Control Act and NPDES Phase II Permit
7.5	Flood Damage Prevention	▪ Flooding ▪ Runoff Quantity	▪ Engineering	All**	Reduces flooding potential and property loss	Minimizing the amount of obstructions in a floodplain	Public protection and FEMA
8.1.4	Subdivision and Site Plan General Provisions (C) Storm Drainage	▪ E&SC	▪ Engineering ▪ Planning	All	Reduces flooding potential and property loss	Provide adequate storm runoff conveyance systems	Public protection and FEMA
11.3 11.4 11.5	Violations, Remedies and Penalties, Enforcement Procedures	▪ Enforcement	▪ Engineering ▪ Planning ▪ Inspections and Permits	All	Assures compliance with ordinances	To provide means to require compliance with ordinances	All of the above

* Different aspects of rule apply based on watershed
** For sites greater than 50 acre

Water Quality

The primary water quality related components of the LDO include the Neuse and Jordan Nutrient Reduction and Buffer programs, the Watershed Protection Overlay requirements, and the NPDES Phase II Stormwater Permit-based requirements. These ordinances address water quality by requiring pollutant removing stormwater BMPs (both during construction and as permanent site features), nutrient offsets, riparian buffers, density restrictions, and maintenance of BMPs. These requirements are particularly relevant for the Town since Jordan Lake is its major raw drinking water source. Detailed explanations of the Rules and programs that drove the establishment of the ordinances are provided above. The ordinances also address some aspects of the Swift and Williams Creek TMDL in regards to development density requirements. Some of the requirements of the TMDL will be met through the Town's WQRP.

Flooding and Stormwater Runoff

Proactively addressing flooding and runoff quantity issues is critical to ensure public safety, reduce property loss potential, and maintain a high standard of living in the Town. The Town ordinances go above and beyond FEMA or other State and Federal Agency requirements in order to protect citizens and their property. These requirements are described in more detail above. This proactive approach to runoff quantity is important because the Town is situated on an inter-basin divide with numerous sub-watersheds originating within the Town limits. Typical FEMA regulations on streams begin as the watershed approaches 1 square mile in catchment area which excludes a majority of small headwater streams. These headwater streams are often capable of significant impact.

The Town has three primary means of reducing property flooding potential in its ordinances. First, the Town does not allow development (including, not platting of lots) within the Special Flood Hazard Area and the Future Conditions Flood Hazard Areas. Second, the Town requires that subdivisions with a stream that drains 50 acres or more to perform a flood study (similar to those required by FEMA on larger streams) to substantiate that the homes within the stream floodplain are also protected from flooding risks. Third, the Town will not allow the platting of any individual lots in an Urban Transition Buffer (UTB). This means that no lot can be platted within 50 or 100 feet of any stream including small streams that are outside the FEMA floodplain or other floodplain boundaries (such as those established by the TCAP Study, for instance). These small streams are potentially capable of significant flooding impacts. The benefits of this ordinance are 1) it reduces the potential for property flooding and 2) it protects water quality by protecting riparian buffers and associated streams. Additionally, the Town requires 2 feet of freeboard known as the Building Restriction Flood Line above the FEMA 100 year base flood elevation. The minimum requirement set by FEMA is for a freeboard of 1 foot above the 100-year base flood elevation.

Town's Erosion and Sediment Control Ordinance

The Town has established ordinances with a goal of preventing accelerated land erosion and offsite sedimentation. These ordinances exceed most State requirements by requiring a lower threshold for requiring a Sedimentation and Erosion Control Permit. The Town's threshold is 12,000 square feet (slightly more than ¼ acre) of disturbed ground as opposed to the 1 acre State threshold. This reduced threshold helps prevent sites smaller than 1 acre such as individual residential lot construction from avoiding appropriate erosion control requirements. The Town also required innovative erosion control devices such as skimmers on BMP outlet control structures prior to the State having required them. This benefits the Town because most of the water quality related reports received from citizens relate to erosion and off site sedimentation. (See Section 4B.)

Urban Transition Buffers

The Town's Urban Transition Buffer Ordinance (7.2.14) states, "Urban Transition Buffers (UTBs or "buffers") provide a transition from waterbodies and environmentally sensitive areas associated with waterbodies to areas which are less fragile and appropriate for more intense uses and development. Some of the benefits of UTBs are minimizing danger to lives and properties from flooding, preserving the water carrying capacity of the waterbodies, providing open spaces, limiting intense uses adjacent to waterbodies and environmentally sensitive areas associated with waterbodies, and maintaining the aesthetic qualities and appearance of the Town." Another benefit is the filtering of pollutants.

Urban Transition Buffers are applied alongside the Neuse and Jordan Lake buffers. The Neuse and Jordan Lake Rules (15 A NCAC 2B .0200) came into effect in 1997 and 2009, respectively. Both sets of Rules require protection of 50-foot riparian buffers from each bank for intermittent streams and larger. The Water Supply Watershed Rules (15 A NCAC 2B .0200) originally came into effect circa 1986. These Rules are the basis for the establishment of 50' or 100' buffers on perennial surface waters within Watershed Protection Overlay districts. The requirements of these Rules are summarized above. The Town's General UTBs exceed these State mandated Rules by requiring the protection of up to 100 foot riparian buffers for "blue line" surface waters that appear on the 1:24,000 USGS topographic maps. Also, as required by Inter-Basin Transfer (IBC) Certificate (1989), Condition 8, the Town established the buffer ordinances at least as stringent as those in the Neuse in the Jordan Lake Watershed. The Town agreed to establish 100-foot buffers on larger streams as part of the 1989 IBC. The Neuse and Jordan Lake Buffer Rules only require 50-foot buffers. Additionally, the Town's riparian buffer ordinance required protection of such buffers in the Jordan Lake Watershed prior to adoption of the Jordan Lake Rules. It should be noted that the General UTBs are not the same as the Neuse and Jordan Lake Buffers. For instance, in the Neuse Basin, the General UTBs do not overlap the 50' Neuse Riparian Buffer. In such areas the General UTB extends landward an additional 50' from the outside edge of the Neuse Buffer (see Zone 3 below) if a surface water is indicated on the 1:24,000 scale USGS Topographic Map. In Watershed Protection Overlay district the Town has established Specialized UTBs that are 50' feet from all perennial waters as shown on the 1:24,000 scale USGS Topographic Map for low density areas and 100' for high density areas. For detailed information on the applicability of UTBs, see Section 7.2.14 of the LDO.

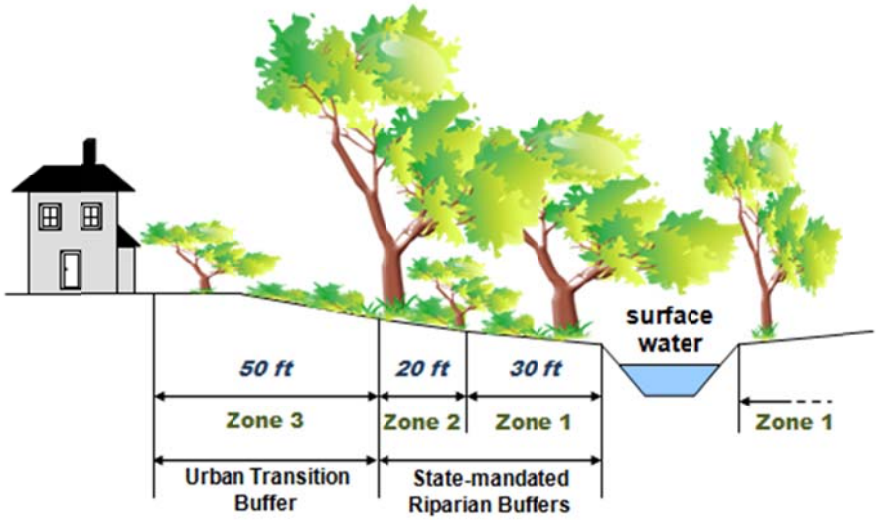

Figure 2.4 Riparian Buffer Zones

Enforcement

The Town has various means to enforce its ordinances and other requirements including fines, "cashing" letters of credit, or by withholding other approvals such as certificates of occupancy (CO). Most of the enforcement procedures related to stormwater are established in Chapter 11 of the LDO. BMP, UTB, and other riparian buffer and floodplain violations are typically addressed by the general provisions of Chapter 11. Erosion and sedimentation control or grading violations are handled under Chapter 11 as well, but under a separate section. Illegal discharges are handled under special procedures specific for such violations under Chapter 7.

Interaction with Other Town Departments

The Town's Planning Department is responsible for implementing the Town's new development review processes. Engineering Service/Stormwater has frequent meetings with the Town's Planning Department to make sure that overlapping ordinances are appropriately addressed. Examples of the topics of discussion are the requirement to screen BMPs, coordinating ways to provide aesthetically pleasing BMPs while meeting the design requirements for BMPs, establishing BMPs with multiple uses (e.g. treatment and amenity), curb and gutter use versus grassed swales, impervious cover limitations, and other zoning issues. Section 2C includes detailed descriptions of the interaction of the various Town Departments with the Town's stormwater program.

Going Beyond State and Federal Requirements

The Town's LDO has exceeded State and Federal requirements in many ways that benefit the Town and its citizens. The Table 2.5 below summarizes a few of the most significant ways the Town's LDO goes beyond State and Federal requirements.

