City of Greenville Stormwater Management Program

Greenville, North Carolina

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City of Greenville
Public Works Department
1500 Beatty Street
Greenville, NC 27834
Phone: 252-329-4467

Mission Statement

The City of Greenville is dedicated to providing
all citizens with quality services in an open, ethical manner,
insuring a community of distinction for the future.

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EXECUTIVE SUMMARY

In accordance with the State's rule, "15A NCAC 2B .0258 Tar-Pamlico River Basin –Nutrient Sensitive Water Management Strategy: Basinwide Stormwater Requirement," the City of Greenville developed a Stormwater Management Program. The purpose of this Program is to help improve water quality in the Tar-Pamlico River Basin. The City's jurisdictional boundaries also extend into the Neuse River Basin. Figure 1 presented in the City's "Stormwater Management Program" is a general representation of which areas of the City are located within the Tar-Pamlico River Basin and which are within the Neuse River Basin. It also identifies the city limits and the City's extra territorial jurisdiction (ETJ).

As part of its program, the City amended Chapter 9 "Storm Drainage" of Title 9 "Building, Planning, and Development Regulations" located in the "Code of Ordinances" for the City of Greenville. This chapter is now referred to as "Stormwater Management And Control". This ordinance is presented in the program's appendices.

Those requirements as set forth by the Tar-Pamlico Rule will be applicable to that portion of the City of Greenville located within the Tar-Pamlico River Basin. For areas of the City's ETJ located within the Tar-Pamlico River Basin, the City will apply the requirements of its program to the extent authorized under State statutes that govern municipality operations in its ETJ. Under State statutes, the City is authorized to perform inspections and report violations within its ETJ to the appropriate County and State authorities. As areas within it's ETJ are annexed into the city limits, the City will be able to enforce these requirements. Those areas of the city and its ETJ located within the Neuse River Basin will be subject to the requirements of this ordinance and program, with the exception of having to meet the requirements for controlling phosphorus releases.

The City's Stormwater Management Program is to be administered by the Engineering Division of the Public Works Department and will be managed by the City Engineer. The City's Stormwater Utility will fund this program. The Engineering Division is responsible for implementation of the program's various elements. The City of Greenville was identified as a NPDES Phase II community. Many of the programs that the City is developing to meet the Phase II requirements will be applied towards those of the Tar-Pamlico Rule.

As part of this program, the City will administer a public education program, addressing residents within and outside Greenville's city limits. The major components of the City's stormwater infrastructure located within the city limits will be mapped as part of the City's NPDES Phase II program, which is to begin in the second year of the City's NPDES Phase II permit. As areas located within the ETJ are annexed into the city limits, the stormwater infrastructure located within these areas to be maintained by this City will be mapped following annexation. The City has started evaluating retrofit opportunities. As presented in the Stormwater Management Program, the City of Greenville will also begin the development of its program to address illicit discharges. The implementation schedule for this component is presented within this program.

In Summary, the overall program objective is to improve the water quality of stormwater run-off that enters the natural waters located in and outside of the City of Greenville.

1. Introduction

In accordance with the State's rule, "15A NCAC 2B .0258 Tar-Pamlico River Basin –Nutrient Sensitive Water Management Strategy: Basinwide Stormwater Requirement," the City of Greenville has developed a stormwater management program.

1-A. Background on the Tar-Pamlico Stormwater Rule

The Tar-Pamlico River Basin begins in Piedmont North Carolina and extends approximately 180 miles through the Coastal Plain to Pamlico Sound. Together, Pamlico Sound and neighboring Albemarle Sound constitute one of the most productive estuarine systems in the country. The 5,400 square mile Tar-Pamlico basin is comprised primarily of agricultural and forest land and many smaller municipalities. Despite the rural character of the basin, in the mid-1970's the Pamlico River estuary began to see increasing frequencies of harmful algal blooms, fish kills, and other nutrient-related problems.

By the mid-1980's, the state began to consider actions to control nutrient inputs to the estuary. Those actions have included the following:

Phase I: In 1989, the North Carolina Environmental Management Commission (EMC) designated the entire basin "Nutrient Sensitive Waters." The first phase of management through 1994 focused primarily on point sources, establishing an annually decreasing nutrient loading cap for an association of dischargers, and an innovative "trading" program that allowed dischargers to achieve reductions in nutrient loading more cost-effectively.

PCS Recycling: In 1992, a phosphate mining company then known as Texas Gulf, which is located on the Pamlico River estuary, instituted a wastewater recycling system that reduced its phosphorus discharges to the estuary by 93 percent.

Phase II: Modeling of estuary conditions showed that despite the gains made to that point, significant reductions in nitrogen and phosphorus loading were still needed to restore water quality standards and minimize the recurrence of harmful algal blooms. The second phase of the nutrient strategy, which runs through 2004, established a biologically based goal of 30 percent reduction in nitrogen loading from 1991 levels and holding phosphorus loading at 1991 levels. Load reductions were apportioned among point sources and the major nonpoint sources. The point sources were given steady annual nitrogen and phosphorus loading caps. A program was designed with the nonpoint sources to achieve the goals through voluntary measures. After two years of voluntary implementation, the EMC found insufficient progress and called for rules for nonpoint sources.

Rules: Beginning in 1998, Division of Water Quality (DWQ) staff conducted a lengthy public input process to evaluate source categories and develop rules where needed. Over the course of 2000, the EMC adopted rules for agriculture, fertilizer application across all land uses, urban stormwater, and rules to protect the nutrient removal functions of existing riparian buffers. These rules were modeled after a similar set of rules recently adopted in the adjacent Neuse River Basin. The Neuse rules were given extensive public review and modification,

and the Tar-Pamlico rules similarly received extensive scrutiny. The resulting rules provide increased flexibility for the regulated community while maintaining the focus of the nutrient reduction goals.

1-B. Requirements of the Tar-Pamlico Stormwater Rule

The Tar-Pamlico Stormwater Rule identifies the City of Greenville as one of the local governments with the greatest likelihood of contributing significant nutrient loads to the Pamlico estuary. The EMC may designate additional local governments in the future through rule amendment based on criteria given in the rule.

The affected local governments are:

Municipalities	**Counties**
Greenville	Beaufort
Henderson	Edgecombe
Oxford	Franklin
Rocky Mount	Nash
Tarboro	Pitt
Washington	

For these local governments, only their geographic areas that fall within the Tar-Pamlico River Basin are subject to the rule. Part of The City of Greenville's jurisdiction is located with this Basin. Figure 1 in Section 1-C identifies which portion of the City and its extraterritorial jurisdiction is located within the Tar-Pamlico River Basin. in subject counties, applicable areas are those under the direct jurisdiction of the counties, which would not include incorporated cities, towns, or villages within county jurisdictional limits. Cities and counties are encouraged to coordinate to establish implementation responsibilities within municipal extraterritorial jurisdictions. Counties administering development regulations by interlocal agreement on behalf of municipalities would implement the rule within only those municipalities that are subject to the rule. The activities of state entities within subject local governments would be subject to the rule.

The rule establishes a broad set of objectives for limiting nutrient runoff from urban areas and then lays out a set of specific elements that the City of Greenville has included in its program. Timeframes for implementation of the rule are as follows:

April 1, 2001:	Effective date of the rule.
February 13, 2003:	Target date for approval of the Model Stormwater Program by the Environmental Management Commission (modified through EMC approval from the date of April 1, 2002, established in the rule).
February 13, 2004:	Deadline for submittal of local Stormwater Programs (including ordinances) to the EMC (modified as above).
August 13, 2004:	Deadline for local governments to begin implementing local Stormwater Programs (modified as above).

Following implementation in August 2004, the City of Greenville is required to make annual progress reports to the EMC that will include nitrogen and phosphorus loading reduction estimates.

The elements that must be included in the City of Greenville's management program are:

1. New Development Review/Approval

New development is required to meet the 30 percent reduction goal through site planning and best management practices. The rule imposes a 4.0 pounds per acre per year (lb/ac/yr) nitrogen loading limit and a 0.4 lb/ac/yr phosphorus loading limit on new development. Proposals that exceed these performance standards may partially offset their load increases by treating existing developed areas offsite that drain to the same stream.

New development shall avoid causing erosion of surface water conveyances. At minimum, post-development peak flows leaving the site may not exceed pre-development for the 1-year, 24-hour storm event. The rule provides the City of Greenville with the option of using regional stormwater facilities to help meet nutrient loading and attenuation requirements under certain circumstances.

2. Illicit Discharges

Illicit discharges are substances deposited in storm sewers (that lead to streams) that should instead be handled as wastewater discharges. Illicit discharges may contain nitrogen. The City of Greenville will develop and implement a program to identify, remove, and prevent illicit discharges.

3. Retrofit Locations

There are a number of funding sources available for water quality retrofit projects such as the Clean Water Management Trust Fund and the Wetland Restoration Program that the NC General Assembly has recently established. To assist technical experts, the City of Greenville is required to identify sites and opportunities for retrofitting existing development to reduce total nitrogen and phosphorus loads.

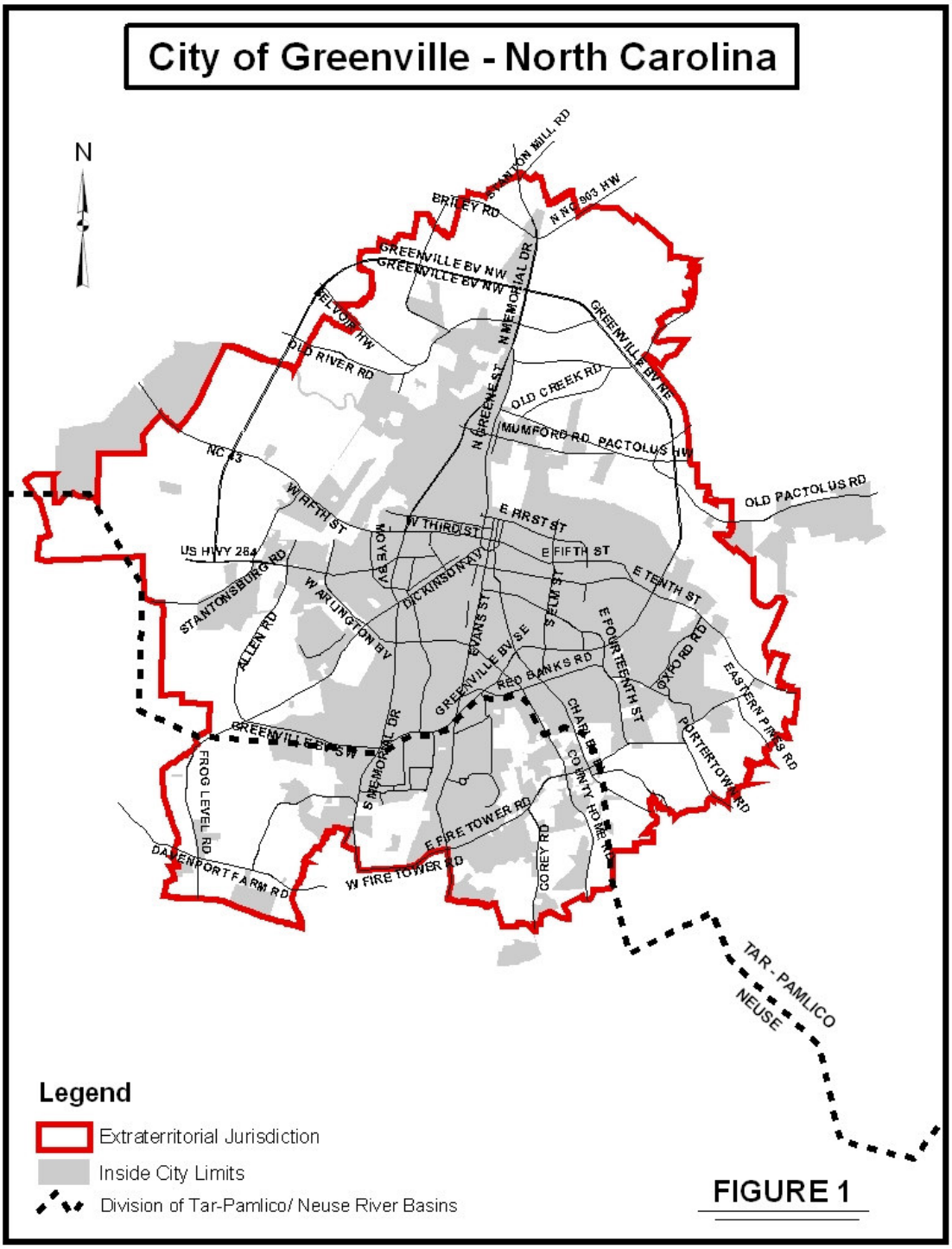
4. Public Education

Citizens can reduce the nitrogen pollution coming from their lawns and septic systems if they understand the impacts of their actions and respond with appropriate management measures. The City of Greenville shall develop and implement public and developer education programs for the Tar-Pamlico basin.

1-C. Applicability of Tar-Pamlico Stormwater Rule

Figure 1 identifies which areas of the City are within the Tar-Pamlico River Basin and which are within the Neuse River Basin. It also identifies the current city limits and the City's extraterritorial jurisdiction (ETJ). Those requirements as set forth by the Tar-Pamlico Rule will be applicable to the portion of Greenville's city limits located within the Tar-Pamlico River Basin under its "Stormwater Manangment and Control" ordinance. For areas of the City's ETJ located within the Tar-Pamlico River Basin, the City will apply the requirements of its program to the extent authorized under State statutes that govern municipality operations

in its ETJ. Under State statutes, the City is authorized to perform inspections and report violations within its ETJ to the appropriate County and State authorities. Those areas of the City and its ETJ located within the Neuse River Basin will be subject to the requirements of this ordinance and program, with the exception of having to meet the requirements for controlling phosphorus releases. As areas within it's ETJ are annexed into the city limits, the City will be able to enforce these requirements.



2. New Development Review/Approval

2-A. Requirements in the Rule

The Tar-Pamlico Stormwater Rule has the following requirements for new development located within that portion of the City of Greenville and its ETJ within the Tar-Pamlico River Basin (Please refer to Appendix A for complete language):

- The nitrogen load contributed by new development activities is held at 4.0 pounds per acre per year. This is equivalent to 70 percent of the estimated average nitrogen load contributed by non-urban areas in the Tar-Pamlico River Basin (as defined using 1995 LANDSAT data). Similarly, the phosphorus load contributed by new development activities is held at 0.4 pounds per acre per year, which is equivalent to the estimated average phosphorus load contributed by non-urban areas in the basin. The Environmental Management Commission may periodically update these performance standards based on the availability of new scientific information.

- Property owners shall have the option of partially offsetting projected nitrogen loads by providing treatment of existing developed areas off-site that drain to the same stream. However, the total nitrogen loading rate cannot exceed 6.0 pounds per acre per year for residential development or 10 pounds per acre per year for non-residential development.

- There is no net increase in peak flow leaving the developed site from the predevelopment conditions for the 1-year, 24-hour storm.