Table 2-5 - Summary of Town Stormwater Requirements that Exceed State/Federal Requirements

State/Federal Requirement	Where Town goes beyond	Benefit	Date of Implementation
Neuse/Jordan Nutrient Management Rules	Town had nutrient reduction requirements (2001) in Jordan prior to being required by Jordan Lake Rules	Improves Water Quality Consistency of ordinances	2001
	Worked with EEP to have nutrient removing BMP retrofitted. First municipality to do so.	Improves Water Quality within Town ETJ (normally EEP provides projects in rural areas)	2005
Neuse/Jordan Riparian Buffer Rules	Town had surface water buffers in the Jordan Basin before required.	Improves Water Quality Protects Drinking Water Supply Consistency of ordinances	2001
	UTB (up to) 100 foot surface water buffers	Improves Water Quality Protects Drinking Water Supply Reduces flooding potential	2007
	No single family residential lots platted in buffer	Improves Water Quality Reduces nuisance flooding potential	2001
NPDES Phase II Stormwater Permit	BMP maintenance program	Highly maintained BMPs	2006
NC 401/SEPA Requirements	Town's MOA with DENR for a general Indirect and Cumulative Impacts Analysis (ICI)	Reduces Permitting Burden on Town	2005
NC Sediment and Erosion Control Act	Erosion control (12,000 square feet as opposed to 1 acre)	Less off site sediment potential	1990
National Flood Insurance Reform Act of 1994	No development allowed in SFHA or Future Conditions Floodplain. Requires residences be protected from flooding within the 100-year floodplain of streams with drainage areas of 50 acres or greater. Has 1 foot of additional freeboard above 100-year flood elevation.	Reduces risk for nuisance, structural, and catastrophic flooding	2000

C. Current Stormwater Program Goals and Vision

Vision and Direction of Program

"The Town of Cary stormwater program includes educational and regulatory initiatives to encourage environmentally sound development. Stormwater ordinances address floodplain management, watershed protection, illegal discharges and sediment and erosion control." (From townofcary.org). The Engineering Services/Stormwater Division is also responsible for engaging the citizenry; not only in being responsive to citizen requests and complaints, but in being proactive with the public and providing education and mitigation opportunities to prevent stormwater and flooding issues before they occur. Engineering Services/Stormwater Division also engages with the development community to ensure proposed development and redevelopment meets or exceeds water quality and quantity requirements set forth in the LDO. It is the desire of the Engineering Services/Stormwater Division to be a national leader in stormwater management at the national level,

Current Program Goals

The current program goals are taken from the stated goals within the 2013 budget for the Engineering Department and are adapted to focus on the stormwater program. The goals are as follows:

1. Provide or coordinate surveying, design, project management and construction administration services for a stormwater related capital improvement projects.
2. Address community issues and citizen inquiries related to public stormwater infrastructure problems beyond routine maintenance. Investigating flooding problems is a key component to this goal.
3. To continue to engage the public through the stormwater management programs' many educational and partnering programs.
4. Evaluate efficiency, operation and future needs for the public stormwater infrastructure.
5. Planning, review and inspection for stormwater systems through implementation of standard specifications and/or master plans.
6. Overall assessment of issues including floodplain management, development agreements and the maintenance of infrastructure records.
7. Enforcement or administration of requirements of the following acts, regulations, ordinances, policies, or programs:
    a. Floodplain Management (National Flood Insurance Act)
    b. National Pollutant Discharge Elimination System (Clean Water Act)
    c. Sedimentation Pollution Control Law of 1973
    d. Neuse River and Jordan Lake Rules
    e. Land Development Ordinance

Current Program Components

The primary components of the stormwater management program for the Town of Cary are:

- Meeting the requirements of its NPDES Phase II Permit
- Floodplain Management (administering Flood Prevention Ordinance)
- Storm Drainage Assistance Program through Policy 35 and Policy 146
- Managing Capital Projects (Culvert Replacements, watershed studies, stream restoration)
- Public Education and Outreach to address the needs and concerns of the citizens
- Administering Erosion and Sediment Control and development permit reviews and approvals
- Managing BMP Inspection Program
- Urban Transition Buffers

These components have been reviewed in depth for this master plan to determine if improvements are necessary. These results of these reviews and discussions are documented throughout this masterplan in detail.

D. Interdepartmental Coordination for Stormwater Management

This section contains a brief description of the stormwater-related responsibilities, functions, and interactions of the various Town Departments with major stormwater roles. The following Departments are discussed herein:

- Engineering Department
- Administration Department
- Parks Recreation and Cultural Resources Department
- Public Works and Utilities Department
- Planning Department
- Technology Services Department

The Town of Cary maintains an efficient organization of services divided into departments to serve the Town's citizens and businesses (See Figure 2.4 for official Town organizational chart as it relates to stormwater). One of the Town's many responsibilities is managing stormwater runoff. Almost every department interacts in some way with the Town's stormwater program; however, some departments have a larger role than others. The focus of this section will be to describe the roles of the various departments that have a more significant role related to the Town's stormwater program. These departments include: the Engineering Department; the Administration Department; the Planning Department; the Public Works and Utilities Department (PWUT); the Technology Services Department; and the Parks, Recreation, and Cultural Resources Department (PRCR). The Department of Administration is not specifically described in the Town's organizational chart, but is included in this discussion since it includes the Town Manager's

Office and houses the Town's Downtown Manager and Sustainability Manager. The purpose of this section is to describe stormwater related roles and responsibilities of each department.

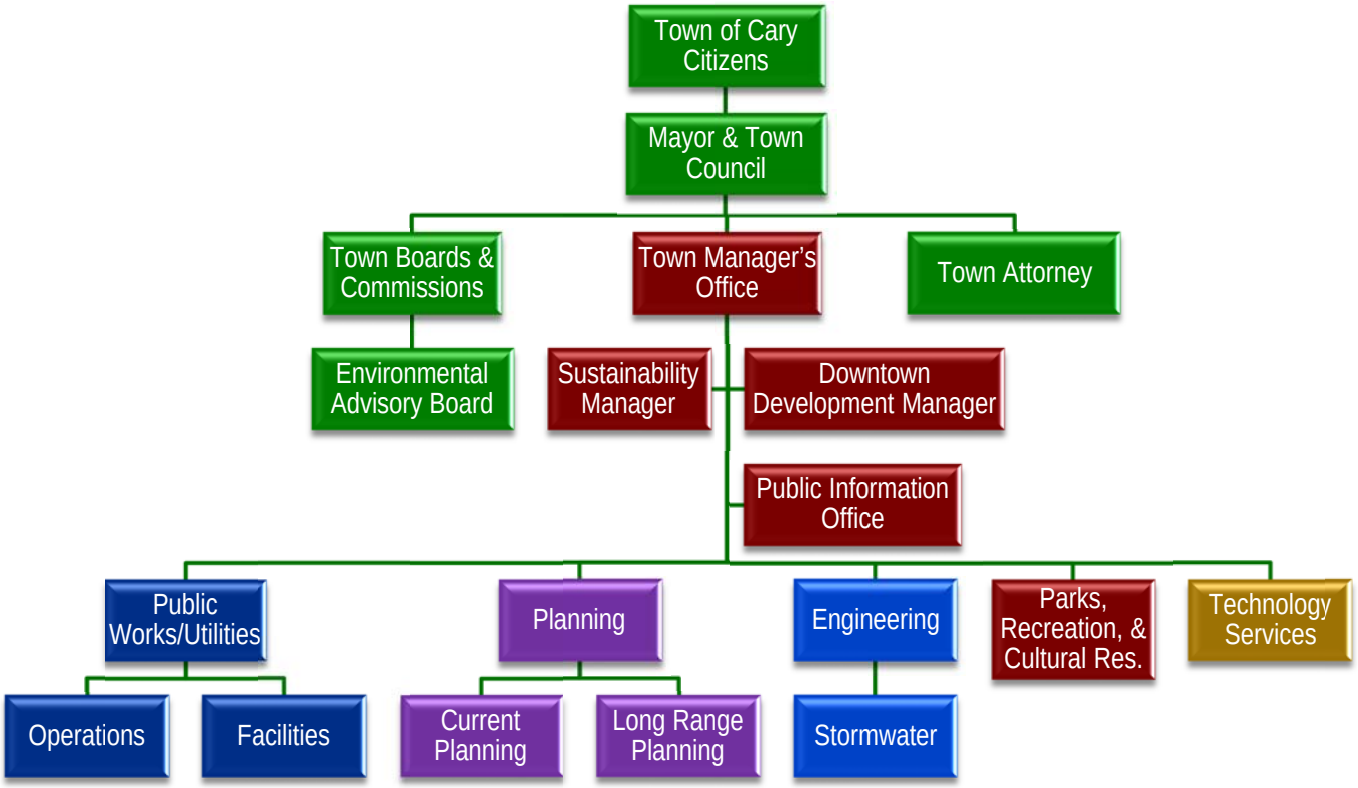

Figure 2.4 Town of Cary Organizational Chart (Departments/groups impacting Stormwater)

Engineering Department

Responsibilities and Functions

"The mission of the Engineering Department is to provide responsible leadership for controlled infrastructure development within the Town of Cary. It is the goal of the Engineering Department to provide quality service that results in the highest achievable levels of customer satisfaction and recognition for excellence." (From townofcary.org)

Overall, the Engineering Department is responsible for planning, design and construction of capital improvements for the Town, including: street improvements, right-of-way acquisition, stormwater and utility system improvements, utility plant expansion, thoroughfare planning, and management of development

contract and easement releases. The Engineering Department develops and implements the Town Standard Specifications and Details Manual for use by private development projects, as well as for Town projects. The Engineering Department is also responsible for developing solutions for infrastructure issues identified by the Town.

The Engineering Services/Stormwater Division has the following primary responsibilities:

- Private and Town-owned stormwater infrastructure design review.
- Internal design of some Town-owned stormwater projects.
- The construction oversight process of Town-owned stormwater projects and improvements.
- Management of FEMA regulated and "non-regulated" floodplain ordinances and requirements.
- Management of the Sediment and Erosion Control Program
- Management of compliance program for the Towns' NPDES Phase II permit.
- Management of the Town Urban Transition Buffers (UTBs) on surface waters.
- Oversight of the post construction BMP Inspection Program (See Chapter 4D).
- Responding to citizen concerns regarding stormwater infrastructure, flooding, and stream erosion.

The Engineering Technical Services Division provides graphical drawings and data management support to the Stormwater Division on an as needed basis in support of the above.

The plan review process ensures all stormwater plans meet design standards and comply with the Town's Land Development Ordinances as it relates to erosion and sedimentation control (E&SC), stormwater runoff control, surface drainage design, and flood control. The review considers applicable State and Federal stormwater program requirements. The review also takes into consideration citizen complaints and concerns regarding drainage, E&SC, and pollution issues.

The Environmental Protection Agency (EPA) and/or the Department of Environment and Natural Resources (NCDENR) requires municipalities to implement (or gives them the option of assuming) certain Federal and State stormwater programs. The Town's stormwater program complies with the N.C. Sedimentation Pollution Control Act of 1973 (SPCA), Flood Impact Program, Water Supply Watershed Rules, Neuse Basin Nutrient Management Rules, the National Pollutant Discharge Elimination System (NPDES) Phase II Stormwater Rules, and Jordan Lake Nutrient Management Rules. As part of the NPDES Phase II Stormwater program, the Town was required to have an NPDES Phase II Stormwater Permit. These regulations and interactions with State and Federal rules, laws, and programs are discussed in the detail in Chapter 2B. The Stormwater Division manages all of these programs and is also responsible for tracking and planning for future Federal and State requirements.

As part of meeting the regulations listed above, Engineering Services/Stormwater Division is also responsible for reviewing drainage and water quality BMP plans. Once a project is approved and under construction, the Stormwater Division is responsible for the Construction Inspection Program. The Construction Inspection Program ensures that erosion and sediment control practices are constructed and

operating according to the approved plans. The Town is also responsible for the Post Construction Best Management Practice (BMP) Monitoring Program. The Post Construction BMP Inspection Program confirms that post-construction BMPs are maintained and operating as designed. The Post Construction BMP Inspection Program is discussed in detail in Chapter 4D.

Additional responsibilities of the Engineering Services/Stormwater Division include infrastructure inventories, ensuring the Town's compliance with the National Floodplain Insurance Program (NFIP), Capital Improvement Projects (CIP) that fall within its purview, and flooding assessments for drainage systems not regulated by the NFIP. The Division is responsible for responding to citizen concerns that involve flooding, stormwater infrastructure, or issues with natural drainage ways, illegal discharge, and maintains a database that provides a record of the issues observed and actions taken.

Administration Department

Downtown Development Manager:

The Downtown Development Manager has the responsibility to initiate and coordinate with other departments to facilitate private redevelopment efforts to leverage the Town's investments in the core area and revitalization through physical improvements and downtown activities. It is important that stormwater requirements as well as drainage and flooding issues are addressed as part of the redevelopment and revitalization plans. The Downtown Development Manager is responsible for seeing that the stormwater requirements and infrastructure such as BMPs are consistent with the Downtown Plan and enhance the Plan. It is important, however, to understand that the Town must meet both State and Federal requirements for stormwater management as administered by the Engineering Services/Stormwater Division.

Sustainability Manager:

The Sustainability Manager is responsible for identifying opportunities for the Town to lead by example on sustainability. Current projects are focused on assuring that Town operations are run efficiently and effectively with attention to the key values of environmental stewardship, cost consciousness, and creativity. The sustainability manager also has the ability to advise other departments on potential improvements to their stormwater-related practices such that they accomplish their individual responsibilities in a sustainable and low impact manner. Effective and efficient stormwater management contributes to a sustainable community and therefore complements the role of the sustainability manager.

Public Information Office

The Public Information Office was created to develop and direct a comprehensive communications effort by building and maintaining beneficial relationships between the Town of Cary and our many publics through appropriate, consistent, timely, complete, and accurate information sharing. The Public Information Office's (PIO) responsibilities include: media relations, research, Cary TV 11, advertising, graphic standards oversight, emergency public information, communications planning, the Bud newsletter, cable television regulation, film/video/photography regulation, and the content for www.townofcary.org. The PIO manages

communication to the public regarding the Town's stormwater programs through venues such as the *Bud Newsletter*, development of educational videos, social media, and the Town's website. The Engineering Services/Stormwater Division will also work with PIO as necessary in preparation for certain public meetings and in developing press releases.

Environmental Advisory Board (EAB):

The Environmental Advisory Board provides feedback and advice to council on policies, ordinances and administrative procedures regarding environmental protection and the conservation of energy and natural resources. The Board supports the Town of Cary's Statement of Values, one of which states: "We will protect and preserve our environment. We will be good stewards of our finite natural resources." They also demonstrate outstanding environmental stewardship and leadership.

The Board's general scope of work is to identify and assess policy alternatives for the Council to consider as part of the Town's strategy to expand leadership and implement cutting edge applications and standards of environmental stewardship.

The EAB is also a point of contact between the Town citizens and Town staff regarding environmental concerns. The EAB is a forum for citizens to provide recommendations to the Town Council and works with Town staff liaisons to provide recommendations and feedback regarding policy decisions and future direction of the stormwater management program. The EAB is currently responsible for providing a review and feedback of this stormwater master plan.

Parks, Recreation and Cultural Resources (PRCR) Department

The mission of the Cary Parks, Recreation & Cultural Resources Department (PRCR) is to serve, educate, and enhance life for the citizens of Cary (from townofcary.org). Among its numerous programs, PRCR is responsible for much of the Town-owned properties. While some of this land has been dedicated for specific recreational and aesthetic purposes, the PRCR Department maintains some currently un-allocated property as well as greenways and other areas often within or adjacent to riparian buffers/areas. Many of the facilities under PRCR management contain stormwater BMPs. PRCR is also responsible for projects that include the design and installation of BMPs and drainage infrastructure. Many of the properties include FEMA-regulated floodplains and floodways as well. Additionally, PRCR-managed properties provide opportunities to be used independently for BMPs or stream restorations or as sites for potential BMP retrofits as required to meet certain State and Federal regulations such as NPDES Phase II Stormwater. Such BMP retrofit opportunities are discussed in detail in Chapter 5. PRCR-managed BMPs and drainage infrastructure maintenance is performed by PWUT staff.

Public Works and Utilities Department (PWUT)

The PWUT has a wide range of responsibilities, including: water and wastewater system operations; solid waste and recycling collection; conservation programs; and maintenance of Town streets, parks, buildings and vehicles (from townofcary.org). PWUT's role in the Town's stormwater management program is both critical and broad based. PWUT's major stormwater-related roles are conservation, inspection, and maintenance of all stormwater infrastructure and BMPs within Town property or right-of-way (ROW). The Department also responds to citizen requests and concerns by maintaining a database to track work orders and record citizen requests. Coordination between PWUT and Engineering is very important and the departments maintain a strong relationship. A detailed description of the Town's stormwater maintenance program and policies can be found in Chapter 3. The following is a brief summary of that information as it relates to the Town's stormwater program.

Facilities Division

The Facilities Division manages stormwater maintenance at properties owned by the Town of Cary, including BMPs, Parks, right-of-ways (ROWs), and streams (typically associated with greenways). Although the Operations Division actually performs much of the maintenance activities, the Facilities Division oversees stormwater maintenance activities for Town-owned property including debris removal from the collection systems, stream blockage removal, and stormwater BMP maintenance through a maintenance request database. In addition, all Town-owned BMPs are inspected annually by the Facilities Division, though the Operations Division is responsible for carrying out any identified maintenance needs.

Operations

The Operations Division performs the maintenance of the Town of Cary's stormwater infrastructure. The Operations Division also responds to a variety of citizen requests related to stormwater and stormwater infrastructure. The Operations Division utilizes the PWUT work order database for monitoring responses to citizen requests, assessing the status of the infrastructure related to the request, and then determining appropriate methods of mitigation. If the needed repairs or maintenance falls outside of Town-owned property or right-of-way (ROW), then Operations staff often provides limited technical advice to the owner.

Stormwater infrastructure maintenance and minor repairs are typically performed by Operations Division dedicated wastewater/stormwater maintenance staff and equipment. This allows for an efficient use of Town resources by not maintaining redundant staff and equipment to perform similar maintenance and minor activities. The most common response-based maintenance activity involves clearing pipes and catchment devices that have become clogged with debris. PWUT has a capital budget dedicated specifically to stormwater infrastructure maintenance and repair within Town-owned property and ROW. PWUT does not have capital budget for maintenance, repairs, or improvements beyond Town-owned properties or ROWs. Where appropriate, most maintenance and repair projects are completed by Operations Division staff; however, some projects that involve larger issues such as large box culverts are contracted out to private contractors.