- The City of Greenville will review new development plans to assure compliance with requirements for protecting and maintaining riparian areas as specified in 15A NCAC 2B .0259.

The City of Greenville may include regional stormwater facilities in their programs to provide for partial nutrient and flow control. Such facilities may not degrade surface waters. This is further discussed under Section 2-G.

To comply with the aforementioned requirements, the City renamed and amended Chapter 9 "Storm Drainage" of Title 9 "Building, Planning, and Development Regulations" located in the "Charter and Code of Ordinances" for the City of Greenville, and this chapter is now referred to as "Stormwater Management And Control", which is presented in Appendix E).

The Engineering Division of the Public Works Department is responsible for reviewing plats and plans for private developments for compliance with the "Building ,Planning, and Development Regulations" Ordinance. Once the Engineering Division has completed its review and determines them to be in compliance, the documents are forwarded to the Planning Division for development permit issuance.

During this review process, review comments for each plat or plan is entered into a Land Development Tracking System. On a quarterly basis, data on approved projects will be retrieved from the Land development Tracking System. This data will be used to generate annual reports to DWQ on Nitrogen and Phosphorus loading from new development projects.

2-B. Protecting Riparian Areas on New Development

The Tar-Pamlico Riparian Buffer Protection Rule, 15A NCAC 2B .0259, requires the City of Greenville to ensure that riparian areas on new developments are protected in accordance with the buffer rule's provisions. The buffer rule requires that 50-foot riparian buffers be maintained on all sides of intermittent and perennial streams, ponds, lakes and estuarine waters in the basin. The buffer rule provides for certain "allowable" uses within the buffer with DWQ approval such as road and utility crossings.

The City of Greenville shall disapprove any new development activity proposed within the first 50 feet adjacent to a waterbody that is shown on either the USGS 7.5 minute topographic map or the NRCS Soil Survey map unless the owner can show that the activity has been approved by DWQ. DWQ approval may consist of the following:

- An on-site determination that surface waters are not present.
- An Authorization Certificate from DWQ for an "allowable" use such as a road crossing or utility line, or for a use that is "allowable with mitigation" along with a Division-approved mitigation plan. A table delineating such uses is included in the buffer rule.
- An opinion from DWQ that vested rights have been established for the proposed development activity.
- A letter from DWQ documenting that a variance has been approved for the proposed development activity.

2-C. Calculating N and P Export from New Development

New Development Described: For the purposes of the City of Greenville's Stormwater Management Program, new development shall be described to include the following:

- Any activity that disturbs greater than one acre of land to establish, expand, or replace a single family or duplex residential development or recreational facility. For individual single family residential lots of record that are not part of a larger common plan of development or sale, the activity must also result in greater than ten percent built-upon area.
- Any activity that disturbs greater than one-half an acre of land to establish, expand, or replace a multifamily residential development or a commercial, industrial or institutional facility.

- Projects meeting the above criteria that replace or expand existing structures or improvements and that do *not* result in a net increase in built-upon area shall not be required to meet the basinwide average non-urban loading levels.

- Projects meeting the above criteria that replace or expand existing structures or improvements and that result in a net increase in built-upon area shall achieve a 30 percent reduction in nitrogen loading and no increase in phosphorus loading relative to the previous development. Such projects may achieve these loads through onsite or offsite measures or some combination thereof.

    - Multi-family residential, commercial, industrial, and institutional projects may choose to achieve all of this reduction by providing treatment of off-site developed areas, or by permanently conserving land from future development in conformance with the the City of Greenville's approved land conservation plan as described in Section 2-G.
    - Alternatively, any project that is subject to the above loading requirements and that is located within an area that the City of Greenville has established for redevelopment, as characterized here, in a pattern conducive to the goals of the Tar-Pamlico nutrient strategy, may not be required to achieve those nutrient reductions if the project meets certain conditions that are established for that area as follows:

        - A "fix it first" policy that reserves public funds for repair of existing infrastructure in these areas before investing in new infrastructure of the same type in new growth areas.
        - Mixed use/mixed density zoning provisions.
        - Retrofits are consistent with NCDOT definitions for pedestrian scale in traditional neighborhood developments (e.g., 80% of users are within a ¼ mile walk from schools, libraries, and recreational/athletic facilities, 60% of students and 50% of teachers are within ½ mile walk from schools, and 40% of congregants are within ¼ mile of churches).
        - Parking maximums or shared parking ratios.
        - Residential density bonuses where parking maximums, pedestrian scale, or "fix it first" are proposed.

- Built-upon area means that portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, and gravel area. Slatted wooden decks and the water surface area of pools shall be considered pervious.

- Land disturbance is defined as grubbing, stump removal, grading, or removal of structures.

New development shall not include agriculture (including intensive livestock operations), mining, or forestry activities.

Vested Rights: All site plans and preliminary plats for new development projects that have received approval from the City of Greenville prior to the effective date of this program (September 10, 2004) and that have implemented that development in accordance with the City of Greenville's vesting provisions shall be exempt from the requirements of the Tar-

Pamlico Stormwater Rule. Vesting provsions and timelines shall be incordance with Section 9-4-34 of the City of Greenvile Code of Ordinances for site plans and Section 9-5-41 for preliminary plats.

Projects that require a state permit, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities shall be considered exempt if a state permit was issued prior to the effective date (September 10, 2004) of the City of Greenville's Stormwater Management Program.

Calculating N and P Export: The nitrogen and phosphorus export from each new development must be calculated. This export will be calculated in pounds per acre per year (lbs/ac/yr). Worksheets to carry out this method are provided in Appendix B.

It is expected that some values provided in the methodology will be refined over time. The Division of Water Quality plans to provide those refinements to the City of Greenville on a periodic basis as they are established. For example, additional research may lead to refined export values for the various urban land covers, particularly rooftop and transportation impervious surface. Also, stormwater management practices are typically in various stages of refinement around the country. Several nutrient reducing BMPs are being applied and studied around North Carolina toward better designs and more accurate knowledge of long-term nutrient removal efficiencies. The City of Greenville will incorporate these refinements into its program from time to time as they are substantiated.

For a given project, the methodology calculates a weighted annual load export for both nitrogen and phosphorus based on event mean concentrations of runoff from different urban land covers and user-supplied acreages for those land covers. The user chooses BMPs that reduce the export to rule-mandated levels. Two versions of the spreadsheet were developed based on rainfall differences; one (the "Piedmont" version) for the jurisdictions of Oxford, Henderson, Rocky Mount, and Tarboro, and the counties of Franklin, Nash, and Edgecombe, and the other (the "Coastal Plain" version) for the remaining communities.

A residential worksheet is also provided in Appendix B to calculate acreages dedicated to different land covers in residential developments where impervious footprints are not shown. One situation not addressed by the methodology is a non-residential subdivision where the impervious surfaces are not shown on the plans at the time of submittal. In this case, the applicant shall determine a worst-case scenario for the areas of impervious surface and managed open space for the type of development specified and then apply the methodology. This determination shall be presented on the preliminary plat as part of its approval.

2-D. BMPs for Reducing Nitrogen and Phosphorus

The Tar-Pamlico Stormwater Rule requires that all new developments achieve a nitrogen export of less than or equal to 4.0 (and a phosphorus export of less than or equal to 0.4 pounds per acre per year. If the development contributes greater than 4.0 pounds nitrogen (or 0.4 pounds phosphorus), then the following options exist.

For residential (or commercial or industrial) development:

- If the computed nitrogen export is greater than 6.0 (or 10.0) lbs/ac/yr, then the owner must either use on-site BMPs or take part in an approved regional or jurisdiction-wide stormwater strategy or some combination of these to lower the nitrogen export to at least 6.0 (or 10.0) lbs/ac/yr. The owner may then use one of the following two options to reduce nitrogen from 6.0 (or 10.0) to 4.0 lbs/ac/yr.

- If the computed nitrogen export is greater than 4.0 lbs/ac/yr but less than 6.0 (or 10.0) lbs/ac/yr, then the owner may either:
  - Install BMPs onsite or take part in an approved regional or jurisdiction-wide stormwater strategy or some combination of these to remove nitrogen down to 4.0 lbs/ac/yr.
  - Provide treatment of an offsite developed area that drains to the same stream to achieve the same nitrogen mass loading reduction that would have occurred onsite.

- The owner must install BMPs that also achieve a phosphorus export of less than or equal to 0.4 lbs/ac/yr but may do so through on-site or offsite measures or some combination thereof.

As with most resource impacts, an ounce of stormwater prevention is worth a pound of cure. A sound site planning process first considers the ability to achieve the needed reductions using site design measures that avoid or minimize runoff to begin with. These planning measures include reducing, disconnecting, and rerouting impervious surfaces, maximizing time of concentration for stormwater, and protecting open spaces for infiltration and evapotranspiration. More detail on planning measures that reduce hydrologic and nutrient loading is given in Appendix C.

Often, structural management practices cannot be avoided. BMP selection is an important and challenging craft. Available data indicate that most BMPs remove only 20 to 40 percent of total nitrogen or phosphorus on a consistent basis. There are a number of issues to consider to ensure this sustained performance. It is crucial to consider the issues of aesthetics, long-term maintenance, safety, and reliability in BMP design. All BMPs require regular maintenance and some have varying performance depending on soil type and season. The efficiencies provided below and in the load calculation worksheets in Appendix B assume correct sizing and other design per the referenced manuals and optimum performance based on regular, effective maintenance as well as proper siting of the practices.

The BMPs available for nutrient reduction and their removal rates based on current literature studies are provided in Table 2 below. These median values are based on a literature review conducted by a contractor that updated Neuse nitrogen efficiencies and established phosphorus values. Also provided in the table are the design standards to be adhered to in permitting BMP design.

The design of Best Management Practices that remove nitrogen and phosphorus from stormwater is a developing field. Researchers throughout the country, particularly in the Southeast, are conducting studies to identify and refine effective means of controlling nitrogen

and phosphorus. As stated in Section 2-C, the Division of Water Quality plans to provide refinements in the stated BMP removal efficiencies to the City of Greenville on a periodic basis as they are substantiated.

Table 2: BMP Types, TN and TP Removal Rates, and Design Standards

BMP Type	TN Removal Rate per Literature Review	TP Removal Rate per Literature Review	Appropriate Design Standards
Wet detention ponds	25%	40%	NC Design Manual (*)
Constructed wetlands	40%	35%	NC Design Manual (*)
Restored riparian buffers	30%	30%	Tar-Pamlico Riparian Buffer Rule (15A NCAC 2B .0259)
Grass Swales	20%	20%	NC Design Manual (*)
Vegetated filter strips with level spreader	30%	30%	NC Design Manual (*) and other literature information
Bioretention (rain gardens)	40%	35%	NC Design Manual (*)
Sand Filters	35%	45%	NC Design Manual (*)
Proprietary BMPs	Varies	Varies	Per manufacturer subject to DWQ approval
Other BMPs	Varies	Varies	Subject to DWQ approval

(*) *The North Carolina Department of Environment and Natural Resources, Division of Water Quality, Water Quality Section, Stormwater Best Management Practices Manual, 1999, and all amendments*

Multiple BMPs: The worksheet provides calculation space for the case where more than one BMP is installed in series on a development. It determines the removal rate through serial rather than additive calculations. This is important to understand in projects where the automated worksheet is not used to estimate the effect of multiple BMPs.

As an example, if a wet detention pond discharges through a restored riparian buffer, then the removal rate shall be estimated to be 47.5 percent, determined as follows: The pond removes 25 percent of the influent nitrogen mass and discharges 75 percent to the buffer. The buffer then removes 30 percent of the remaining 75 percent of the original nitrogen amount that discharged from the pond, or 22.5 percent of the original influent amount. The sum of 25 and 22.5 is 47.5. The removal rate is NOT 25 percent plus 30 percent.

Assigning Values to Pervious Cover: Large-lot residential development may involve substantial open space that, at least initially, may remain in an undisturbed wooded or reforesting condition. While it may seem logical to enter this acreage as wooded pervious, without conservation easements or some other mechanism for ensuring protection of these areas, the City of Greenville has no control over their eventual condition. Thus, unless specific protection instruments, such as conservation easements, are established and provided in the development application or by the City of Greenville, lot areas shall be assigned the lawn/landscape managed pervious export rate. The worksheet will do this automatically.

Riparian buffers protected under the Tar-Pamlico Riparian Buffer Protection rule, 15A NCAC 2B .0259, are divided into two zones, moving landward from the surface water, that are afforded different levels of protection. Zone 1, the first 30 feet, is to remain essentially undisturbed, while zone 2, the outer 20 feet, must be vegetated but may be managed in certain

ways. The user shall enter the acreage in zone 1 into the worksheet as wooded pervious, while zone 2 acrage shall be entered as managed pervious (lawn/landscape).

2-E. Calculating Peak Runoff Volume

The Tar-Pamlico Stormwater Rule requires that new development not cause erosion of surface water conveyances. At a minimum, new development shall not result in a net increase in peak flow leaving the site from pre-development conditions for the 1-year, 24-hour storm event. A number of Neuse local governments sought to use the 2-year rather than the 1-year storm as the design storm for peak flow control given that the 2-year storm is more consistent with current hydrologic modeling methodologies.

The main reason that the rule requires a 1-year design storm for peak flow control is to protect stream channels from erosion. Development on land causes many changes in stormwater hydrology. One of the major causes of streambank erosion in urban streams is the increase in the frequency of the bankfull-flooding event. The bankfull-flooding event generally occurs at approximately a 1.5-year frequency. The Tar-Pamlico Stormwater Rule requires control of the 1-year storm to predevelopment levels to insure that the rate of release will be below bankfull and therefore less erosive to the stream channel. Releasing the 2-year storm at predevelopment levels would likely have the effect of increasing the frequency of a storm that is just a bit larger than the most erosive storm.

Protecting streambanks from erosion is a crucial part of the overall Tar-Pamlico Nutrient Sensitive Waters Management Strategy. Riparian buffers are protected under this program because in most situations they are effective at removing nitrogen resulting from nonpoint source pollution. The use of nitrogen reducing BMPs on new development does not obviate the need to maintain valuable riparian buffers.

In the Neuse process, DWQ staff devised a strategy, which is incorporated here, to allow use of the 2-year design storm while also providing a similar level of protection for streambanks as the use of the 1-year design storm. The strategy is to give the City of Greenville the option of using the 2-year storm as the design storm for peak flow control; however, requiring that it be controlled to the pre-development levels of the 1-year storm. This can be done by computing the peak flow associated with the 2-year storm for pre-development conditions and then reducing it by an appropriate percentage to reflect the difference between the 1-year and 2-year storm peak flows. The City of Greenville will allow either of the following two options:

Option 1: Use the 1-year Design Storm

The US Weather Bureau (Technical Paper 40) published maps of rainfall depths for the 1-year storm of duration 30 minutes to 24 hours. The 1-year, 24-hour precipitation, varies along the Tar-Pamlico River Basin. For the City of Greenville, the amount of precipitation for a 1-year, 24-hr storm is 3.4 inches.