In addition to the systematic assessment or resolution of isolated maintenance concerns, the Operations Division performs routine maintenance for infrastructure with known routine maintenance needs. If a large storm event such as a hurricane is forecast, the Operations Division will often proactively address known high-maintenance areas prior to the storm's arrival. Additionally, the Operations Division often responds to citizen flooding complaints that are not on Town-owned properties and provides assessments and advice for such citizens.

Water Resources

The Water Resources Division provides planning and implementation to address both water and wastewater needs for the Town. The Division is also responsible for the Town's conservation programs. Water Resources sees stormwater runoff as a source of raw water in reservoirs and is concerned about water quality issues as well. As part of its planning efforts, the Water Resource Division is looking at potential means of harvesting rainwater (in regional BMPs for instance) to meet some irrigation needs. This is discussed in detail in Chapter 4.

PWUT Administration

The Administration Division administers the other divisions and is the primary point of contact between the PWUT and the Town Engineering Department, including Engineering Services/Stormwater.

Planning Department

The Town's Planning Department is responsible for present and future land use and transportation plans, affordable housing, protection of open space, and other development initiatives. The Planning Department also reviews private development projects, including rezoning proposals and site/subdivision and sign plans (from townofcary.org). The Planning Department has two main divisions, Current Planning and Long Range Planning, both of which interact with the Town's stormwater program. The Current Planning Division is responsible for developing and enforcing the zoning and site and subdivision plan ordinances, as well as administering the site plan approval process. The Long Range Planning Division is responsible for developing Town's land use plans and transportation plans among other responsibilities. In regards to stormwater, the Department ensures aspects such as screening and appearance of BMPs are consistent with the Land Development Ordinance (LDO). It is also responsible for assuring compliance with site imperviousness requirements as described in the LDO. However, Engineering Services/Stormwater Division reviews BMP and stormwater infrastructure designs as well as sedimentation and erosion control plans as part of the site and subdivision plan review process. Because the Planning Department is oversees both land use planning and the site plan approval process, it has the opportunity to assist the Engineering Services/Stormwater Division in the implementation of the Town's stormwater program and goals.

Technology Services Department

The purpose of the Technology Services Department is to serve as a consultant to the Town Council, Town Manager, other departments and staff of the Town of Cary in the management and use of information technology. This provides better and more cost effective services to the citizens of Cary. The duties of this department include providing tools and training for data analysis; creation, acquisition, development, maintenance, distribution, training and exchange of spatial or geographic information; support for all areas of communication including voice, radio, and data; and enhancing and improving information exchange from department to department and to the citizens of Cary. Using GIS, the Technology Services Department maintains information on BMPs, road networks, buildings, town limits, buffers, and other town infrastructure. The Technology Services Department also maintains the BMP Inspection databases and updates the conveyance inventories. The Department also provides GIS support to the Engineering Services Department.

E. Compatibility of SWMP with Long-Range Departmental Plans

Cary's Comprehensive Plan lays out the development goals for all aspects of the Town and is organized into eight volumes. Some, but not all, of the volumes have aspects that relate to the Town's stormwater management program. The volumes that interact with the stormwater program as well as the general interactions are summarized below.

Volume 2: Area Plans

The Area Plans are included in volume 2. Seven areas of Cary have unique plans based on their individual characteristics. These areas include: Carpenter Community, Northwest, Southeast, Southwest, Walnut Street Corridor, Town Center, and Northwest Maynard Activity Center Area Plans.

Carpenter Community Area Plan

The Carpenter Community Area Plan's main goal is to maintain and restore the historic features of the neighborhood, while providing convenient access to residential areas, shopping, and the Research Triangle Park (RTP). It incorporates mainly Low Density Residential (LDR) areas, with some Medium Density Residential (MDR) areas. The desire to maintain a historic look and a focus on LDR development means that green areas or open space will be maintained, which would help maintain high water quality and lowers the volume of stormwater runoff. This planning area drains both to Jordan Lake and to the Neuse River and is subject to the Neuse Basin Rules and Jordan Lake Rules; therefore, nutrient reduction BMPs are required for most new development. The requirements of these Rules and the nature of the development plans are intended to protect water quality.

Northwest Area Plan

The Northwest Area Plan strives to balance higher density development with open space areas and multi-use paths connecting residential areas and places of employment in RTP. This area is expected to experience a high degree of development associated with RTP as a goal to reduce regional sprawl and encourage transit use. Impervious areas are expected to grow which would increase the volume of stormwater runoff; maintaining a balance between development and open space protects water quality. This planning area, like Carpenter Community, drains to Jordan Lake and the Neuse River and would be subject to Jordan Lake Rules and Neuse Basin Rules. The requirements of these rules would protect water quality and reduce stream erosion potential; however, as with any concentrated area of development, water quality from the immediate area could diminish due to increased pollution from runoff and erosion. If the plan does reduce regional sprawl, then the localized impacts would be balanced on a regional basis.

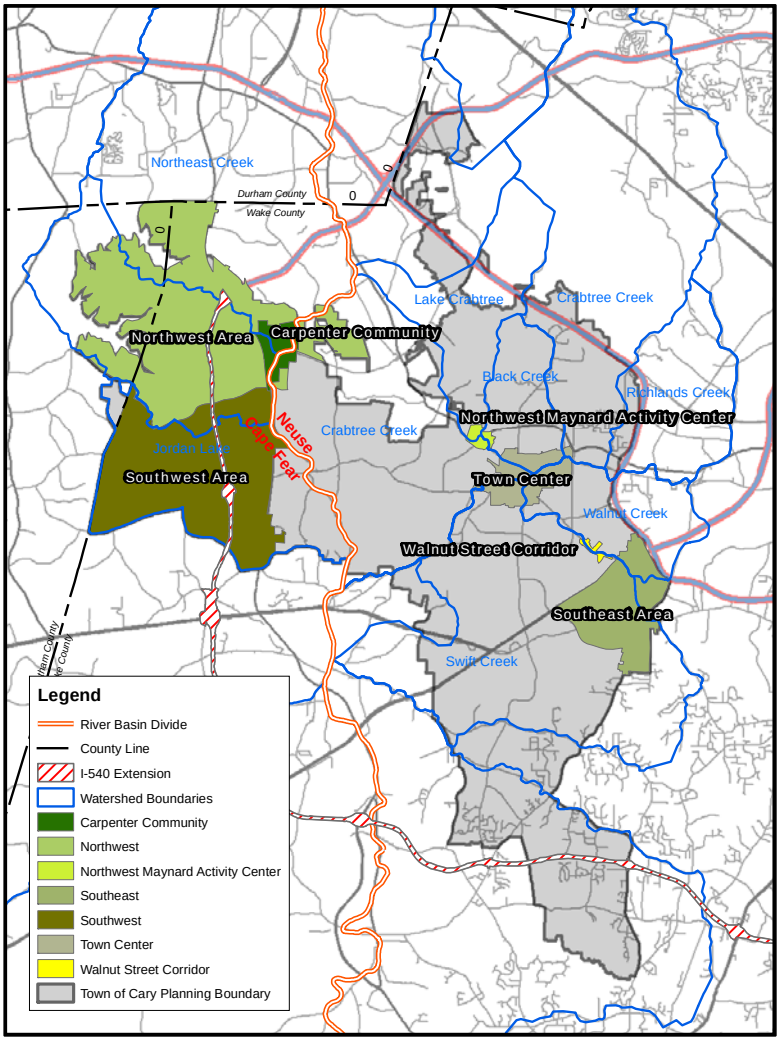

Figure 2.5 - Overview of the Town of Cary Area Plans

Southeast Area Plan

Four mixed-use activity centers would be created in the Southeast Area Plan. These centers are intended to fulfill many needs and are proposed to be developed with a range of housing types. This plan also provides open space areas and multi-use pathways to connect pedestrians and bicyclists with various areas of Cary and Raleigh to encourage alternative transportation. The increased development could be balanced with a decreased dependence on vehicles for transportation and an increase in open space areas and greenways, which would be positive for water quality as well as the volume of runoff. A portion of this planning area drains into the Swift Creek watershed which includes limits for development density (impervious cover). It is required that this plan addresses these additional density requirements. New development in this area is also required to comply with the Neuse Basin Rules and Swift Creek Land Management Plan so water quality should be protected.

Southwest Area Plan

The Southwest Area Plan is intended to compliment the Northwest Area Plan by offsetting the higher density development in the Northwest Area Plan with environmental protection and LDR development and also contains provisions for Low Impact Development (LID),. In this plan, the location and amount of development are controlled to provide significant open space and to protect the water quality of Jordan Lake reservoir. Preserving open space and protecting the Jordan Lake watershed will help balance the increased development of other areas of Cary. The rules that affect this area include Jordan Lake Rules and Water Supply Watershed Rules which will require nutrient reduction and pollution and volume control for new development.

Walnut Street Corridor Area Plan

The Walnut Street Corridor Plan lays out a strategy for the development and redevelopment of the Walnut Street corridor for residential and commercial uses. This plan minimizes impact and provides a landscape buffer for existing residential areas. The development of this corridor would have little impact on water quality and quantity since the amount of impervious area will increase very little, especially when considering the relatively small size of this corridor. This is subject to the Neuse Basin Rules and the Swift Creek Land Management Plan.

Town Center Area Plan (TCAP)

Although some open space areas are desired, the majority of Town Center Area Plan focuses on High Density Residential (HDR) and commercial property redevelopment. The plans for this area would result in an increase in runoff that would not be offset by the creation of open areas. As is common in areas that are heavily developed without offsetting open space areas, there is potential to negatively impact water quality. Innovative approaches to managing stormwater, as described in Section 5C, can be used to address potential negative water quality impacts. The entire Town Center Area drains to the Neuse River and would be subject to the Neuse Basin Rules. A portion of the Town Center Area drains to Swift Creek and would be subject to Swift Creek TMDL. A plan is also being developed (as of the date of this Mater Plan) for the downtown core that will likely require a high amount of impervious cover. Section 5C includes recommendations for addressing the impervious cover both from a water quantity and water quality point of view. Section 6B describes some BMP retrofits that can also potentially address some of the water quantity and water quality issues created by increased impervious cover.

Northwest Maynard Activity Center Area Plan

The Northwest Maynard Activity Center Plan encompasses a relatively small area and focuses on the development of an area with a mix of shopping, offices, and medium-density housing. Because of its small size, the development will have a relatively small impact on water quality and quantity despite an anticipated increase in impervious areas. This area is subject to the Neuse Basin Rules and is part of the Black Creek watershed. Although the Black Creek watershed does not have an established TMDL, the BCWA plan was established to improve water quality.

Table 2.6 - Area Plan Summary Matrix

Area Plan	Area (acres)	River Basin	Primary Subbasins	Rules the Area is Subject To
Carpenter Community	475	▪ Cape Fear ▪ Neuse	▪ Jordan Lake	▪ Neuse Basin ▪ Jordan Lake ▪ Water Supply Watershed
Northwest	8,160	▪ Cape Fear ▪ Neuse	▪ Jordan Lake ▪ Kit Creek ▪ Panther Creek	▪ Neuse Basin ▪ Jordan Lake ▪ Water Supply Watershed
Southeast	2,000	▪ Neuse	▪ Swift Creek ▪ Walnut Creek	▪ Neuse Basin ▪ Swift Creek TMDL ▪ Swift Creek Land Management Plan
Southwest	5,700	▪ Cape Fear	▪ Jordan Lake ▪ White Oak Creek ▪ Panther Creek	▪ Jordan Lake ▪ Water Supply Watershed
Walnut Street Corridor	55	▪ Neuse	▪ Walnut Creek ▪ Swift Creek	▪ Neuse Basin ▪ Swift Creek TMDL ▪ Swift Creek Land Management Plan
Town Center	950	▪ Neuse	▪ Walnut Creek ▪ Swift Creek ▪ Black Creek ▪ Crabtree Creek	▪ Neuse Basin ▪ Swift Creek TMDL ▪ Swift Creek Land Management Plan ▪ BCWA Plan
Northwest Maynard Activity Center	125	▪ Neuse	▪ Black Creek ▪ Crabtree Creek	▪ Neuse Basin ▪ BCWA Plan

Volume 3: Parks & Recreation and Cultural Resources Plan

It should be noted that the Parks & Recreation and Cultural Resources (PRCR) Plan is currently under revision and subject to change. In the plan, there is a proposal to increase the amount of per capita open area from 7.5 acres per 1000 residents to 11.1 acres per 1000 residents. PRCR also wishes to investigate new areas for parks and greenways and increase the connectivity of these areas. Another goal is to manage the Town's natural resources effectively. This plan could help maintain water quality by preserving pervious areas for runoff and limiting the amount of impervious areas that could be used for development. Overall, the PRCR plan integrates well with the goals of the Town's stormwater program.

Volume 4: The Growth Management Plan

The Growth Management Plan was originally published in 2000 and will soon be updated; however, this plan describes the need for new wastewater treatment facilities and allocation of water to meet the town's growing potable water demands. Long range plans for the Town's potable water needs are currently being developed by Public Works and Utilities and are described in more detail below.

Volume 6: The Transportation Plan

The Transportation Plan describes an improvement to environmental quality by increasing pedestrians' and bikers' ability to safely travel to residential, commercial, and office areas. It also lays out a plan to reduce impacts of roads on environmental and natural features. Unless BMPs are used, increasing impervious areas will have a negative impact on water quality and will increase the amount of stormwater runoff and pollutant loading; however, the desire to encourage multi-modal transportation and increase the amount of greenways and other open areas could help offset this effect by reducing impacts from fossil fuel emissions.

Volume 7: The Open Space Plan

The Open Space Plan describes the desire to preserve Cary's environmental resources by protecting its forest, natural open spaces, wildlife habitats, cultural resources, and water quality which integrate well with the goals of the Town's stormwater program. This plan provides Cary with water quality protection and flood prevention by maintaining infiltration to reduce runoff volume. Additionally allowing for open space also maintains for nutrient cycling mechanisms and prevents generation of other pollutants associated with impervious cover.

Public Works and Utilities Involvement in the Stormwater Management Program

Public Works and Utilities (PWUT) is currently working on developing its long range plan for water supply and water use for the Town. PWUT views stormwater as a water source for non-potable water needs. Rainwater harvesting could be used to relieve some of the demand for potable water especially during times of high demand. One means of harvesting rainwater would be to collect water from the roofs of single family residential buildings and store it in individual cisterns. This method, according to a study performed by CH2M HILL, could not completely satisfy all water needs for irrigation. A relatively high cost per residence and little impact on water demand makes this method unfavorable. In certain situations, developers may consider providing a rain water harvesting system for an entire development. An example is described in Section 4C. Such a system could be implemented for multi-family housing developments, for instance, where there is a single entity maintaining the landscaping.

Conclusion

Overall, these area plans consider water quality and quantity issues. By a combination of ordinances and balancing development and open space areas, water volumes can be controlled and a high water quality can be achieved.

F. Review of Existing Maintenance Policies

Priority Response Policy

The Town of Cary is committed to maintaining the stormwater conveyance infrastructure within the Town owned ROW. The Operations Division group maintains sufficient staff to identify issues and maintain the stormwater infrastructure within the ROW on an as-needed basis. Eighty-five to ninety percent (85% - 90%) of Operations Division' stormwater related activities are in direct response to citizen reports. Operations Division utilizes the PWUT database to identify and prioritize maintenance for specific segments of pipe and other infrastructure features demonstrating signs of deterioration or deficiency. The identified features are then replaced in order of priority. In addition, Operations Division maintains approximately 10% - 15% of the system on a routine basis, including all larger pipes/culverts/bridges that are 72 inches in diameter or larger. These systems are also inspected annually by PWUT.

Stormwater Systems Maintenance

The PWUT database includes work orders and the outcomes that are mostly generated by citizens reporting maintenance needs. The majority of the maintenance required involves sediment and debris buildup at stormwater intakes, but the need for infrastructure repairs or improvements are identified and addressed. The Town uses the database to identify trends in maintenance requests. For example, the Operations Division reports that citizen requests for maintenance are more common in the older neighborhoods of Cary and often require recurring maintenance to prevent sediment and debris accumulation from blocking these systems. Additionally, the Operations Division often responds to citizen requests for NCDOT owned systems. Division staff will contact NCDOT and inform them of problems.

Combined Service Structure

The Operations Division capitalizes on the similarities between wastewater and stormwater maintenance processes to eliminate redundancies by using the same staff and equipment to maintain and repair both the wastewater and stormwater infrastructure. The primary maintenance required of both stormwater and wastewater infrastructure is the clearing of pipe blockages using a vacuum truck and water jets. Sharing equipment and maintenance crews eliminates the need for multiple instances of expensive equipment; however, it also means wastewater-related activities must have priority over stormwater-related activities.

Service on Private Property

While the Operations Division does not typically inspect and maintain stormwater infrastructure on private property, the Town does maintain two programs to assist citizens with drainage improvements on their own property. These policies, Policy Statement 35 *Storm Drainage Improvement Requests*, and Policy 146 *Stormwater Capital Improvement Requests,* were implemented in 2005 and updated in 2011 and both utilize a ranking system to ensure stormwater issues receive financial assistance relative to their severity. Historically, the town had a policy of considering upgrading pipes on private property if the citizens paid for materials. This policy expired 15 years ago and was replaced with Policy 35, the current Town cost-share program. These programs are managed through the Engineering Department.

G. Extent of Service (EOS) and Level of Service (LOS)

Two key components that define the Town's stormwater management program are extent of service (EOS) and level of service (LOS).

The EOS defines the components of the stormwater conveyance system that are maintained by the Town. The LOS defines the services the Town provides to maintain the stormwater conveyance system.

The stormwater conveyance system may be divided according to who owns the land on which it is located. For this purpose, there are essentially four different types of property, including:

1. Town-maintained right-of-way (ROW) or Town property
2. Private property that has a private drainage easement on it, which allows a conveyance pipe or open channel carrying pubic water to pass through private property
3. Private property without a private drainage easement
4. NCDOT right-of-way

Public water may be defined as the portion of stormwater runoff that emanates from publicly-owned land, including rights-of-way. This definition shall be used to distinguish between stormwater runoff that originates on private property and that which originates on public property.