The Rational Method is an acceptable method for estimating peak discharge in the design of stormwater facilities for relatively small watersheds (up to 50 acres). The basic equation is:

$$Q = CIA$$

Where: Q is the peak flow for the design storm in cubic feet per second
C is the coefficient of runoff based on land cover (dimensionless)
I is the storm intensity in inches per hour
A is the drainage area in acres

The rational equation is based upon the assumption that rainfall is uniformly distributed over the entire drainage area at a steady rate, causing the flow to reach a maximum at the outlet of the watershed at a time to peak, Tp. The Rational Method typically gives a conservative estimate of runoff.

In order to use the Rational Method to determine peak flows, it is necessary to compute the storm intensity in inches per hour for the 1-year storm. The intensity is computed by the formula:

$$I = g/(h+T)$$

Where: I is the storm intensity in inches per hour
g and h are empirically derived constants
T is the duration in minutes (or $(L^3/H)^{0.385}$)/128)

The values for constants g and h for the 1-year storm are not presently available. The appropriate values for g and h were estimated by graphing the 2, 5, 10, 25, 50 and 100-year values of g and h for Wake and Wilson Counties as a function of return period on a log-normal scale and determining the y-intercept of the best-fit line. For the City of Greenville, the resulting values of g = 112 and h = 20 are applicable in the Tar-Pamlico River Basin.

Option 2: Use the 2-year Design Storm, but Control it to 1-year Predevelopment Levels

This option involves the following three steps:

- First, compute the peak flows (both pre- and post-development) from the drainage area based on the 2-year design storm using one of the methodologies listed below.
- Second, estimate the 1-year pre-development peak flow by multiplying the 2-year predevelopment peak flow by 80%.
- Third, design a BMP that will control the 2-year post-development peak flow to 1-year pre-development peak flow levels (estimated by the second step).

Exceptions to the Peak Flow Requirement

Peak flow control is not required for developments that meet one or more of the following requirements:

- The increase in peak flow between pre- and post-development conditions does not exceed 10 percent (note that this exemption makes it easier to conduct redevelopment activities).

- The development occurs in a part of a drainage basin where stormwater detention can aggravate local flooding problems.

Acceptable Methodologies for Computing Peak Flow

Acceptable methodologies for computing the pre- and post-development conditions for the design storm include:

- The Rational Method
- Dr. Rooney Malcom, P.E., Small Watershed Method
- NRCS Methodologies applied through the Corps of Engineers HEC-1 Program
- The Peak Discharge Method as described in USDA Soil Conservation Service's. Technical Release Number 55 (TR-55)
- The Putnam Method
- Other methods approved by the Environmental Management Commission

The same method must be used for both the pre- and post-development conditions.

2-F. Offsite Partial Offset Option

The Tar-Pamlico Stormwater Rule provides the option to partially offset nitrogen load increases from new development by providing treatment of offsite developed areas. The developer must provide legal assurance of the dedicated use of the off-site area for the purposes described here, including achievement of specified nutrient load reductions and provision for regular operation and maintenance activities, in perpetuity. The legal assurance shall include an instrument, such as a conservation easement, that maintains this restriction upon change of ownership or modification of the off-site property. Before using off-site treatment, the new development must attain a maximum nitrogen export of six (6) pounds/acre/year for residential development and ten (10) pounds/acre/year for commercial or industrial development.

Typical features of such an offsite offset project that distinguish it from regional systems (described in section 2-G) include the following:

- The new development site does not typically drain into the offsite treatment facility.
- The offsite facility is retrofitted to treat an existing developed property.
- The offsite facility may address only the nutrient requirements unless a development proposal demonstrates that meeting some or all attenuation requirements offsite will not result in degradation of surface waters to which the new development site discharges.

In consideration of this option, the City of Greenville will require a developer submit the appropriate documentation and calculations with their plat and plans that demonstrate the following:

- Projects reduce nitrogen load onsite to 6 lb/ac/yr for residential, 10 lb/ac/yr for commercial, industrial.
- Offsite location achieves remaining nitrogen reduction requirement.
- Projects reduce phosphorus loading to 0.4 lb/ac/yr between onsite and offsite BMPs.
- Projects meet the flow attenuation requirements of the Rule.

- The offsite property drains to the same receiving body of water as the new development project.
- Current owners agree in a documented, enforceable manner that offsite facilities are dedicated to achieving the specified nutrient and flow reductions for the life of the new development.
- All future owners of both properties will understand and accept these restrictions at the time of purchase.
- Current and future owners of the new development will maintain stormwater facilities on both the new development and the offsite properties.

Plats and plans for projects are required to show easements, buffers, and other applicable restrictions. The Engineering Division maintains records of plats within its planning jurisdiction. Consideration of these records is part of the Engineering Division's review process for projects. As per Section 9-9-8 of the Code of Ordinancnes for the City of Greenville, a developer is required to submit a maintenance plan and complete annual inspection reports for BMPs on their properties. In addition to its annual inspection program, the City will utilize this information as a mechanism for tracking offsite partial offsets and to assure that these areas will be maintained.

2-G. Regional or Jurisdiction-Wide Approaches

The Tar-Pamlico Stormwater Rule provides local governments the option to develop regional or jurisdiction-wide stormwater facilities in its program as an alternative means for developers to address nutrient or flow control requirements. Currently, the City of Greenville does not have plans for a regional facility. However, if the City determines that it would be beneficial to develop such facilities, they would require the review and approval of the North Carolina Department of Environment and Natural Resources, Division of Water Quality. At such time, the City of Greenville will develop appropriate ordinances, guidelines, and requirements for these types of facilities and also establish appropriate tracking processes, mechanisms, legal instruments, etc. to ensure that regional or jurisdiction-wide approaches continually meet attenuation and loading requirements of the Tar-Pamlico Stormwater Rule.

Regional Facilities: Within the context of the rule, the concept of a regional facility means generally a stormwater facility that serves more than one development project, each of which drains to the facility for treatment or attenuation. Inflows to regional facilities may already be partially treated or attenuated.

Many individual developments include stormwater designs that could be interpreted as "regional" under the broadest of definitions but which are not intended for the type of review and approval process described here. Projects such as phased developments or commercial projects with outparcels may use common stormwater facilities that receive runoff from more than one development under different ownership. However, common facilities that are permitted under single projects are intended for permitting by the City of Greenville.

Regional facilities provided for in the rule would serve more than one development project. They could be publicly or privately owned but would be proposed to DWQ by the City of Greenville. Basic elements of regional system proposals, to be permitted by DWQ, and other "common-facility" individual projects permitted by the City of Greenville would be the same.

Jurisdiction-Wide Approach: Within the context of the rule, the concept of a jurisdiction-wide approach means generally a nutrient-reducing management measure implemented under the authority of a local government to offset one or more increases that may take place in the same or a separate watershed within the jurisdiction. An offsite offset project (see Section 2-F) that is implemented under the authority of a local government would be a specific type of jurisdiction-wide approach.

2-H. BMP Maintenance

BMPs implemented to achieve the nitrogen and phosphorus loading reductionand flow attenuation requirements for a development must be maintained as established in Sec.9-9-8 in the City Code of Ordinances. (Presented in Appendix E.) An example of an operation and maintenance agreement for BMPs is presented in Appendix D. BMPs shall be maintained in accordance with the methods presented the North Carolina Department of Environment and Natural Resources, Division of Water Quality, Water Quality Section, *Stormwater Best Management Practices Manual.*

The City of Greenville shall inspect all BMPs on an annual basis and will maintain records for BMPs to include types of BMPs, their locations, approved maintenance plans, and required inspection process. The City of Greenville shall notify the owner upon finding that maintenance is needed on a BMP in accordance with Sec. 9-9-8 of the City Code. If the owner does not complete the maintenance in a timely manner, then the City of Greenville shall contract out the maintenance itself and recover its costs in the manner as permitted by this section of the City Code.

2-I. Land Use Planning Provisions

An objective of the Tar-Pamlico Stormwater Rule is to provide the flexibility and incentives for the City of Greenville to improve its growth management practices and for developers to considerusing impact-reducing site design techniques that will reduce nitrogen and phosphorus loading from their developments. One such measure, reducing impervious surfaces, reduces the need for BMPs to control nitrogen and peak stormwater flows and also reduces associated BMP maintenance concerns.

The City of Greenville encourages developers to consider the following planning techniques and the general advantages and disadvantages of incorporating the following:

- Pervious Paver
- Pervious concrete/asphalt mixes
- Minimizing use of curb and gutter

- Cluster or open-space developments
- Traditional neighborhood developments
- Mixed-use developments
- Low Impact Development principles
- Other impact-reducing approaches

Descriptions of these techniques are provided in Appendix C.

3. Illicit Discharges

3-A. Requirements in the Rule

The Tar-Pamlico Stormwater Rule requires the City of Greenville establish a program to prevent, identify, and remove illicit discharges. Illicit discharges are flows in the stormwater collection system that are not associated with stormwater runoff or an allowable discharge.

3-B. What is an Illicit Discharge?

Stormwater collection systems are vulnerable to receiving illicit discharges (even though the person responsible for the discharge may be unaware that it is illicit). Depending on their source, illicit discharges may convey pollutants such as nutrients, phenols, and metals to receiving waters. Table 3a identifies some potential flows to the stormwater collection system that may be allowable. Table 3b identifies some discharges that are not allowed.

Table 3a: Discharges that may be allowable to the stormwater collection system

Waterline Flushing	Landscape Irrigation	Diverted Stream Flows
Uncontaminated Rising Ground Water	Uncontaminated Ground Water Infiltration to Stormwater Collection System	Uncontaminated Pumped Ground Water
Discharges From Potable Water Sources	Foundation Drains	Uncontaminated Air Conditioning Condensation
Irrigation Water	Springs	Water From Crawl Space Pumps
Footing Drains	Lawn Watering	Non-Commercial Car Washing
Flows From Riparian Habitats and Wetlands	NPDES Permitted Discharges	Street Wash Water
Fire Fighting Emergency Activities	Wash Water From the Cleaning of Buildings	Dechlorinated Backwash and Draining Associated With Swimming Pools

Table 3b: Types of Discharges that are not allowed to stormwater collection system

Dumping of Oil, Anti-Freeze, Paint, Cleaning Fluids	Commercial Car Wash	Industrial Discharges
Contaminated Foundation Drains	Cooling Water Unless no Chemicals Added and has NPDES Permit	Washwaters From Commercial/ Industrial Activities
Sanitary Sewer Discharges	Septic Tank Discharges	Washing Machine Discharges
Chlorinated Backwash and Draining Associated With Swimming Pools		

Note: Some of these items may be disposed of through the sanitary sewer system. Please contact the GUC WWTP at 551-1542 for further information.

3-C. Establishing Legal Authority

In accordance with Chapter 9 "Stormwater Management and Control" of Title 9 in the City Code of Ordinances (Appendix E), the City of Greenville has established the legal authority to control and prohibit illict discharges under Section 9-9-17. The purpose and objectives of establishing this authority by ordinace is as follows:

- Control the contribution of illegal pollutants identified in Table 3b to the stormwater collection system.
- Prohibit illicit discharges to the stormwater collection system.
- Prohibit discharge of spills and disposal of materials other than stormwater to the stormwater collection system.
- Determine compliance and non-compliance.
- Require compliance and undertake enforcement measures in cases of non-compliance.

3-D. Collecting Jurisdiction-Wide Information

As part of its program, the City of Greenville will collect geographic information within its legal boundary, as defiened under State statute, at three increasing levels of detail:

- The first, most cursory level is information that shall be collected for the City's legal jurisdiction. The associated requirements are discussed in this section.

- The second level is a more detailed screening for high priority areas within the City's legal jurisdiction. The associated requirements are discussed in Section 3-E.

- The third level is a very detailed investigation that shall be done upon the discovery of an illicit discharge. The associated requirements are discussed in Section 3-F.

The purpose of collecting jurisdiction-wide information is to assist with identifying potential illicit discharge sources and characterizing illicit discharges after they are discovered.

The City of Greenville will compile maps that may include, but not necessarily limited to, the following:

- Location of sanitary sewers in areas of the major stormwater collection systems and the location of areas that are not served by sanitary sewers.

- Waters that appear on the USDA – Natural Resources Conservation Service Soil Survey Maps and the U.S. Geological Survey 1:24,000 scale topographic maps.

- Land uses, such as residential, commercial, agriculture, industrial, institutional, publicly owned open space, and others.

- Currently operating and known closed municipal landfills and other treatment, storage, and disposal facilities, including for hazardous materials.

- Major stormwater structural controls.

- Known NPDES permitted discharges to the stormwater collection system .

Written descriptions for the map components will be as follows:

- A summary table of municipal waste facilities that includes the names of the facilities, the status (open/closed), the types, and addresses.

- A summary table of the NPDES permitted dischargers that includes the name of the permit holder, the address of the facility, and permit number.

- A summary table of the major structural stormwater control structures that shows the type of structure, area served, party responsible for maintaining, and age of structure.

- A summary table of publicly-owned open space that identifies size, location, and primary function of each open area.

The City of Greenville shall complete this collection of jurisdiction-wide information by the time the second annual report is due.

3-E. Mapping and Field Screening in High Priority Areas

Beginning in its third year after implementation , the City of Greenville shall identify a high priority area of its jurisdiction for more detailed mapping and field screening. This high priority area shall comprise at least ten percent of the jurisdiction's area. Each subsequent year, the City of Greenville is responsible for selecting and screening another high priority area that comprises at least 10 percent of its jurisdiction.

"High priority" means the areas where it is most likely to locate illict discharges. The most likely locations for identifying illicit discharges are areas within older developments. Each year, the City of Greenville shall explain its basis for selection of its high priority areas.

The first part of the screening process for the selected high priority areas is mapping the stormwater system. At a minimum, the map that is produced should include the following:

- Locations of the outfalls, or the points of discharge, of any pipes from non-industrial areas that are greater than or equal to 36 inches.

- Locations of the outfalls of any pipes from industrial areas that are greater than or equal to 12 inches.

- Locations of the outfalls of drainage ditches that drain more than 50 acres of non-industrial lands.

- Locations of the outfalls of drainage ditches that drain more than 2 acres of industrial land.

- An accompanying summary table listing the outfalls that meet the above criteria that includes outfall ID numbers, location, primary and supplemental classification of receiving water, and use-support of receiving water.

The second part of the screening process for the selected high priority area is conducting a dry weather field screening of all outfalls that meet the above criteria to detect illict discharges. The dry weather field screening shall not be conducted during or within 72 hours following a rain event of 0.1 inches or greater.

Figure 3 illustrates a process for conducting field screening sampling activities and following up with any findings of dry weather flow. As shown in this figure, if the field screening shows that an outfall is dry, then the outfall will be checked for intermittent flow at a later date.