Extent of Service

Currently, the Town's EOS is within the town-owned ROW or Town-owned property. As discussed in Section 3C, the town maintains all stormwater infrastructure within this area. Sometimes this area is not easily identifiable in the field, in which case one of the following is used:

- reliance on surveyed legal boundaries
- ten feet beyond the curb outlet
- first sanitary sewer cleanout
- water meter

The latter two markers are frequently located on the ROW line.

The Town has a long-standing policy in place, which is documented on property plats and on the Town Storm Drainage Specifications and Details (Section 08000), that the Town "shall maintain only the storm sewer systems within Town maintained right of way and on Town property." The Town maintains the stormwater conveyance system within the ROW but it does not maintain stormwater infrastructure on private property, including that which has a private drainage easement. As will be seen in the following section, maintaining the ROW only is the normal practice by many other municipalities. The property plats where there is a drainage easement includes this statement for the Certificate of Ownership and Dedication:

This certifies that the undersigned is (are) the owner (s) of the property shown on this map, having acquired title thereto by deed (s) recorded in the office of the register of deeds of Wake County, North Carolina, or otherwise, as shown below and that by submission of this plat or map for approval, I/We do dedicate to the Town of Cary for public use all street easements, rights-of-way and parks shown thereon for all lawful purposes to which the Town may devote or allow the same to be used and upon acceptance thereof and in accordance with all Town policies, ordinances, and regulations or conditions of the Town of Cary for the benefit of the public; said dedication shall be irrevocable (provided dedication of easements for storm drainage are not made to the Town of Cary but are irrevocably made to the subsequent owners) of any and all properties shown hereon for their use and benefit.

Though the Town does not maintain stormwater conveyance infrastructure on private property, the Town staff have demonstrated a willingness to advise the property owner as much as possible as to their options and assist as much as possible within the framework of the Town's jurisdiction.

It is widely accepted that the Town does a very good job of maintaining conveyance systems within the Town ROW. They respond promptly to citizen calls and routinely maintain larger pipes.

Level of Service

The LOS may be defined in two ways: maintenance LOS and performance LOS. Maintenance LOS has to do with how the system is managed, generally through routine maintenance before there are blockages/problems, or through response-based maintenance after notification that a problem exists. The Town's maintenance LOS is predominantly (approximately 85%) response-based.

Performance LOS has to do with, for example, conveying a certain storm event without surcharging into manholes or overtopping roads. For the Town of Cary, this is the 10-year storm event for street drainage pipe sizing. For cross-street drainage, the performance LOS increases to the 25-year storm. For areas impacting floodplains, the 100-year storm should be conveyed.

Another LOS that is being examined as part of the Stormwater Master Plan study is preventing flooding of buildings by the 100-year storm event. In this case, the LOS could be defined as no crawl space flooding within or beyond the 100-year floodplain during the 24-hour storm event with a 100-year recurrence interval.

H. Evaluation of Potential Changes to EOS and LOS

The development of an updated Stormwater Master Plan is an appropriate time to consider changes to the Town's EOS and LOS. Changes to the EOS and LOS would require changes to the Town's stormwater management budget, so decisions must be considered in context of what benefit or cost they will provide. This section explains the potential changes to EOS and LOS that will be considered and Section 6A will include the economic analysis of how much the potential changes would cost. The Town will decide on potential changes when they have a clearer understanding of the resources required.

Comparison to Other Programs

Table 2.7 shows the EOS and LOS for a number of municipalities in North Carolina and beyond. The comparative budgets and programs show that the Town of Cary is doing a good job of providing the core services to maintain the stormwater conveyance system. Typically, the municipalities that offer enhanced services do so through additional funding obtained via a stormwater utility. The Town may decide that the current protocols for maintaining the conveyance system are the best approach, particularly if they decide a stormwater utility is not a good alternative for the Town at this stage.

One municipality that has a utility but is expanding their EOS/LOS is the City of Wilmington, NC. Specifically, Wilmington is determining how it will expand its regular maintenance activities to private property with drainage easements. Wilmington is doing this on a case-by-case basis or staged approach because it takes time to complete the detailed analysis that informs the decision about where the City will assume maintenance responsibility. Also, it allows Wilmington to incrementally expand its services. If an area is annexed, a factor they use is to analyze the stormwater conveyance system of the annexed area to determine how much public water is conveyed through areas with drainage easements. Similarly, if the City conducts a subwatershed study, they may evaluate expanding their maintenance responsibilities in that larger area.

Wilmington does not use a set cutoff percentage to determine whether they will maintain a section of the system; rather, they use the criteria of a 'bucketful' versus a 'teaspoonful' of public water but also use best professional judgment (BPJ) when making the final decision. There may be times when the volume of runoff from the public property is minor but it is critical for that segment of drainage infrastructure to function correctly for safety, flooding, or property accessibility reasons. If so, Wilmington maintains the components of the system that are within drainage easements. Also, if a conveyance pipe crosses a public road that the City is responsible for, then typically Wilmington will continue to maintain the conveyance system downstream when it is within a drainage easement.

Some external factors that are part of Wilmington's decision framework for maintaining stormwater infrastructure include the presence of obstacles (e.g., sheds, fences, etc.) and if there are flooding problems. The City would be less inclined to maintain the system if there are obstacles to do so, and would be more inclined to maintain the system if there are risks of flooding streets or houses.

As shown in Table 2.7, the Town of Cary's program is similar to the Town of Chapel Hill's in terms of EOS and LOS. Chapel Hill's EOS includes maintenance of stormwater conveyance on some private property at lower elevations where flooding is common. Cary could consider expanding their EOS to include areas where flooding is common, or such areas could be addressed through Policy 35 if the infrastructure is the cause of the flooding. The Cities of Raleigh and Durham also have similar programs to the Town of Cary in that they primarily limit maintenance to the ROW, provide technical assistance outside of the ROW, and provide cost share to fix infrastructure problems on private property. Chapel Hill, Durham, and Raleigh have a stormwater utility.

The other programs listed in Table 2.7, Fort Collins, CO and Naperville, and Danville, IL, tend to maintain the conveyance system in the ROW and within drainage easements, and also use a routine approach to maintenance. Only Fort Collins has a stormwater utility. One additional measure Fort Collins does that may warrant consideration by the Town of Cary is inspection of private conveyance infrastructure every three years with recommendations to improve deficiencies.

Chapter 6 includes an economic analysis that will consider changes to the LOS and EOS with estimates of what those changes will cost.

Table 2.7 – Comparison of LOS and EOS with Other Municipalities

Municipality	Citizen to Stormwater Staff Ratio	Funding	LOS and EOS
Town of Cary	• 142,000 citizen population • 79.2 square miles • Eight employees work on stormwater management. • 17,750:1 citizen to staff ratio.	• Annual Budget - $2.37 million • Funding through general and operating funds	LOS: • 85% response-based maintenance • 15% routine maintenance. EOS: • Maintain ROW only • They provide technical assistance outside ROW. • Cost share (50/50 outside for ROW if structure is threatened.
Chapel Hill, NC	• 57,000 citizen population • 19.8 square miles • Eight employees work on stormwater management. • 7,125:1 citizen to staff ratio.	• Annual Budget - $1.9M • Funding generated through the Stormwater Management Fund (Utility fee).	LOS: • 80% response-based maintenance • 20% routine maintenance. EOS: • Maintain ROW only. • They provide technical assistance outside ROW. • Do not maintain the system on private property, except under unusual circumstances.
Raleigh, NC	• 416,000 citizen population • 115.6 square miles • 42 employees work on stormwater management. • 9,900:1 citizen to staff ratio	• Annual Budget - $5.2 million for stormwater program and $3.1 million for stormwater maintenance. Does not include capital improvement funding • Funded through a stormwater utility fee.	LOS: • More routine than response-based maintenance EOS: • Maintain ROW only. • They provide technical assistance outside ROW. • Cost share (75% City/25% Homeowner) for infrastructure problems or water quality improvement.

Durham, NC	• 233,000 citizen population • 94.9 square miles • 23 employees work on stormwater management. • 10,130:1 citizen to staff ratio	• $2.1 million for operating budget and approx. $3 million more for maintenance. • Funded through a stormwater utility.	LOS: • 25% response-based maintenance • 75% routine maintenance. EOS: • ROW only • Technical assistance outside of ROW • Cost share discretionary program (80% City/20% homeowners and 75% City/25% commercial) •
Wilmington, NC	• 107, 000 citizen population • 51 square miles. • Ten employees work on stormwater management. • 10,700:1 citizen to staff ratio	• The stormwater budget is approximately $7.6M. T • The program is largely funded through a utility which collects approximately $5.9M in fees.	LOS: • 75% proactive (routine). Open channel maintenance is almost all routine. • 25% reactive. EOS: • ROW maintained • Policy outside of the ROW is to look at the amount of public water in the system (“teaspoon or bucket”). If there are flooding problems with streets or houses that elevates the City’s interest in maintaining the system in that vicinity.
Naperville, IL	• 142,000 citizen population • 35.5 square miles.	• $1.2M in operating costs for FY11-12 and FY12-13. Planning & engineering not included. • Another roughly $1.2M for capital improvement. • They do not have a utility.	LOS: • Mainly routine, though some is response based. EOS: • Naperville maintains pipes on residential property if they connect to the City system. However, if the pipe is on commercial property and it drains to a detention basin, the City would not maintain it.