If a field screening shows that an outfall has a dry weather flow, the City of Greenville shall complete a screening report for the outfall. The information that will be contained in the screening report is outlined in Table 3c. Screening reports shall be kept on file for a minimum of five years. Example screening report forms are provided in Appendix F.

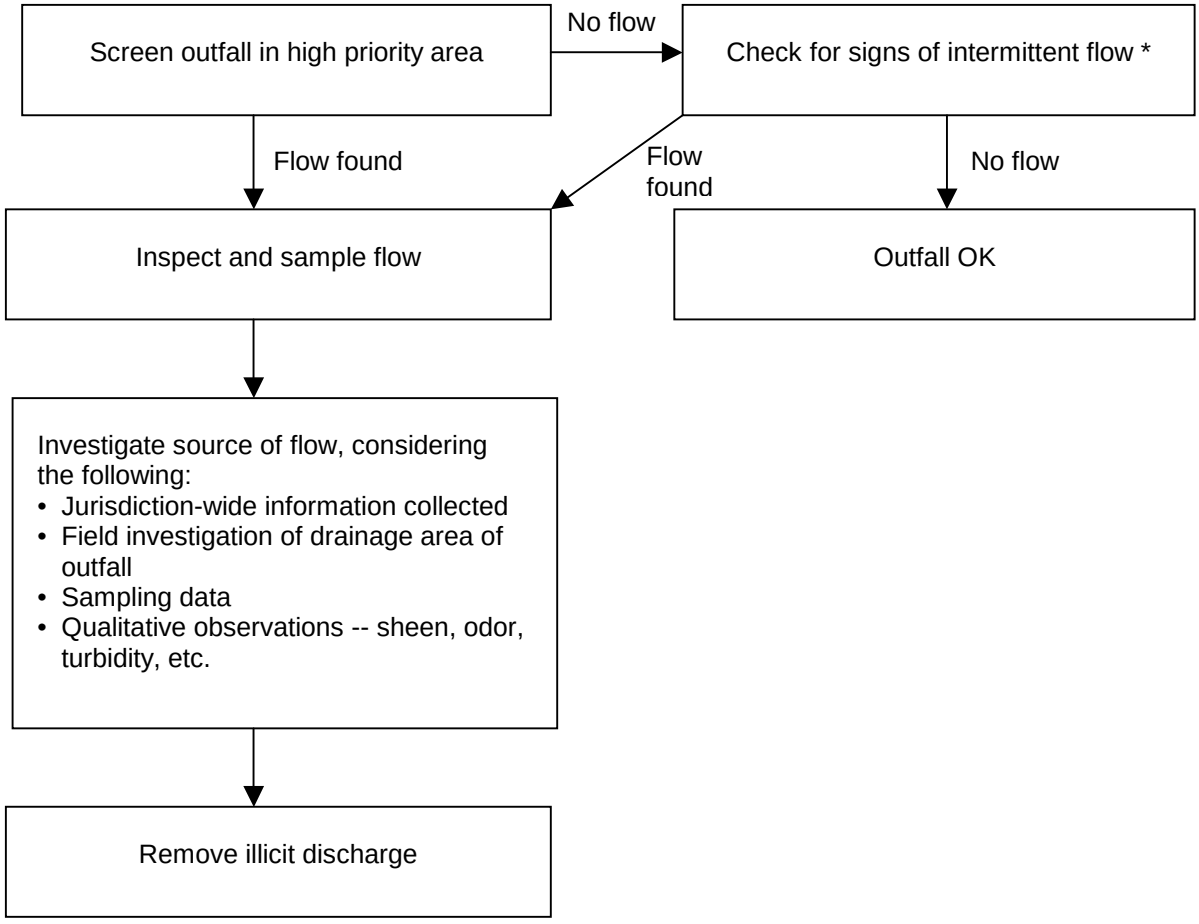
Table 3c: Field Screening Report Information

General Information	Sheet Number Outfall ID Number Date Time Date, Time and Quantity of Last Rainfall Event	
Field Site Description	Location Type of Outfall Dominant Watershed Land Use(s)	
Visual Observations	Photograph Odor Color Clarity Floatables	Deposits/Stains Vegetation Condition Structural Condition Biological Flow Estimation
Sampling Analysis *	Temperature pH Nitrogen-Ammonia	Nitrogen-Nitrate/Nitrite Fluoride or Chlorine Total Phosphorus Ortho-Phosphate

* Analytical monitoring is required only if an obvious source of the dry weather flow cannot be determined through an investigation of the upstream stormwater collection system.

Outfalls with flow will be screened again within 24 hours for the above parameters.

Figure 3: Field Screening Process



* Checking for intermittent flow includes rechecking outfall at a later date as well as visual observations for evidence of intermittent flow.

Note: Analytical monitoring may be conducted only if an obvious source of the dry weather flow cannot be determined through an investigation of the upstream stormwater collection system.

3-F. Identifying and Removing Illicit Discharges

After the field screening is complete, the City of Greenville shall take measures to identify and remove illicit discharges. Identifying illicit discharges may require a combination of office and field work. After the field screening, the City of Greenville shall consult the jurisdiction-wide information they have compiled (see Section 3-D) to obtain information about the land uses, infrastructure, industries, potential sources, and types of pollution that exist in the drainage area of the outfall.

After potential sources have been identified in the office, a systematic field investigation will be completed minimizing the amount of resources required to identify the source. Several

field methods may be used to identify illegal discharges. The City of Greenville will use a simple approach if that will suffice. Listed below are several approaches, but not necessarily limited to, that may be used as part of the inspection process:

- Site Investigation
- Additional Chemical Analysis (recommend testing for fecal coliform if the ammonia concentration was found to exceed 1.0 mg/L)
- Flow Monitoring (recommended to use multiple site visits rather than a depth indicator)
- Dye Testing (fluorescent dye is recommended)
- Smoke Testing
- Television Inspection

Documentation of the results of the office and field investigations shall be kept on file for a minimum of five years with the screening report.

After the City of Greenville identifies the source of an illicit discharge, it shall take enforcement action to have the source removed. The legal authority that was established for the illicit discharge program shall provide the means to accomplish this requirement. Enforcement shall include requiring the person responsible for the discharge to remove or redirect it to the sanitary sewer. If redirected to the sanitary sewer, prior approval from Greenville Utilities Commission will be required by the person responsible for the discharge. There shall be remedies to deal with cases of non-compliance. Records of all compliance actions shall be kept for a minimum of five years with the screening report.

In addition to keeping all screening reports on file, the City of Greenville shall maintain a map that includes the following:

- Points of identified illicit discharges.
- Watershed boundaries of the outfalls where illicit discharges have been identified.
- An accompanying table that summarizes the illicit discharges that have been identified that includes location, a description of pollutant(s) identified, and removal status.

3-G. Preventing Discharges and Establishing a Hotline

The City of Greenville shall contact persons who are responsible for establishments that are likely sources of illicit discharges. Some of these sources include automotive sales, rental, repair and detailing establishments, lawn care companies, cleaners, and certain types of contractors. Previous experience has shown that many illicit discharges are actually unintentional.

The City of Greenville shall establish a hotline. The hotline will require the designation of a new phone number or use an existing service. The hotline shall include a recording advising

citizens what to do if they call during non-business hours. There will be another number given in cases where the illicit discharge is perceived to be an emergency.

3-H. Implementation Schedule

In keeping with their goal of having an efficient and cost-effective program, the City of Greenville has created a phased implementation schedule for illicit discharges (Table 3d). The schedule allows for collecting jurisdiction-wide information during the first year of implementation and then screening the high priority areas during future years. This phased schedule is also intended to allow the City to evaluate and make improvements to its programs as the City progresses through high priority areas.

Table 3d: Implementation Schedule and Annual Reporting Requirements

Year	Implementation Requirements	Annual Report Requirements
By August 2004	• Establish legal authority to address illicit discharges	• Submit report identifying established legal authority to meet requirements.
By October 2006	• Collect jurisdiction-wide information. • Select high priority area for additional screening. • Initiate illicit discharge hotline.	• Report on completion of jurisdiction-wide information collection. • Submit map of high priority areas and reason for selection. • Report on initiation of illicit discharge hotline.
Each subsequent year after 2006	• Complete mapping and field screening for high priority area. • Select next high priority area. • Identify and remove illicit discharges as encountered. • Continue operating illicit discharge hotline.	• Submit map of stormwater collection system in high priority area upon request by DWQ. • Document illicit discharges found and resulting action. • Report on hotline usage and actions taken. • Submit map of next high priority area and reason for selection.

4. Retrofit Locations

4-A. Requirements in the Rule

As part of its program, the City of Greenville will identify and prioritize places within existing developed areas that are suitable for retrofits.

4-B. Approach for Meeting the Requirements

Retrofit opportunities will be considered acceptable if all of the following conditions have been investigated:

- The retrofit, if implemented, clearly has the potential to reduce nitrogen or phosphorus loading to the receiving water.

- The watershed is clearly contributing nitrogen or phosphorus loading above background levels.

- The landowner where the retrofit is proposed is willing to have the retrofit installed on his property. Securing the landowner's cooperation is one of the most important tasks for the local government, as this is often the most difficult aspect of implementing a retrofit.

- There is adequate space and access for the retrofit.

- It is technically practical to install a retrofit at that location.

The minimum number of retrofit opportunities that the City of Greenville is required to identify is three. Sites may be carried over to meet the minimum requirements for up to two subsequent years provided that BMPs/retrofits have not been implemented and the site continues to meet the criteria above on an annual basis.

4-C. Data Collection and Notification

Each retrofit opportunity that is identified shall be accompanied by information to describe the location of the retrofit being proposed, the property owner, as well as basic information about the watershed and the receiving water. Table 4 is the format in which the City will present the information for each retrofit opportunity. This information shall be included as part of the City's annual report to be submitted to the Division of Water Quality on Octorber 30th of each year beginning in the year 2005.

Table 4: Retrofit Opportunity Table

Each retrofit opportunity that is identified shall be accompanied by information to describe the location of the retrofit, the type of retrofit being proposed, the property owner, as well as basic	
Location description, including directions from a major highway	
Type and description of retrofit opportunity	
Current property owner	
Is the property owner willing to cooperate?	
Land area available for retrofit (sq. ft)	
Accessibility to retrofit site	
Drainage area size (acres)	
Land use in drainage area (percent of each type of land use)	
Average slope in drainage area (%)	
Environmentally sensitive areas in drainage area (steep slopes, wetlands, riparian buffers, endangered/ threatened species habitat)	
Approximate annual nitrogen and phosphorus loading from drainage area (lbs/acre/year) *	
Potential nitrogen reduction (lbs/ac/yr)*	
Potential phosphorus reduction (lbs/ac/yr)*	
Estimated cost of retrofit	
Receiving water	
DWQ classification of receiving water	
Use support rating for receiving water	
Other important information	

4-D. Mapping Requirements

The City of Greenville shall provide maps that show the locations of retrofit opportunities, which will include the following parameters:

- Drainage area to retrofit opportunity site.
- Land uses within the drainage area.
- Location of retrofit opportunity.

- Property boundaries in the vicinity of the retrofit opportunity.

- Roads.

- Environmentally sensitive areas (wetlands, riparian buffers, endangered/threatened species habitat – if available).

- Publicly-owned parks, recreational areas, and other open lands.

5. Public Education

5-A. Requirements in the Rule

The Tar-Pamlico Stormwater Rule requires the City of Greenville to develop a locally administered environmental education program to address nitrogen & phosphorous loading issues with the public and developers and to address peak stormwater flow issues with developers.

5-B. Public Education Action Report and Plan

The City of Greenville has developed a Public Education Action Report and Plan, An example Action Report and Plan format is presented in Appendix G. This Report and Plan outlines proposed education activities for an upcoming year identifies target audiences, and anticipated costs of the program. The City of Greenville shall submit an Annual Action Report and Plan to DWQ for approval as part of its annual report.

The Action Report and Plan template in Appendix G identifies point values for each type of education activity that may be used by the City of Greenville. The City of Greenville is required to conduct activities that sum to at least 15 points each year. Ongoing activities, such as continuing programs for pet waste or storm drain marking, receive credit for each year they are continued.

During the first year of program implementation, the City of Greenville will conduct two (2) technical workshops. One shall be designed to educate local government officials and staff and the other for the development community to include: engineers, developers, architects, contractors, surveyors, planners, and realtors. These two workshops will receive point credit toward the annual total. During subsequent years, technical workshops are considered an optional activity.

6. Reporting Requirements

Annual Tar-Pamlico River Basin stormwater program reports must be submitted to the Division of Water Quality by October 30th of each year beginning in 2005. All reports shall contain the following information:

6-A. New Development Review/Approval

The City of Greenville shall be responsible for submitting the following information as part of the annual reporting requirement:

- Acres of new development and impervious surface based on plan approvals.
- Acres of new development and impervious surface based on certificates of occupancy.
- Summary of BMPs implemented and use of offsite options.
- Computed baseline and net change in nitrogen and phosphorus export from new development that year.
- Summary of maintenance activities conducted on BMPs.
- Summary of any BMP failures and how they were handled.
- Summary of results from any applicable jurisdictional review of planning issues.
- Summary of Construction compliance, O & M compliance, inspections and enforcement actions.
- Compliance with program implementation schedule.
- Program administrative changes, other issues for DWQ.

6-B. Illicit Discharges

Table 6a outlines the annual reporting requirements for illegal discharges.

Table 6a: Implementation Schedule and Annual Reporting Requirements

Year	Implementation Requirements	Annual Report Requirements
By August 2004	• Establish legal authority to address illicit discharges	• Submit report identifying established legal authority to meet requirements.
By October 2006	• Collect jurisdiction-wide information. • Select high priority area for additional screening. • Initiate illicit discharge hotline.	• Report on completion of jurisdiction-wide information collection. • Submit map of high priority areas and reason for selection. • Report on initiation of illicit discharge hotline.

Each subsequent year after 2006	• Complete mapping and field screening for high priority area. • Select next high priority area. • Identify and remove illicit discharges as encountered. • Continue operating illicit discharge hotline.	• Submit map of stormwater collection system in high priority area upon request by DWQ. • Document illicit discharges found and resulting action. • Report on hotline usage and actions taken. • Submit map of next high priority area and reason for selection.

6-C. Retrofit Locations

The City's annual report will include the following on retrofit locations:

- Data on each retrofit opportunity (Table 4 or other equivalent format),
- Maps of potential retrofit sites as specified in Section 4-D, and
- The status of any retrofit efforts that have been undertaken within the jurisdiction.

6-D. Public Education

The City's annual report wills also included a summary of the next year's Action Plan and evaluation regarding the implementation of the previous year's Action Plan (if applicable). The report will also include goals, activities completed, realized education program costs, explanation of experienced shortfalls, vf and possible plans as to address these shortfalls.

APPENDICES TO THE

CITY OF GREENVILLE STORMWATER MANAGEMENT PROGRAM

Appendices

Appendix A.- 15A NCAC 2B .0258 Tar-Pamlico River Basin - Nutrient Sensitive Waters Management Strategy: Basinwide Stormwater Requirements

(a) PURPOSE. The purposes of this Rule are as follows.