Danville, IL	• 32,500 citizen population • 18 square miles. • Two employees work on stormwater management. • 16,250:1 staff to citizen ratio.	• The stormwater budget is roughly $750K. • They do not have a utility.	LOS: • 75% routine maintenance • 25% response-based maintenance. EOS: • Maintenance is done within the ROW and private drainage easements.
Fort Collins, CO	• Serves population of 143,986 • 53 square miles. • Twelve employees work on stormwater management. • 12,000:1 staff to citizen ratio.	• The stormwater budget is approximately $14M annual. • The program is funded through a stormwater fee.	LOS: • 80% routine maintenance • 20% response-based. EOS: • Maintains all City-owned drainage facilities. Privately-owned and maintained drainage facilities are inspected by the City at least once every three years and any noted deficiencies are submitted to the owner with instructions on the required maintenance.

In terms of the population per staff focused on stormwater management, Cary has the highest ratio at 17,000:1. This demonstrates that the Town of Cary staff are able to serve more citizens with their program at a high level of efficiency compared to their peers.

A table is provided to summarize the LOS and EOS provided by the surveyed municipalities. This table generally shows that there are core services provided, such as maintenance within the ROW and technical assistance outside of the ROW, as well as extra services that may be offered. Extra services for many municipalities are typically funded by a stormwater utility.

Table 2.8 – EOS/LOS Policies of Several Municipalities

Municipality	ROW Maintenance	Technical Assistance Outside of ROW	Maintenance Outside of ROW	Percent of Routine Maintenance	Cost Share Percentage
Town of Cary	Yes	Yes	No	15	50
Chapel Hill, NC	Yes	Yes	Rarely	20	Installation
Raleigh, NC	Yes	Yes	No	60	75
Durham, NC	Yes	Yes	No	25	75-80
Wilmington, NC	Yes	Yes	Sometimes	75	No program
Naperville, IL	Yes	Yes	Sometimes	60	No program
Danville, IL	Yes	Yes	Yes	75	No program
Fort Collins, CO	Yes	Yes	Inspection only	80	No program

Note: Only Cary, Naperville, and Danville, IL do not have a stormwater utility fee.

Potential Changes to the Town of Cary's LOS/EOS

Several changes that the Town is considering as part of the Stormwater Master plan include:

- Potential inclusion of private drainage easements in EOS based on public water percentage
- Potential change in LOS to include more routine maintenance.

Each of these will be discussed further in the following subsections.

Potential Inclusion of Private Drainage Easements in EOS

For the EOS, the Town may consider maintaining stormwater conveyance infrastructure on private property where a drainage easement exists. A key factor in this decision will be what portion of stormwater runoff conveyed by a pipe is public water. The implication is that if a larger percentage of runoff within the pipe (or overall infrastructure) is public water then the more likely the Town would be to assume responsibility for maintaining it. The difficulty in making these determinations is two-fold. First, the drainage easements are not electronically-archived (i.e., not maintained as a GIS dataset) by the Town, so analysis regarding which pipes should be considered is not straight forward. Second, determining what percentage of runoff carried by the pipe is public water is not readily determined on a Town-wide basis. This is because drainage areas must be determined for each of thousands of pipes and then the drainage area must be delineated according to what portion is public property. The Town may later elect to add pipes within drainage easements on a case-by-case basis to those it maintains.

The framework for a policy may be established in this Master Plan, but the final decisions to include certain drainage easements within the Town's maintenance responsibility may not be made until each particular area can be reviewed.

Funding Infrastructure Improvement According to Percent of Public Water

The Town of Cary has two policies for funding stormwater conveyance infrastructure improvements: Policy 35 and Policy 146. The purpose of Policy 35 is to assist citizens with the cost and management of storm drainage improvements. For approved Policy 35 projects, the Town pays 50% of the cost. Policy 146 is the Town's official policy for replacing/rehabilitating culverts, located in the public rights-of-way, based on citizen requests or input from Town staff resulting from routine inspections or inventories.

The Town Engineering Department wishes to consider a potential change to Policy 35, whereby the Town's portion of the bill would be directly proportional to the percentage of public water that passes through the stormwater infrastructure that is to be replaced or rehabilitated. Alternatively, this could become a separate, stand-alone policy not related to Policy 35. Public water shall be defined as stormwater runoff that originates on public property, including Town or DOT ROW. The Town would need to include a runoff volume method for determining the proportion of public water, such as the Simple Method or the Discrete SCS Curve Number Method.

These methods are further explained in Section 3.3 (Runoff Volume) of the NCDWQ's Stormwater BMP Manual. The main difference between these two methods is that the Simple Method only considers impervious area whereas the

SCS Method considers soil type and land cover. The calculations would need to be done separately for public and private runoff to determine the proportion of public water. Using GIS with aerial photography to determine land cover (including impervious surface), property boundaries, and soils data (for the SCS method), the calculations could be considered close estimations. The premise would be that the Town would pay for infrastructure repairs and improvement proportional to the percentage of public water. So, if the calculations determined that 60% of the runoff volume was public water, the Town might pay for 60% of the infrastructure improvement. Since the Town already pays 50% as part of Policy 35, it may consider whether to continue to pay at least 50% under a policy that considers the proportion of public water.

The Simple Method is the better option for the Town since it is more straight-forward and includes impervious cover, which is the most significant factor in determining stormwater runoff. The method, as presented in the DWQ BMP Manual, is provided below:

$$R_V = 0.05 + 0.9 * I_A$$

Where: R_V = Runoff coefficient [storm runoff (in) / storm rainfall (in)], unitless

I_A = Impervious fraction [impervious portion of drainage area (ac) / drainage area (ac)], unitless

Once the runoff coefficient is determined, the volume of runoff that must be controlled is given by the equation below:

$$V = 3630 * R_D * R_V * A$$

Where: V = Volume of runoff from public and private land (calculated separately)

R_D = Design storm rainfall depth (in) (Typically 1.0” or 1.5”)

A = *Watershed area (ac)*

Note that R_D would not be important for the Town of Cary consideration as long as it is consistent between the public water and private water calculations.

Potential Increase in Routine Maintenance in LOS

A potential change to the maintenance LOS that will be considered in the economic analysis is for the Town to provide more routine maintenance of the stormwater conveyance system. It would take an additional crew of three staff, as well as the required equipment, to provide more routine maintenance. The required equipment would include a dedicated vacuum truck, a support pickup truck, and the required tools. The cost of providing more routine maintenance with an added crew and equipment will be evaluated in the Chapter 6.

The Town’s performance LOS (Specifications Section 0800, referenced above) appears to be appropriate and changes will not be considered but locations within the conveyance system have been identified where the performance LOS is not being met. For example, analysis in Chapter 3 identified stream roadway crossing pipes that

do not meet their specified level of service (see Section 3B). The economic analysis will consider the costs of repairing or replacing those sections of the conveyance system.

LOS and EOS Matrix

EOS and LOS combine to address financial requirements, liability and risk management, and customer satisfaction. The potential EOS boundaries are predetermined by property lines and do not typically change. How the Town decides to manage these areas falls more under LOS, which is based on the Town's Land Development Ordinance (LDO) and resources, and is subject to change. Provided below in Table 3.19 is an example matrix that may be further developed into a comprehensive stormwater maintenance policy. Over time, each segment of, or structure within, the drainage system might be put into a given cell within the matrix. The Town currently provides core services that maintain the conveyance system within the ROW and provides cost share and technical advice outside of the ROW. As part of the stormwater master plan, the Town will consider adding enhanced services where the conveyance system is not always functioning as designed. Table 3.19 lists those enhanced services according to the type of property (e.g., Town ROW, private with easement private, NCDOT ROW).

As shown in Table 3.21, it may be possible to have components on private property with a drainage easement that are both in and out of the City's maintenance program, depending on the effect of public water on system function, safety, flooding, or property accessibility. For example, if there is a drainage easement but public water has very little impact on the system, then the current LOS would be appropriate. If public water is determined to be important to system function and infrastructure is not functioning as designed, then the enhanced LOS might be better suited.

As previously discussed, these decisions should be based on an understanding of how much they will cost the Town and if the Town is prepared to meet those costs. The economic analysis in Section 5E will develop estimates of these costs and consider what changes to the Town's budget would be required to meet them.

Table 2.9 - Draft LOS and EOS Matrix for the Town of Cary

Level of Service	Extent of Service			
	Town Right of Way	Drainage Easement on Private Land	Private	NCDOT Right of Way
Core Services - Existing (2012)	- Complaint-based response (90%). - Predominate Maintenance Item: Blockage removal and drainage maintenance. - Annual inspection of largest pipes and bridges. - Routine clearing of biggest problem areas.	- No regular maintenance beyond ROW. - 50/50 cost share if structure at risk	- No regular maintenance beyond ROW. - 50/50 cost share if structure at risk	- Notification of DOT
Enhanced Service – Town will consider for structures that are degrading and not always functioning as designed.	- Consider existing maintenance plus more routine maintenance where and when it's determined to be beneficial.	- Consider response-based maintenance where pipes pass significant portions of public water or where public water has some effect.	- Consider expansion to EOS so that Town pays for percent of project equal to percent of public water that passes through problem area.	

I. Comparison to other Municipal Programs

As part of this stormwater master plan, a cursory review was performed of multiple municipal stormwater programs throughout the country to better understand how others administer their programs and how Cary relates to its peers. Through discussion with stormwater staff, it was determined that the following municipal programs would be used for this assessment as they represent a cross-section of respected and/or similar sized programs to Cary. They are the following:

- City of Austin, TX
- Fairfax County, VA
- City of Portland, OR
- Town of Chapel Hill, NC
- Gwinnett County, GA
- City of Naperville, IL
- City of Wilmington, NC
- City of Danville, IL
- City of Ft. Collins, CO

Key information that was gathered for the comparisons centered on factors such as population, service area, how the program is organized, funding of the various programs, how the municipalities deal with their ordinances and development criteria, maintenance operations, capital improvement programs, and special programs or enhancements.

To start our assessment we will examine two elements to the various stormwater programs. First, we will look at how much the various municipalities fund their programs and whether or not they employ a stormwater utility or tax to raise these funds. Table 2.10 describes this information and also reflects how this funding distributes on a per capita and per square miles of service area basis as well as looking at citizen/staff ratios.

Table 2.10 Comparison with other Municipalities

Municipality	Population	Staff Size	Citizen/ Staff Ratio	Area (sq. mi.)	Annual Funding (millions)	Staff /$$	$$/ capita	$$/ sq. mi.	Stormwater Utility Fee
Town of Cary	142,000+	8	17.7k	55.4	$2.4	3.3	$17	$43,321	N
Austin, TX	800,000+	255	3.1k	300	$65	3.9	$81	$216,667	Y
Fairfax County, VA	1,000,000+	144	6.9k	400	$30	4.8	$30	$75,000	Y
Portland, OR	583,000+	62	9.4k	145	$18	3.4	$31	$124,138	Y
Chapel Hill, NC	57,000+	8	7.1k	19.8	$1.9	4.2	$33	$95,960	Y
Gwinnett County, GA	805,000+	63	12.7k	1360	$29	2.2	$36	$21,323	Y
Naperville, IL	142,000+	12	11.8	35.5	$2.4	5	$17	$67,606	N
Wilmington, NC	107,000+	10	10.7k	57	$7.6	1.3	$71	$133,333	Y
Danville, IL	32,500+	2	16.3k	18	$0.75	2.7	$23	$41,667	N
Ft. Collins, CO	143,986+	12	12k	53	$14.3	0.8	$99	$269,811	Y
Overall Average	381,249	58	10.7k	244	$17.1	3.2	$44	$108,883	
No Utility Average	105,500	7	15.2k	36	$1.9	3.7	$19	$50,865	
With Utility Average	499,427	79	8.9k	334	$23.7	3.0	$55	$133,747	

From the comparison in Table 2.10 we can make several conclusions:

- Cary is consistent with other programs that do not have a utility fee. Its per capita expenditure is similar to Naperville and Danville, IL and within 20% on the per sq. mi. expenditure. Danville and Cary also have a similar citizen to stormwater staff ratio.
- On average, programs that have a utility fee spend 289% more per capita and 262% more per square mile than those without a utility fee. If you remove Gwinnett County from the per square mile comparison as it has a very large service are which skews the data, the remaining utility fee based programs outspend non-utility fee programs by over 300%.
- 4 of the 10 programs expend an average of $33 per capita, which includes several of what are considered the most "progressive" stormwater programs (Fairfax County, Portland, Chapel Hill, and Gwinnett County). If we were to apply the $33 per capita against the Cary population, the revenue requirement would be $4.7 million.
- The Town of Cary has the highest citizen/staff ratio of any of the municipalities, which indicates the Town is able to maintain a high LOS with a smaller staff than those with a utility fee.

Second, we wanted to look at how the other municipalities compare in terms of core components of their programs. This comparison is done with Table 2.11. To establish the baseline for this let's identify the core components of the Cary program for Table 2.11. They are:

- Meeting the requirements of its NPDES Phase II Permit
- Floodplain Management (administering Flood Prevention Ordinance)
- Storm Drainage Assistance Program through Policy 35 and Policy 146
- Managing Capital Projects (Culvert Replacements, watershed studies, stream restoration)
- Public Education
- Administering Erosion and Sediment Control and development permit reviews and approvals
- Managing BMP Inspection Program
- Urban Transition Buffers

In order to understand how there could be differences in the core components, a summary of the primary stormwater program components of the seven programs that use a stormwater utility fee are listed below:

Gwinnett County:

- Water Quality Monitoring Program – 12 Long Term monitoring sites, fecal coliform monitoring on the Alcovy River and Yellow River for TMDL. Dry weather sampling program.
- Citizen Service Request Automated system.
- Meeting requirements for NPDES MS4 permit
- Robust Floodplain Management program

  - Flood Information Portal – countywide
  - Flood Warning System
  - Flood study Program to go beyond FEMA limits.
- Watershed Improvement Plans being developed for all watersheds includes computer modeling for both water quality and quantity.
  - Implementing recommended improvements from WIPs (Stream restoration and BMPs)
  - Watershed Dam Upgrade Program
- Umbrella Stream and Wetland Mitigation Banking Program
- Aggressive Post Construction Stormwater Management
- Public Education Program
- BMP Inspection Program
- Ongoing Mapping and Inventory

Portland, Oregon

- Robust Public Involvement Campaign – strong website linking to numerous programs, vides, opportunities, case studies, provides tours of BMP locations
- NPDES MS4 Permit Compliance
- Maintenance Inspection Program
- Underground Injection Control Program
- Watershed Restoration Projects – These are large scale projects
- Clean River Programs
- Green Streets Program
- Wet Weather Program
- Basic Floodplain Management Program

Austin, TX

- Creek Flooding Program – includes flood mitigation improvements, buyouts, and a small dam inspection program.
- Environmental monitoring program on a two-year cycle for all watersheds
- Erosion Control-Stream Restoration Program
- Flood Early Warning System
- Flood Safety and Preparedness Program
- Various Public Awareness Programs
- Hydrilla control program
- Localized Flooding Program
- Pollution Prevention and Reduction Program
- Regional Stormwater Management Program for developers

- Stormwater Management Program (BMP Design and Construction)
- Youth Education Program

Ft. Collins, CO

- Flood Warning System
- Master Planning for Drainage Basins
- Floodplain Mapping Program – (FEMA and City)
- Meeting requirements under NPDES MS4 Permit
- Drainage Improvement Projects

Fairfax County, VA

- Outreach and Education Program
- Volunteer Programs (Stream Monitoring, stream cleanup, drain labeling)
- Maintenance and Inspection Program (County Owned – Easements)
- Stream Quality Assessment Program
- Stream ID and Mapping
- Stream Stabilization and Restoration
- Watershed Management Plans and Projects

City of Wilmington, NC

- Design and Construction of Stormwater Capital Projects
- Watershed Master Planning
- Meeting NPDES Permit Requirements
- Education and Outreach Program
- Publications and Videos
- Operation and Maintenance Program
- Street sweeping program

Town of Chapel Hill, NC

- Meeting NPDES Phase II Permit Requirements
- Maintains a Stormwater Advisory Board
- Developed and is working of off Stormwater Master Plan for Improvement Projects
- Has a Drainage Assistance Program
- Public Education and Participation
- Water Quality Monitoring Program

Table 2.11 - Comaparison of Municipal SWMP Core Components

	SWMP Core Components (TOC based)								Expanded Programs				
Municipality	Meet NPDES Permit	Floodplain Management	Drainage Assistance Program	Capital Improvement Projects	Public Education	Erosion & Sediment Control Program	BMP Inspection Program	Riparian Buffer Program	Enhanced Outreach	Watetr Quality Monitoring	Flood Warning	Watershed Master Planning	Special Programs
Town of Cary*	■	■	■	■	■	■	■	■					
Austin, TX	■	■	■	■	■	■	■	■	■	■	■	■	Hydrilla Control Program
Fairfax County, VA	■	■	■	■	■		■		■	■	■	■	Stream/stormwater inventory annually
Portland, OR	■	■	■	■	■		■	■	■	■		■	Green Streets, Ecoroof program, Clean Rivers program, tours, wet weather program
Chapel Hill, NC	■			■	■					■		■	
Gwinnett County, GA	■	■	■	■	■	■	■		■	■	■	■	Ongoing inventory, stream mitigation banking
Naperville, IL*	■			■	■								
Wilmington, NC	■		■	■	■		■		■	■		■	
Danville, IL*	■			■	■	■							
Ft. Collins, CO	■	■		■	■						■	■	
Raleigh, NC	■	■	■	■	■	■	■	■		■		■	

*Do not have a stormwater utility fee

Looking at the above components for the other municipalities in relation to the Town of Cary we can see several recurring elements that these communities invested in above certain base components. The base components that most all seem to cover are:

- Meeting requirements for NPDES Phase II Permits
- Public Outreach and Education
- Citizen complaint/request system
- Drainage Assistance Program
- Maintenance and Inspection Program
- Administer Capital Improvement Projects

Where the utility fee based communities gain enhancement over the base level services is with the following:

- Watershed planning studies on a regular basis with quantity and quality modeling
- Flood Warning Systems
- Water quality or quantity monitoring
- Expanded Inspection Programs
- Enhanced Public Education and Outreach Programs

The results of this comparison shows that Cary maintains a comprehensive program that is far more robust than the other programs that are not funded by a utility fee and matches up well against other North Carolina cities with utility fees. Going forward the Town of Cary has the option consider ways to provide enhanced and/or additional services with some of the above components based on funding mechanisms of its choosing. Many of the expanded programs will be discussed in later chapters with economic thresholds defined.