(1) To achieve and maintain a reduction in nitrogen loading to the Pamlico estuary from lands in the Tar-Pamlico River Basin on which new development occurs. The goal of this Rule is to achieve a 30 percent reduction relative to pre-development levels;

(2) To limit phosphorus loading from these lands to the estuary. The goal of this Rule is to limit phosphorus loading to pre-development levels;

(3) To provide control for peak stormwater flows from new development lands to ensure that the nutrient processing functions of existing riparian buffers and streams are not compromised by channel erosion; and

(4) To minimize, to the greatest extent practicable, nitrogen and phosphorus loading to the estuary from existing developed areas in the basin.

(b) APPLICABILITY. This Rule shall apply to local governments in the Tar-Pamlico basin according to the following criteria.

(1) This Rule shall apply to the following municipal areas:
- (A) Greenville
- (B) Henderson
- (C) Oxford
- (D) Rocky Mount
- (E) Tarboro
- (F) Washington

(2) This Rule shall apply to the following counties:
- (A) Beaufort
- (B) Edgecombe
- (C) Franklin
- (D) Nash
- (E) Pitt

(3) The Environmental Management Commission may designate additional local governments as subject to this Rule by amending this Rule based on the potential of those jurisdictions to contribute significant nutrient loads to the Tar-Pamlico River. At a minimum, the Commission shall review the need for additional designations as part of the Basinwide process for the Tar-Pamlico River Basin. The Commission shall consider, at a minimum, the following criteria related to local governments: population within the basin, population density, past and projected growth rates, proximity to the estuary, and the designation status of municipalities within candidate counties.

(c) REQUIREMENTS. All local governments subject to this Rule shall develop stormwater management programs for submission to and approval by the Commission according to the following minimum standards:

(1) A requirement that developers submit a stormwater management plan for all new developments proposed within their jurisdictions. These stormwater plans shall not be approved by the subject local governments unless the following criteria are met:

(A) The nitrogen load contributed by the proposed new development activity shall not exceed 70 percent of the average nitrogen load contributed by the non-urban areas in the Tar-Pamlico River basin based on land use data and nitrogen export research data. Based on 1995 land use data and available research, the nitrogen load value shall be 4.0 pounds per acre per year;

(B) The phosphorus load contributed by the proposed new development activity shall not exceed the average phosphorus load contributed by the non-urban areas in the Tar-Pamlico River basin based on land use data and phosphorus export research data. Based on 1995 land use data and available research, the phosphorus load value shall be 0.4 pounds per acre per year;

(C) The new development shall not cause erosion of surface water conveyances. At a minimum, the new development shall not result in a net increase in peak flow leaving the site from pre-development conditions for the 1-year, 24-hour storm event; and

(D) Developers shall have the option of partially offsetting their nitrogen and phosphorus loads by providing treatment of off-site developed areas. The off-site area must drain to the same classified surface water, as defined in the Schedule of Classifications, 15A NCAC 2B .0316, that the development site drains to most directly. The developer must provide legal assurance of the dedicated use of the off-site area for the purposes described here, including achievement of specified nutrient load reductions and provision for regular operation and maintenance activities, in perpetuity. The legal assurance shall include an instrument, such as a conservation easement, that maintains this restriction upon change of ownership or modification of the off-site property. Before using off-site treatment, the new development must attain a maximum nitrogen export of six pounds/acre/year for residential development and 10 pounds/acre/year for commercial or industrial development.

(2) A public education program to inform citizens of how to reduce nutrient pollution and to inform developers about the nutrient and flow control requirements set forth in Part (c)(1).

(3) A mapping program that includes major components of the municipal separate storm sewer system, waters of the State, land use types, and location of sanitary sewers.

(4) A program to identify and remove illegal discharges.

(5) A program to identify and prioritize opportunities to achieve nutrient reductions from existing developed areas.

(6) A program to ensure maintenance of BMPs implemented as a result of the provisions in Subparagraphs (c)(1) and (c)(5).

(7) A program to ensure enforcement and compliance with the provisions in Subparagraph (c)(1).

(8) Local governments may include regional or jurisdiction-wide strategies within their stormwater programs as alternative means of achieving partial nutrient removal or flow control. At a minimum, such strategies shall include demonstration that any proposed measures will not contribute to degradation of surface water quality, degradation of aquatic or wetland habitat or biota, or destabilization of conveyance structure of involved surface waters. Such local governments shall also be responsible for including appropriate supporting information to quantify nutrient and flow reductions provided by these measures and describing the administrative process for implementing such strategies.

(d) TIMEFRAME FOR IMPLEMENTATION. The timeframe for implementing the stormwater management program shall be as follows:

(1) Within 12 months of the effective date of this Rule, the Division shall submit a model local stormwater program that embodies the minimum criteria described in Paragraph (c) of this Rule to the Commission for approval. The Division shall work in cooperation with subject local governments in developing this model program.

(2) Within 12 months of the Commission's approval of the model local stormwater program or within 12 months of a local government's later designation pursuant to Subparagraph (b)(3), subject local governments shall submit their local stormwater management programs to the Commission for review and approval. These local programs shall meet or exceed the requirements in Paragraph (c) of this Rule.

(3) Within 18 months of the Commission's approval of the model local stormwater program or within 18 months of a local government's later designation pursuant to Subparagraph (b)(3), subject local governments shall adopt and implement their approved local stormwater management program.

(4) Local governments administering a stormwater management program shall submit annual reports to the Division documenting their progress and net changes to nitrogen load by October 30 of each year.

(e) COMPLIANCE. A local government that fails to submit an acceptable local stormwater management program within the timeframe established in this Rule or fails to implement an approved program shall be in violation of this Rule. In this case, the stormwater management requirements for its jurisdiction shall be administered through the NPDES municipal stormwater permitting program per 15A NCAC 2H .0126. Any local government that is subject to an NPDES municipal stormwater permit pursuant to this Rule shall:

(1) Develop and implement comprehensive stormwater management program to reduce nutrients from both existing and new development. This stormwater management program shall meet the requirements of Paragraph (c) of this Rule for new and existing development.

(2) Be subject to the NPDES permit for at least one permitting cycle (five years) before it is eligible to submit a local stormwater management program to the Commission for consideration and approval.

History Note: Authority G.S. 143-214.1; 143-214.7; 143-215.3(a)(1); 143-215.6A; 143-215.6B; 143-215.6C; 143-282(d);
Eff. April 1, 2001.

Appendix B. Site Evaluation Tools

This appendix contains a set of worksheets for estimating nitrogen and phosphorus export from a development project prior to and following development, and following the installation of best management practices (BMPs) on the development.

An automated version of the worksheets is available on the North Carolina Department of Environment and Natural Resources, Division of Water Quality website. The website address is http://h2o.enr.state.nc.us/nps/documents/N-PCalcsheetCoastProtected10-04.xls. The worksheets are presented in an Excel format and can be downloaded from this site.

The worksheets in this appendix and the automated version of the worksheets both contain the following elements:

1. Definitions of Land Use Terms Used in Spreadsheets (1 pg.)
2. Residential Worksheet when Footprints are not Shown (1 pg.)
3. Export Calculation Worksheet for Coastal Plain Communities (1 pg.)
4. BMP Removal Calculation Worksheet for Coastal Plain Communities (3 pp.)

Introduction

The set of worksheets included in this file will enable stormwater permit applicants to comply with, and local governments to administer, the nutrient loading requirements of the Tar-Pamlico Stormwater Rule, 15A NCAC 2B .0258. The file contains a set of worksheets for estimating nitrogen and phosphorus export from a development project prior to and following development, and following the installation of best management practices (BMPs) on the development. Supporting information on the design of the worksheets can be found in the document, *Tar-Pamlico River Basin: Model Stormwater Program for Nutrient Control* , available from local governments implementing the stormwater rule and the NC Division of Water Quality staff contact for the Tar-Pamlico nutrient strategy, in the Nonpoint Source Unit of the central DWQ office, Raleigh, NC. The information may also be downloaded from the Division of Water Quality's Tar-Pamlico web page at http://h2o.enr.state.nc.us/nps/tarpam.htm.

This file contains worksheets with the following elements:
1. Definitions of Land Use Terms Used in Spreadsheets (this page)
2. Residential Worksheet when Footprints are not Shown (1 pg.)
3. Export Calculation Worksheet for Coastal Plain Communities (1 pg.)
4. BMP Removal Calculation Worksheet for Coastal Plain Communities (3 pp.)

Definitions of Land Use Terms Used in Spreadsheets

Transportation impervious: The portion of the development that is taken up by roads, driveways, parking areas, wash pads or any other facility designed for vehicular use, maintenance or storage. Transportation impervious includes areas covered in pavement, gravel, pavers and dirt.

Roof impervious: The portion of the development that consists of roofs of buildings and garages that serve single-family homes. Commercial parking garages shall be considered as transportation impervious.

Managed pervious: The portion of the development that consists of vegetated areas that the landowner could manage by mowing, logging, applying fertilizer, etc. Although residential development may include pervious areas that are initially undisturbed, these areas must be considered as managed pervious (instead of wooded pervious) unless they have conservation easements or another mechanism to insure they will not be managed. Also, the land in Zone 2 (the outer 20 feet) of a protected riparian buffer must be considered as managed pervious area unless it is protected by a conservation mechanism.

Wooded pervious: The portion of the development that consists of forested areas that are permanently protected by a conservation easement or other binding conservation mechanism. Also, wetlands and the land in Zone 1 of a protected riparian buffer (the first 30 feet adjacent to a stream) may be considered as wooded pervious area.

Residential Worksheet when Footprints are not Shown

. . .

Use this worksheet when building footprints are not known to determine the acreage in each of the four categories - transportation impervious, roof impervious, managed pervious, and wooded pervious - in the development. You will need these acreages for both the "Export before BMPs" and "Export after BMPs" worksheets. For the "Export after BMPs" worksheet, you will need to subtract the acreage occupied by BMPs from the managed pervious acreage produced by this worksheet. Also for the "Export after BMPs" worksheet, if the development contains more than one catchment, use this worksheet for each catchment.

Project Name: _____

Date: _____

By: _____

Directions:

> In the two green spaces in the box below, enter the average lot size and the percent of the right-of-way that is impervious within the development.

> In the table below, for the type of land cover listed for each column, enter acreages in the green boxes beneath.

> In the "Lot Area" column, be sure to enter acreage within lots that is protected by a conservation easement, the Tar-Pamlico buffer rule, or wetland rules in the green box in the lower lefthand corner (enter "0" if there is none). If lots are drawn to exclude protected lands that are part of the total development acreage, enter the acreage of those protected lands as wooded pervious in the "Community Areas" column.

> The spreadsheet will compute all values in the light blue shaded boxes.

> NOTE: In the "Community Areas" column, you will need to ensure that the various component acreages sum to the value in the "TOTAL" box at the top. The spreadsheet will not correct for inconsistencies. Any inconsistency between the total value and the sum of individual acreages will carry over to column (5).

Average lot size = _____ ac (Must show building footprints if lot size < 0.13 ac.)

% impervious in right-of-way = _____ %

(1) Type of Land Cover	(2) Lot area (ac)	(3) Right-of-way area (ac)	(4) Community areas (ac)	(5) Sum of Columns (2), (3), and (4)
TOTAL				
Transportation impervious				
Roof impervious				
Managed pervious				
Wooded pervious				

Coastal Plain of the Tar-Pamlico River Basin:

Includes Greenville and Washington as well as Pitt and Beaufort Counties

Total Nitrogen and Total Phosphorus Loading Calculation Worksheet (Automated)

Project Name: _____

Date: _____

By: _____ Checked By: _____

Directions (same for pre-development and post-development tables):

> Enter the acres of each type of land cover in the green boxes. The spreadsheet will calculate all of the values in light blue.

> Compare total areas of development in pre- and post- tables for consistency (bottom of column (2)), and also for consistency with the site plans. If all of these values are not the same, there is an error that must be corrected.

> Unless drainage onto the development from offsite is diverted around or through the site, offsite catchment area draining in must be included in the acreage values and treated.

Pre-development:

(1) Type of Land Cover	(2) Area (acres)	(3) S.M. Formula (0.51 + 9.1 I)	(4) Average EMC of TN (mg/L)	(5) Column (2) * (3) * (4)	(6) Average EMC of TP (mg/L)	(7) Column (2) * (3) * (6)
Transportation impervious			2.60		0.19	
Roof impervious			1.95		0.11	
Managed pervious (lawn/landscaped)			1.42		0.28	
Managed pervious (cropland)			4.23		1.23	
Managed pervious (pasture)			2.04		0.62	
Wooded pervious			0.95		0.14	
Fraction Impervious (I) =			TN Loading (lb/yr) =		TP Loading (lb/yr) =	
Total Area of Development =			TN Exp. Coeff. (lb/ac/yr) =		TP Exp. Coeff. (lb/ac/yr) =	

Post-development:

(1) Type of Land Cover	(2) Area (acres)	(3) S.M. Formula (0.51 + 9.1 I)	(4) Average EMC of TN (mg/L)	(5) Column (2) * (3) * (4)	(6) Average EMC of TP (mg/L)	(7) Column (2) * (3) * (6)
Transportation impervious			2.60		0.19	
Roof impervious			1.95		0.11	
Managed pervious			1.42		0.28	
Wooded pervious			0.94		0.14	
Fraction Impervious (I) =			TN Loading (lb/yr) =		TP Loading (lb/yr) =	
Total Area of Development =			TN Exp. Coeff. (lb/ac/yr) =		TP Exp. Coeff. (lb/ac/yr) =	

Note: The nutrient loading goals are 4.0 lb/ac/yr for TN and 0.4 lb/ac/yr for TP. If the post-development nutrient loading is below these levels, then no BMP is necessary. Otherwise, the next worksheet calculates post-development TN and TP loadings after BMPs are installed.

Coastal Plain of the Tar-Pamlico River Basin:

Includes Greenville and Washington as well as Pitt and Beaufort Counties

BMP Removal Calculation Worksheet (Automated)

Project Name: _____

Date: _____

By: _____ Checked By: _____

Directions:

> It may be advantageous to split the development into separate catchments to be handled by separate BMPs. The tables below allow the development to be split into as many as three catchments, and can be copied for greater than three. NOTE: Unless runoff flowing onto the development from offsite is routed separately around or through the site, the offsite catchment area draining in must be included in the acreage values of the appropriate land use(s) and treated.

> **Above each table:** Enter the catchment acreage in the top green blank. Based on a comparison of the post-development TN and TP export coefficients you calculated above to the rule requirements of 4.0 lb/ac/yr TN and 0.4 lb/ac/yr TP, select BMP(s) from the list for treating the catchment runoff. Enter the chosen BMP(s) nutrient removal rates in the green blanks. If more than one BMP is to be used in series, the combined removal rates will be calculated automatically in the blue blanks.

> **Catchment Tables:** Enter the acres of each type of land cover in the green boxes. The spreadsheet will calculate all of the light blue boxes. NOTE: Compare the Total Catchment Acreage for the Development (final table) to the value you established in the pre-BMP worksheet tables, and also to the site plans, for consistency. All of these values need to be the same

BMP Nutrient Removal Rates

	TN	TP	Design Standard
Wet Detention Pond	25	40	NC BMP Manual
Stormwater Wetland	40	35	NC BMP Manual
Sand Filter	35	45	NC BMP Manual
Bioretention	35	45	NC BMP Manual
Grass Swales	20	20	NC BMP Manual
Vegetated Filter Strip w/ Level Spreader	20	35	NC BMP Manual
Dry Detention	10	10	NC BMP Manual

Catchment 1:

Total acreage of catchment 1 = _____ ac

First BMP's TN removal rate = _____ %

Second BMP's TN removal rate = _____ %

Third BMP's TN removal rate = _____ %

TOTAL TN REMOVAL RATE = 0 %

First BMP's TP removal rate = _____ %

Second BMP's TP removal rate = _____ %

Third BMP's TP removal rate = _____ %

TOTAL TP REMOVAL RATE = 0 %

(1) Type of Land Cover	(2) Catchment Acreage	(3) S.M. Formula (0.51 + 9.1 I)	(4) Average EMC of TN (mg/L)	(5) Column (2) * (3) * (4)	(6) Average EMC of TP (mg/L)	(7) Column (2) * (3) * (6)
Transportation impervious			2.60		0.19	
Roof impervious			1.95		0.11	
Managed pervious			1.42		0.28	
Wooded pervious			0.94		0.14	
Area taken up by BMP			1.95		0.11	
Fraction Impervious (I) =			Pre-BMP TN Load (lb/yr) =		Pre-BMP TP Load (lb/yr) =	
Total Area of Development =			Pre-BMP TN Export (lb/ac/yr)		Pre-BMP TP Export (lb/ac/yr)	
			Post-BMP TN Load (lb/yr) =		Post-BMP TP Load (lb/yr) =	
			Post-BMP TN Export (lb/ac/yr)		Post-BMP TP Export (lb/ac/yr)	

Catchment 2:

Total acreage of catchment 2 = ac

First BMP's TN removal rate = %
Second BMP's TN removal rate = %
Third BMP's TN removal rate = %
TOTAL TN REMOVAL RATE = **0** %

First BMP's TP removal rate = %
Second BMP's TP removal rate = %
Third BMP's TP removal rate = %
TOTAL TP REMOVAL RATE = **0** %

(1) Type of Land Cover	(2) Catchment Acreage	(3) S.M. Formula (0.51 + 9.1 I)	(4) Average EMC of TN (mg/L)	(5) Column (2) * (3) * (4)	(6) Average EMC of TP (mg/L)	(7) Column (2) * (3) * (6)
Transportation impervious			**2.60**		**0.19**	
Roof impervious			**1.95**		**0.11**	
Managed pervious			**1.42**		**0.28**	
Wooded pervious			**0.94**		**0.14**	
Area taken up by BMP			**1.95**		**0.11**	
Fraction Impervious (I) =			**Pre-BMP TN Load (lb/yr) =**		**Pre-BMP TP Load (lb/yr) =**	
Total Area of Development =			**Pre-BMP TN Export (lb/ac/yr)**		**Pre-BMP TP Export (lb/ac/yr)**	
			Post-BMP TN Load (lb/yr) =		**Post-BMP TP Load (lb/yr) =**	
			Post-BMP TN Export (lb/ac/yr)		**Post-BMP TP Export (lb/ac/yr)**	

Catchment 3:

Total acreage of catchment 3 = ac

First BMP's TN removal rate = %
Second BMP's TN removal rate = %
Third BMP's TN removal rate = %
TOTAL TN REMOVAL RATE = **0** %

First BMP's TP removal rate = %
Second BMP's TP removal rate = %
Third BMP's TP removal rate = %
TOTAL TP REMOVAL RATE = **0** %

(1) Type of Land Cover	(2) Catchment Acreage	(3) S.M. Formula (0.51 + 9.1 I)	(4) Average EMC of TN (mg/L)	(5) Column (2) * (3) * (4)	(6) Average EMC of TP (mg/L)	(7) Column (2) * (3) * (6)
Transportation impervious			**2.60**		**0.19**	
Roof impervious			**1.95**		**0.11**	
Managed pervious			**1.42**		**0.28**	
Wooded pervious			**0.94**		**0.14**	
Area taken up by BMP			**1.95**		**0.11**	
Fraction Impervious (I) =			**Pre-BMP TN Load (lb/yr) =**		**Pre-BMP TP Load (lb/yr) =**	
Total Area of Development =			**Pre-BMP TN Export (lb/ac/yr)**		**Pre-BMP TP Export (lb/ac/yr)**	
			Post-BMP TN Load (lb/yr) =		**Post-BMP TP Load (lb/yr) =**	
			Post-BMP TN Export (lb/ac/yr)		**Post-BMP TP Export (lb/ac/yr)**	

Weighted Average of Nutrient Loadings from the Catchments:

	Catchment Acreage	Post-BMP TN Loading (lb/ac/yr)	Post-BMP TP Loading (lb/ac/yr)
Catchment 1	**0.00**	**0.00**	**0.00**
Catchment 2	**0.00**	**0.00**	**0.00**
Catchment 3	**0.00**	**0.00**	**0.00**
TOTAL FOR DEVELOPMENT	**0.00**	**0.00**	**0.00**

Note: The nutrient loading goals are 4.0 lb/ac/yr for TN and 0.4 lb/ac/yr for TP. If the post-development nutrient loading is below these levels, then the BMPs planned are adequate. Otherwise, additional BMPs and/or modifications in development plans are required.

Appendix C. Land Use Planning and Design Techniques

Reducing Road Widths

In many instances, road widths are required to be wider than needed to safely convey traffic through residential and commercial areas. Although these wide widths are often adopted to increase safety for automobiles, they often increase speeds through residential areas and, in so doing, may decrease safety for pedestrians and cyclists. Also, some jurisdictions require curb and gutter for aesthetic reasons where it is not actually necessary to control stormwater runoff. This can result in increased flooding and also eliminates the potential for stormwater runoff control and treatment that can occurs in properly designed and maintained roadside swales.

Most local governments model their residential street design standards after state and/or federal highway criteria, although the traffic capacity and function of their street system is considerably different from highways. Very few communities recognize any local road categories that are different from established state and federal street categories. Many local traffic engineers have simply accepted the notion that wider streets adequately address these concerns and that wide streets are safe streets (Schueler 1995).
Narrower road widths can reduce the road surface area by up to 35 percent.

A number of communities have implemented standards that promote narrower residential streets and have concluded this to be an attractive, safe and environmentally beneficial alternative.

Communities should also review their standards for turnarounds to reduce the need or unnecessary road surface. One of the most common types of turnaround is a cul-de-sac that may have a diameter of 80 to 100 feet or more (Schueler 1995). Some communities are recognizing that this is excessive and are choosing alternatives that create less impervious cover, such as T-shapes. A 60-foot by 30-foot T-shaped turnaround creates only about 36% as much impervious area as an 80-foot diameter cul-de-sac and is more than adequate for most vehicles.

Local governments should: (1) examine community regulations governing road width and turnaround size; (2) evaluate if the specified widths are necessary; and (3) where feasible, make changes to reduce unnecessary road surfaces.

Reducing Minimum Parking Requirements

Parking lots are often designed to accommodate parking needs on the busiest days of the year. For example, shopping center parking areas are often big enough to handle the busy holiday times, but then sit vacant for much of the rest of the year. This can result in increased nitrogen load (as opposed to maintaining open space).

Some management strategies that would contribute to a reduction in urban nitrogen from parking lots:

- Use angles and smaller parking spaces.
- Use more pervious construction materials in seldom-used parking areas (Land of Sky 1995).
- Provide public transportation to shopping centers during the peak holiday times and encourage people to use it.
- Design parking areas to drain in sheet flow into stable vegetated areas.

Minimizing Use of Curb and Gutter

Runoff is conveyed along streets and parking areas in one of two ways, either (a) in an open drainage channel located in the right of way, or (b) in an enclosed storm drain located under the street or right of way. The use of an open channel or storm drain in a particular street is determined by a number of factors, such as drainage area, slope, length, housing density, and street type. Open channels can be used on smaller streets, but at some point runoff velocities become too erosive to be adequately handled in an earthen channel and they must be enclosed in a storm drain. This erosive velocity is typically around 4 feet per second. A channel's maximum velocity is generally defined and computed using the peak discharge rate under the two year design storm event.

Open vegetated channels can have many water resource protection benefits. For example, a portion of stormwater pollutants may be removed through grass and soil as they pass through the channel. Performance monitoring has shown that open channels only realize these benefits under ideal conditions (e.g., low slope, sandy soils, dense grass cover, etc.). When these conditions are not met, drainage channels can have a low or even negative removal capability for many pollutants.

Only recently have engineers recognized the value of designing open channels explicitly for pollutant removal during small and moderate-sized storm events. Depending on the depth to the water table, they are known as either grass channels, dry swales or wet swales. Checkdams, underdrains, stone inlets, prepared soil mixes and landscaping are also used to enhance the pollutant removal capability of swales. The use of grass channels or swales along residential streets can be an economical and effective element of a BMP system, as long as the critical erosive velocity is not exceeded. In addition, open channels must be designed to prevent standing water, to ensure that mowing is convenient, and to avoid odors, mosquitoes, or other nuisances associated with standing water.

Even the moderate vertical break of a curb shelters airborne pollutants that blow in by the wind. Thus, dust, pollen, leaves, grass clippings, and other nitrogen-rich organic matter can be trapped by the curb, where they remain until they are washed into the storm drain system.

Some management strategies that may contribute to a reduction in urban nitrogen from roadside drainage systems are:

- Minimize the use of curb and gutter and maximize the use of vegetated swales where feasible.
- If curb and gutter is necessary, consider frequent curb cuts to divert manageable quantities of runoff into stable vegetated areas for infiltration. (Land of Sky 1995).
- Develop a site/landscaping plan that uses landscaped areas for infiltration or detention/retention areas (bioretention).
- Instead of grass that requires chemical applications, use trees, shrubs, ground cover, mulch or other materials that require little or no chemical applications.

Allowing Cluster or Open-Space Developments

Cluster or open-space developments rearrange density on each development tract so that a lower percentage of the tract is covered by impervious surfaces. This results in more land being retained in a natural state.

This approach respects private property rights and the ability of developers to create new homes for the expanding population. Such developments are "density-neutral" since the overall number of dwellings allowed is not less than it would be in a conventional development. This lessens the adverse impact on the remaining natural areas and cultural resources that make our communities such special places to live, work, and recreate.

The most important step in designing an "open space subdivision" is to identify the land to preserve. "Primary Conservation Areas" include unbuildable wetlands, waterbodies, floodplains, and steep slopes. "Secondary Conservation Areas" include mature woodlands, upland buffers around wetlands and waterbodies, prime farmland, natural meadows, critical wildlife habitats, and sites of historic, cultural or archeological significance.

Cluster developments can reduce road lengths by 50 to 70 percent (Arendt 1993). At an average cost of over $100 to construct a linear foot of road, such reductions are extremely cost-effective. The reduction in road length may also reduce the overall capital costs for stormwater controls. The developer may realize a significant savings in the reduced need for storm drain pipes and best management practices. It has been reported that in some cases the overall reduction in capital costs associated with these developments can be 10 to 33 percent (Schueler 1995).

Property owners can realize indirect economic benefits from reduced impervious cover. While a host of factors influence future residential property values, some evidence indicates that homes located adjacent to well designed and maintained open or green space do appreciate at a faster rate than traditional subdivision properties. This premium has been found to range from 5 to 32 percent, according to Land Ethics (1994). Another study in Massachusetts indicated that homes in cluster subdivisions with open space appreciated 13% more in value than similar homes in conventional subdivisions over a 21-year period (Arendt 1993).

For local governments, it is typically more expensive to provide public services on large residential lot developments compared to smaller ones. Clustered

developments can greatly reduce the length of water and sewer pipes and roads that local governments have to construct and maintain.

Allowing Traditional Neighborhood Developments

Traditional neighborhood developments (TNDs) are designed so that dwellings, shops, and workplaces are in close proximity. They typically follow a rectilinear pattern of streets and blocks arranged to provide interesting routes of travel that also accommodate and promote pedestrian travel and bicycle travel rather than automobile travel. These developments also include greenways, landscaped streets, churches, stores, schools, and parks woven into the neighborhood for social activity, recreation, aesthetics, and environmental enhancement. See Figure G1 for a diagram of a TND.

One of the most important features of TNDs that affects water quality is their compactness. As these developments expand, they maintain their compact, rectilinear layout and their accessibility. Another environmental advantage offered by TNDs is that they may reduce automobile traffic and promote increased use of alternative forms of transportation, such as mass transit.

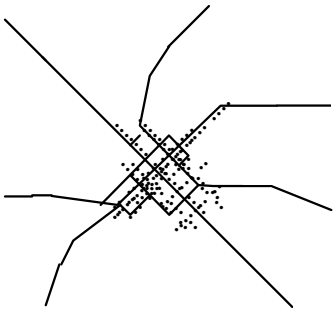
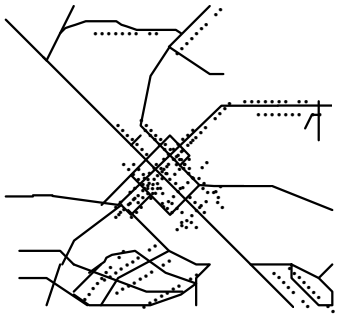
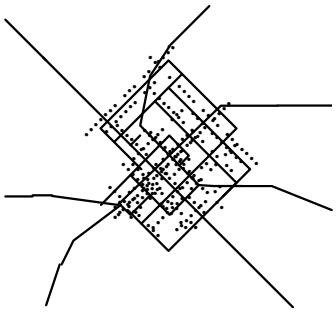
Environmental impacts of TNDs are affected by site conditions and the development intensity and design. Those TNDs that offer environmental benefits may also offer economic benefits. The increased value of real estate in a traditional development is illustrated in Raleigh. The "inside the beltline" neighborhoods in Raleigh that have city blocks, greenways, and accessibility to shopping areas, on the average, sell for 40 percent more per square foot than homes in North Raleigh subdivisions (pers. comm. Marilyn Marks, Simpson and Underwood Realtors, 1997).

Other Techniques

In many instances, subdivision codes contain rigid requirements that govern setbacks from the property lines. These requirements increase the length of driveways, roads, and sidewalks and thus increase the proportion of impervious cover to housing units. These requirements can inadvertently increase impervious surfaces and cause expense for developers and homeowners.

Large-lot zoning also impacts overall imperviousness. Although large-lot zoning reduces rooftop impervious cover in a watershed and spreads development over a wider geographic area, it can increase transport-related impervious cover because of longer road networks. Although large-lot zoning may be wise for individual sensitive watersheds, it is probably not practical as a uniform standard. An alternative is forming more compact neighborhoods in order to decrease impervious surfaces associated with transportation, a factor that has long been overlooked. Another advantage to compact neighborhoods is that they decrease automobile use by allowing better accessibility for walkers and cyclists and facilitating public transportation.

Figure G1. Maytown Before and After (adapted from Stimmel Associates, 1993)

A. Maytown in 1900	B. Maytown today.	C. Maytown as it could have been.
		
A. Maytown developed around a central square with a grid street pattern. Development was compact and there was a distinct separation between the village and the surrounding countryside.	B. The development that has occurred over the past 30 years is not compatible with the original village. Curvilinear street and cul-de-sacs have replaced the traditional grid street pattern. The separation between the village and the surrounding countryside have been lost.	C. The same amound of development could have been accommodated in a pattern that complements the original village. All residents could have been within walking distance of the center square, community facilities, and parks.

Appendix D. BMP Operation and Maintenance Agreement (Example)

The BMP Operation and Maintenance Agreement presented is in a general format for recording purposes. It is the landowner's responsibility to prepare a document that is in accordance with the requirements of the City of Greenville's Stormwater Management and Control Ordinance.

BMP OPERATION AND MAINTENANCE AGREEMENT[1]

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between _____ hereinafter
(Insert Full Name of Owner)
called the "Landowner" and the City of Greenville, hereinafter called the "City".

WITNESSETH, that

WHEREAS, the Landowner is the owner of certain real property described as _____ as recorded by deed in the land
(Pitt County Tax Map / Parcel Identification Number)
records of Pitt County, North Carolina, Deed Book _____Page _____, hereinafter called the "Property".

WHEREAS, the Landowner is proceeding to build on and develop the Property; and

WHEREAS, the Site Plan/Subdivision Plan known as _____,
(Name of Plan/Development)
hereinafter called the "Plan", which is expressly made a part hereof, as approved or to be approved by the City, provides for detention of stormwater within the confines of the property; and

WHEREAS, the City and the Landowner, its successors and assigns, including any homeowners association, agree that the health, safety, and welfare of the residents of the City of Greenville, North Carolina, require that on-site stormwater management/BMP facilities be constructed and maintained on the Property; and

WHEREAS, the City requires that on-site stormwater management/BMP facilities as shown on the Plan be constructed and adequately maintained by the Landowner, its successors and assigns, including any homeowners association.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

---

[1] Return to:
City of Greenville – Public Works Department, Engineering
1500 Beatty Street, Greenville, North Carolina 27834

1. The on-site stormwater management/BMP facilities shall be constructed by the Landowner, its successors and assigns, in accordance with the plans and specifications identified in the Plan.

2. The Landowner, its successors and assigns, including any homeowners association, shall adequately maintain the stormwater management/BMP facilities in accordance with the requirements of the City of Greenville's Stormwater Management Program, which references the North Carolina Department of Environment and Natural Resources, Division of Water Quality, Water Quality Section, *Stormwater Best Management Practices Manual*. This includes all pipes and channels built to convey stormwater to the facility, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions.

3. The Landowner, its successors and assigns, shall have a qualified professional as defined by Title 9 Chapter 9 of the Greenville City Code inspect the stormwater management/BMP facility and maintain annual inspection reports. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structure, pond areas, access roads, etc. Deficiencies shall be noted in the inspection report. Annual reports shall be kept on record for a minimum of five years and shall be made available to the City upon request.

4. The Landowner, its successors and assigns, hereby grant permission to the City, its authorized agents and employees, to enter upon the Property and to inspect the stormwater management/BMP facilities whenever the City deems necessary. When making the entry, the City will take reasonable efforts to ensure that the entry does not unreasonably interfere with the business operations of the Landowner, its successors and assigns, at the Property. The purpose of inspection is to follow-up on reported deficiencies and/or to respond to citizen complaints. The City shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary.

5. In the event the Landowner, its successors and assigns, fails to maintain the stormwater management/BMP facilities in good working condition acceptable to the City within 60 days after receipt of the inspection findings and a directive to commence with the repairs, the City may enter upon the Property and take whatever steps necessary to correct deficiencies identified in the inspection report and to charge the costs of such repairs to the Landowner, its successors and assigns. This provision shall not be

construed to allow the City to erect any structure of permanent nature on the land of the Landowner outside of the easement for the stormwater management/BMP facilities. It is expressly understood and agreed that the City is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.

6. The Landowner, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management/BMP facilities (including sediment removal) is outlined on the approved plans, the schedule will be followed.

7. In the event the City pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the City upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the City hereunder.

8. This Agreement imposes no liability of any kind whatsoever on the City and the Landowner agrees to hold the City harmless from any liability in the event the stormwater management/BMP facilities fail to operate properly.

9. This Agreement shall be recorded in the Registry of Deeds among the land records of Pitt County, North Carolina, and shall constitute a covenant running with the Property, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests, including any homeowners association.

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the day and year first above written:

_____ _____

Company/Corporation/Partnership Name Mailing Address

_____

By: _____

_____

(Type Name)

_____

(Type Title)

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public for _____ County, North Carolina, certify that _____ personally came before me this day and acknowledged that he (or she) is_____ of _____, a corporation, and that he (or she), as _____, being authorized to do so, executed the foregoing on behalf of the corporation.

Witness my hand and official seal, this the _____ day of _____, 20_____.

(Official Seal)

_____
NOTARY PUBLIC

My Commission Expires: _____

City of Greenville, Pitt County, North Carolina
Company/Corporation/Partnership Name

By: _____

Scott P. M. Godefroy
(Type Name)
City Engineer
(Type Title)

STATE OF North Carolina

COUNTY OF Pitt

I, _____, a Notary Public for Pitt County, North Carolina, certify that Scott P. M. Godefroy personally came before me this day and acknowledged that he is City Engineer for The City of Greenville, a corporation, and that he, as City Engineer, being authorized to do so, executed the foregoing on behalf of the corporation.

Witness my hand and official seal, this the _____ day of _____, 20_____.

(Official Seal)

_____
NOTARY PUBLIC

My Commission Expires: _____

Approved as to Form:

_____ _____
City Attorney Date

CHAPTER 9: STORMWATER MANAGEMENT AND CONTROL

Section

SEC. 9-9-1 TITLE.

This chapter shall be known and may be cited as the City of Greenville's "Stormwater Management and Control Ordinance" or this chapter.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-2 PURPOSES.

(A) This chapter is adopted for the purposes of:

(1) Protecting the public health, safety and welfare by controlling the discharge of pollutants into the stormwater conveyance system;

(2) Promoting the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by regulations designed to control the rate of release of stormwater runoff of certain developments where the rate of runoff has been significantly increased;

(3) Promoting activities directed toward the maintenance and improvement of surface and ground water quality;

(4) To protect the riparian buffer along all intermittent and perennial streams;

(5) Limiting the nitrogen and phosphorus load from new development;

(6) Satisfying the requirements imposed upon the City of Greenville under the Tar-Pamlico Stormwater Rule (15A NCAC 2B .0258) and the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) discharge permit issued by the state; and

(7) Establishing administration and enforcement procedures through which these purposes can be fulfilled.

(B) The provisions of this chapter are supplemental to regulations administered by federal and state governments. (Ord. No. 04-112, passed 9-9-2004; Ord. No. 11-006, § 1, passed 1-13-2011)

SEC. 9-9-3 DEFINITIONS.

For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

Best management practices (BMPs). Structural and/or non-structural controls that temporarily store or treat stormwater runoff, which act to reduce flooding, remove pollutants, and provide other amenities.

Built-upon area (BUA). That portion of a development project that is covered by impervious or partially impervious cover including buildings, pavement, gravel areas (e.g., roads, parking lots, paths), recreation facilities (e.g., tennis courts) and the like. (Note: wooden slatted decks and the water area of a swimming pool are considered pervious.)

City. The City of Greenville, North Carolina.

Detention facility (dry). A facility, constructed for the purpose of detaining stormwater runoff from a developed site to control the peak discharge rates, that is normally maintained as a dry basin.

Detention facility (wet). A facility, constructed for the purpose of detaining stormwater runoff from a developed site to control the peak discharge rates, that is normally maintained with a permanent pool of water.

Ditch. An open channel constructed to transfer stormwater from one area to another. This does not include any open channel that is classified as a perennial or intermittent stream.

Drainage easement. The land required for the installation of stormwater drainage facilities and/or along a natural stream or watercourse for preserving the channel and providing access for maintenance and operation.

Drainage facilities. All ditches, channels, conduits, retention-detention systems, tiles, swales, sewers, and other natural or artificial means of draining stormwater from land.

Drainage requirements.

(1) Minimum drainage standards as established by this chapter;

(2) Regulations promulgated by the Public Works Department of the city;

(3) Obligations and requirements relating to drainage established under the Subdivision Control Ordinance of the city, as set forth in Title 9, Chapter 5;

(4) Requirements stated under the Zoning Ordinance of the city as set forth in Title 9, Chapter 4, including floodway zoning requirements; and

(5) Conditions relating to drainage attached to a grant of variance by the Board of Adjustment of the city.

Drainage (subsurface). A system of pipes, tile, conduit or tubing installed beneath the ground surface used to collect underground water from individual parcels, lots, building footings or pavements.

Drainage (surface). A system by which the stormwater runoff is conducted to an outlet. This would include the proper grading of parking lots, streets, driveways and yards so that stormwater runoff is removed without ponding and flows to a drainage swale, open ditch or a storm sewer.

Drainage (swale). A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water from a field, diversion or other site feature.

Drainage system. Any combination of surface and/or subsurface drainage components fulfilling the drainage requirements of this chapter.

Easement. A grant by the property owner of the use of a strip of land by the public, a corporation, or persons, for specified purposes.

Engineer. The City Engineer of the City of Greenville, North Carolina.

Extraterritorial jurisdiction. The area beyond the city limits within which the planning, zoning and building regulations of the city apply in accordance with state law. The area is delineated on the official zoning map for the city.

Impervious surfaces. Those areas within developed land that prevent or significantly impede the infiltration of stormwater into the soil. Common "impervious surfaces" include but are not limited to roof tops, sidewalks, walkways, patio areas, roads, driveways, parking lots, storage areas, brick or concrete pavers, compacted gravel surfaces (roads, driveways, parking and storage areas), and other surfaces which prevent or significantly impede the natural infiltration of stormwater into the soil.

Illicit connection. Any unlawful connection that allows the discharge of non-stormwater to the stormwater conveyance system or waters of the state in violation of this chapter.

Illicit discharge. Any unlawful disposal, placement, emptying, dumping, spillage, leakage, pumping, pouring, emission or other discharge of any substance other than stormwater, unless associated with permitted activity as identified in section 9-9-16(A), into a stormwater conveyance, the waters of the state, or upon the land in such proximity to the same, such that the substance is likely to reach a stormwater conveyance or the waters of the state.

Jurisdictional stream. A stream that has been determined to be either permanent or intermittent by North Carolina Division of Environment and Natural Resources. These features have flora and fauna that are characteristic of streams in undeveloped areas.

Land-disturbing activity. Any use of the land by any person in residential, industrial, educational, institutional or commercial development, highway and road construction and maintenance that results in a change in the natural cover or topography and that may cause or contribute to sedimentation.

Land preservation. The permanent dedication of development rights for conservation purposes to a third party on currently undeveloped property contained wholly within one parcel as registered with Pitt County or a portion of a developed parcel that is permanently dedication to a third party for conservation purposes.

Maintenance. Cleaning, spraying, removing obstructions from and making minor repairs to a drainage facility so that it will perform the function for which it was designed and constructed.

Municipal separate storm sewer system (MS4). A stormwater conveyance or unified stormwater conveyance system (including without limitation: roads with drainage systems, municipal streets, catch basins, stormwater detention facilities, curbs, gutters, ditches, natural or man-made channels, or storm drains), that:

(1) Is located within the corporate limits of Greenville, North Carolina;

(2) Is owned or operated by the state, county, the city or other public body; and

(3) Discharges to waters of the state, excluding publicly owned treatment works, and lawful connections thereto, which in turn discharge into the waters of the state.

New development. The following:

(1) Any activity including grubbing, stump removal and/or grading that disturbs greater than one acre of land to establish, expand or replace a single-family or duplex residential development or recreational facility. For

individual single-family residential lots of record that are not part of a larger common plan of development or sale, the activity must also result in greater than 10% built-upon area.

(2) Any activity including grubbing, stump removal and/or grading that disturbs greater than one-half an acre of land to establish, expand or replace a multi-family residential development or a commercial, industrial or institutional facility.

(3) Projects meeting subsection (1) or (2) above that replace or expand existing structures or improvements and that do not result in a net increase in built-upon area shall not be required to meet the basinwide average non-urban loading levels.

(4) Projects meeting subsection (1) or (2) above that replace or expand existing structures or improvements and that result in a net increase in built-upon area shall achieve a 30% reduction in nitrogen loading and no increase in phosphorus loading relative to the previous development. Such projects may achieve these loads through onsite or offsite measures or some combination thereof.

(5) New development shall not include agriculture, mining, or forestry activities.

Non-jurisdictional stream. A stream that has been determined to be neither permanent nor intermittent by North Carolina Division of Environment and Natural Resources. These features do not have the flora and fauna that are characteristic of streams in undeveloped areas.

NPDES or *National Pollutant Discharge Elimination System.* A Federal Environmental Protection Agency program initiated to reduce and eliminate pollutants reaching water bodies of all types.

Open channel. A drainage channel, which may or may not have a continuous water flow. Intended to convey surface, subsurface and stormwater runoff.

Pollution. A man-made or man-induced alteration of the chemical, physical, biological, thermal, and/or radiological integrity of water.

Qualified professional. An individual who both: has received a baccalaureate or postgraduate degree in the natural sciences or engineering; and is trained and experienced in stormwater treatment techniques and related fields as may be demonstrated by state registration, professional certification, or completion of coursework that enable the individual to make sound, professional judgments regarding stormwater control/treatment and drainage planning.

Redevelopment. Any rebuilding activity other than a rebuilding activity that:

(1) Results in no net increase in built-upon area; and

(2) Provides equal or greater stormwater control than the previous development.

Registered professional. An individual who is registered in the State of North Carolina as a professional engineer.

Riparian buffer. The 50-foot wide area directly adjacent to surface waters in the Tar-Pamlico and Neuse River Basins (intermittent streams, perennial streams, lakes, ponds and estuaries), excluding wetlands. For the purpose of this definition, a surface water shall be present if the feature is approximately shown on either the most recent version of the soil survey map by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS).

Stormwater. The runoff from precipitation that travels over natural or developed surfaces to the nearest stream, other conduit, or impoundment and appears in lakes, rivers, ponds, or other bodies of water.

Stormwater and drainage systems. Natural and structural channels, swales, ditches, swamps, rivers, streams, creeks, branches, reservoirs, ponds, drainage ways, inlets, catch basins, pipes, head walls, storm sewers, lakes, and other physical works, properties, and improvements which transfer, control, convey or otherwise influence the movement of stormwater runoff.

Stormwater management programs. Programs designed to protect water quality by controlling the level of pollutants in, and the quantity and flow of, stormwater.

Waters of the state. Any stream, river, brook, swamp, lake, sound, tidal estuary, bay, creek, reservoir, waterway, or other body or accumulation of water, whether surface or underground, public or private, or natural or artificial, that is contained in, flows through, or borders upon any portion of this state, including any portion of the Atlantic Ocean over which the state has jurisdiction. Treatment systems, consisting of man-made bodies of water, which were not originally created in waters of the state and which are not the result of impoundment of waters of the state, are not "waters of the state."
(Ord. No. 04-112, passed 9-9-2004; Ord. No. 11-006, § 2, passed 1-13-2011)

SEC. 9-9-4 SCOPE; EXCLUSIONS.

This chapter shall apply within the city limits of the city and within the extraterritorial jurisdiction of the city, with the following exclusions:

(A) Any area or subject matter where federal, state or local government, including their agencies, have jurisdiction preempting the city unless intergovernmental agreements have been established giving the city enforcement authority.

(B) All new development projects that have received approval from the city for a site-specific or phased development plan before September 10, 2004, and that have implemented the development project in accordance with the vesting provisions of the Greenville City Code shall be exempt from the requirements of the Tar-Pamlico stormwater rule. Any preliminary plats associated with such development approved before September 10, 2004 must be recorded no later than five years from the date of approval in accordance with section 9-5-43. Any building permit related to a site plan associated with such development approved before September 10, 2004 must be applied for no later than two years from the approval of the site plan in accordance with section 9-4-34. Projects that require a state permit, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities shall be considered exempt if a state permit was issued prior to September 10, 2004.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-5 OBJECTIVES.

The objectives of this chapter are to:

(A) Regulate the discharge of substances, which may contaminate or cause pollution of stormwater, stormwater conveyances or waters of the state;

(B) Regulate connections to the stormwater conveyance system;

(C) Provide for the proper handling of spills; and

(D) Provide for the enforcement of same.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-6 PROTECTION OF RIPARIAN AREAS.

(A) The Tar-Pamlico riparian buffer protection rule, 15A NCAC 2B .0259 requires that 50-foot riparian buffers be maintained on all sides of intermittent and perennial streams, ponds, lakes and estuarine waters in the basin. The buffer rule

provides for certain "allowable" uses within the buffer with Division of Water Quality approval, such as road and utility crossings.

(B) The city shall disapprove any new development activity proposed within the first 50 feet adjacent to a waterbody that is shown on either the USGS 7.5 minute topographic map or the NRCS soil survey map unless the owner can show that the activity has been approved by Division of Water Quality. Division of Water Quality approval may consist of the following:

(1) An on-site determination that surface waters are not present;

(2) An authorization certificate from Division of Water Quality for an "allowable" use such as a road crossing or utility line, or for a use that is "allowable with mitigation" along with a Division-approved mitigation plan. A table delineating such uses is included in the buffer rule;

(3) An opinion from Division of Water Quality that vested rights have been established for the proposed development activity; and/or

(4) A letter from Division of Water Quality documenting that a variance has been approved for the proposed development activity.

(C) After site development, it shall be the responsibility of the landowner or person in possession or control of the land to properly maintain all necessary permanent erosion and sediment control measures installed for the protection of the riparian buffers.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-7 CALCULATING NITROGEN AND PHOSPHORUS EXPORT.

(A) The nitrogen and phosphorus export from each new development within the Tar-Pamlico River Basin must be calculated. The nitrogen export from each new development outside the Tar-Pamlico River Basin must be calculated. These exports will be calculated in pounds per acre per year (lbs/ac/yr). Worksheets to carry out this method are provided in the city's Stormwater Management Program and shall be provided along with a description of the development. It is the responsibility of the person proposing the development to calculate and submit this information to the city.

(B) For a given project, the methodology calculates a weighted annual load export for both nitrogen and phosphorus based on event mean concentrations of runoff from different urban land covers and user-supplied acreages for those land covers. All new developments must achieve a nitrogen export of less than or equal to 4.0 lbs/ac/yr and a phosphorus export of less than or equal to 0.4 lbs/ac/yr. The applicant chooses BMPs that reduce the export to required levels.

(C) All plans shall be prepared by and sealed by a registered professional who certifies under seal that the plan, including engineering detail, conforms to the minimum requirements established by this chapter.

(D) The review of all plans and applications submitted to the city will be overseen by the City Engineer.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-8 BEST MANAGEMENT PRACTICES (BMPS) AND MAINTENANCE.

(A) Best management practices in any new development shall be the entire and sole responsibility of the landowner except those natural streams, channels, ditches, branches and drainage outfall lines for which the city has accepted the responsibility for continuous maintenance.

(B) For residential (or commercial or industrial) development:

(1) If the computed nitrogen export is greater than 6.0 (or 10.0) lbs/ac/yr, then the landowner must either use on-site BMPs or take part in an approved regional or jurisdiction-wide stormwater strategy or some

combination of these to lower the nitrogen export to at least 6.0 (or 10.0) lbs/ac/yr. The owner may then use one of the following two options to reduce nitrogen from 6.0 (or 10.0) to 4.0 lbs/ac/yr.

(2) If the computed nitrogen export is greater than 4.0 lbs/ac/yr but less than 6.0 (or 10.0) lbs/ac/yr, then the owner may either:

(a) Install BMPs on-site or take part in an approved regional or jurisdiction-wide stormwater strategy or some combination of these to remove nitrogen down to 4.0 lbs/ac/yr; or

(b) Provide treatment of an off-site developed area that drains to the same stream to achieve the same nitrogen mass loading reduction that would have occurred on-site.

(3) The landowner must install BMPs that also achieve a phosphorus export of less than or equal to 0.4 lbs/ac/yr, but may do so through any combination of on-site and off-site measures.

(C) Each BMP shall be constructed to meet the requirements of the city's Stormwater Management Program and shall have a maintenance plan.

(D) Each maintenance plan shall be on file in the office of the City Engineer. Maintenance plans must be on file prior to construction and shall contain the following information:

(1) Owner's name or names;

(2) Owner's mailing address;

(3) Deed book, page number or other recording information for the land containing the BMP(s);

(4) Any easements for maintenance, ingress, egress and regress to the BMP(s);

(5) A description of the BMP(s);

(6) Maintenance recommended for the BMP(s) to achieve the maximum effect; and

(7) Notarized signature of the owner of the BMP(s) and statement that the owner understands the requirements of the rules and regulations for the BMP(s).

(E) Each BMP shall be maintained as required in the maintenance plan as to allow the BMP to achieve its maximum effect. Maintenance is to be performed as needed.

(F) Maintenance of the BMP includes maintaining access for the stormwater to reach and leave the BMP, maintenance of the BMP structure itself, and maintaining access to the BMP for the purpose of inspections, maintenance and repairs.

(G) An annual maintenance and inspection report completed by a qualified professional shall be maintained by the owner for each BMP in accordance with the operation and maintenance agreement submitted in the initial plan submittal. The annual report will describe the maintenance and repair activities of the subject year, including copies of inspection and repair logs, and note any needed modifications to the repair plan for the following year. Annual reports shall be kept on record for a minimum of five years and shall be made available to the city upon request.

(H) All BMP(s) shall be inspected annually by the city. If repairs or maintenance to the BMP is required, the city will notify the property owner in writing that maintenance is required. The owner will have 90 days from the receipt of such written notice to bring the BMP into proper working order.

(I) If any person, having been ordered to perform such maintenance, fails, neglects or refuses to perform the maintenance within 90 days from receipt of the order, the Public Works Director shall, at his or her own discretion, have employees of the city or other designated persons go upon said premises and perform the necessary maintenance.

(J) The cost of repairs and work completed by the city shall be the responsibility of the owner. The city will submit a statement of charges to be reimbursed by the owner. The owner shall have 30 days to remit payment.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-9 OFF-SITE PARTIAL OFFSET OPTION.

Landowners shall have the option of partially offsetting their nitrogen and phosphorus loads by providing treatment of off-site developed areas. The off-site area must drain to the same classified surface water, as defined in the Schedule of Classifications, 15A NCAC 2B .0316, that the development site drains to most directly. The developer must provide legal assurance of the dedicated use of the off-site area for the purposes described here, including achievement of specified nutrient load reductions and provision for regular operation and maintenance activities, in perpetuity. The legal assurance shall include an instrument, such as a conservation easement, that maintains this restriction upon change of ownership or modification of the off-site property. Before using off-site treatment, the new development must attain a maximum nitrogen export of six pounds/acre/year for residential development and ten pounds/acre/year for commercial or industrial development.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-10 PEAK FLOW REQUIREMENTS.

(A) At a minimum, new development and redevelopment as described in section 9-9-3 shall not result in a net increase in peak flow leaving the site from pre-development conditions for the one-year, 24-hour storm event.

(B) Peak flow leaving the site from pre-development conditions for the one-year, 24-hour storm event shall be calculated and the plan shall be prepared and approved using the standards of the City Engineer, as set forth in the city's *Manual of Standard Designs and Details* and stormwater management program.

(C) The drainage plan as required by this section shall include but not be limited to a site plan showing existing proposed buildings, storm drainage facilities, ground cover, site construction plans with grading plan, and drainage system; drainage facility design data including area map, engineering calculations, area of impervious cover and total land area.

(D) In the event that literal interpretation of this section creates an undue hardship, the applicant may appeal to the Board of Adjustment for a variance in whole or in part from this section.

(E) No part of this section shall be applied to structures existing prior to the effective date of this section nor shall existing impervious ground cover be used in the calculation of runoff.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-11 EXCEPTIONS TO PEAK FLOW REQUIREMENT.

Peak flow control is not required for developments that meet one or more of the following requirements:

(A) The increase in peak flow between pre- and post-development conditions does not exceed 10% (note that this exemption makes it easier to conduct redevelopment activities); or

(B) The development occurs in a part of a drainage basin where stormwater detention can aggravate local flooding problems as determined by the city.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-12 NEW SUBDIVISIONS.

Storm drainage systems in any new subdivision shall be the entire and sole responsibility of the developer except those natural streams, channels, ditches, branches and drainage outfall lines for which the city has accepted the responsibility for

continuous maintenance. All new subdivisions shall have drainage systems installed by the developer in accordance with Title 9, Chapter 5 of this Code. Any drainage ditch in a new subdivision that will require a 48-inch diameter or smaller pipe must be piped. Larger ditches may be left open. The required pipe size shall be as determined by the engineer for the developer and approved by the City Engineering Division.
(Ord. No. 04-112, passed 9-9-2004; Ord. No. 11-006, § 3, passed 1-13-2011)

SEC. 9-9-13 DRAINAGE PROJECTS LOCATED OUTSIDE OF CITY-OWNED RIGHTS-OF-WAY.

(A) *Drainage projects on ditches or non-jurisdictional streams; piping.* The city will participate with property owners in the installation of storm drains crossing private property in other than new subdivisions within the city's corporate limits under the following conditions:

(1) The storm drain to be installed will carry stormwater discharged from an existing city or state street or streets dedicated for public street purposes, including alleys, and accepted for maintenance by the city or state. Storm drainage systems not meeting this requirement are the responsibility of the property owner(s) and the city will not participate in the installation of such storm drains.

(2) An application for the installation of storm drains must be signed by 100% of the owners of the affected property within the limits of the proposed project and submitted to the City Engineering Division.

(3) The property owners must dedicate a drainage easement of a width, length, and type as specified by the Director of Public Works. The dedication of such easement will be at no cost to the city.

(4) The shortest distance in which the city will participate in the installation of storm drainage will be 300 linear feet; any shorter distances than 300 linear feet must be deemed feasible by the City Engineering Division before city participation.

(5) All pipe sizes, structural accessories, discharge points and other specifications shall be as determined by the City Engineering Division.

(6) The city will furnish all labor and equipment and the adjoining property owners will pay for all materials for construction. These materials shall be as determined necessary by the City Engineering Division and shall include headwalls, manholes, catch basins and all other structures normal to a complete storm drainage system. All monies for materials must be deposited by property owners before construction is started.

(7) All authorized work shall be performed by the city, its agents and/or contractors. The city will direct all necessary activities including but not limited to design, engineering, contracting, and construction.

(8) Nothing in this subsection (A) shall be construed, interpreted or applied in a manner to mean that the city will participate in any way in the construction of any box culvert or other structure to be built or constructed in place. The piping of streams shall be restricted in all instances to that drainage where pre-cast or preassembled pipe will be of sufficient capacity, as calculated by the City Engineering Department, for the piping and enclosing herein mentioned and contemplated.

(9) Cost for each property owner shall be determined by dividing the total cost of materials by the total footage of property owners adjoining the proposed pipe locations directly and multiplying the result by the footage of each individual owner to determine his share of the cost.

(10) All storm drainage construction on private property shall be done on a scheduled basis so as not to interfere with other city projects and then only as budgeted funds of the city are available.

(11) The city will not participate in the construction of any storm drainage systems which will require a pipe size larger than 48 inches due to the greatly increased cost of labor, equipment and engineering required due to the use of box culverts, paved channels and other types of solutions.

(B) *Drainage projects on ditches or non-jurisdictional streams; erosion.* The city will stabilize banks on ditches or non-jurisdictional streams crossing private property in other than new subdivisions within the city's corporate limits under the following conditions:

(1) The ditch or non-jurisdictional stream carries stormwater discharged from an existing city or state street or streets dedicated for public street purposes, including alleys, and accepted for maintenance by the city or state. Storm drainage systems not meeting this requirement are the responsibility of the property owner(s) and the city will not participate in such drainage projects.

(2) An application for bank stabilization must be signed by 100% of the owners of the affected property within the limits of the proposed project and submitted to the City Engineering Division.

(3) The property owners must dedicate a drainage easement of a width, length, and type as specified by the Director of Public Works. The dedication of such easement will be at no cost to the city.

(4) Materials and construction methods shall be as determined necessary by the City Engineering Division. All authorized work shall be performed by the city, its agents and/or contractors. The city will direct all necessary activities including but not limited to design, engineering, contracting, and construction.

(5) All drainage projects on private property shall be done on a scheduled basis so as not to interfere with other city projects and then only as budgeted funds of the city are available.

(C) *Drainage projects on jurisdictional streams; piping.* The city will not participate in the piping of jurisdictional streams.

(D) *Drainage projects on jurisdictional streams; erosion.* The city will stabilize or restore banks crossing private property in other than new subdivisions within the city's corporate limits under the following conditions:

(1) The jurisdictional stream carries stormwater discharged from an existing city or state street or streets dedicated for public street purposes, including alleys, and accepted for maintenance by the city or state. Storm drainage systems not meeting this requirement are the responsibility of the property owner(s) and the city will not participate in such drainage projects.

(2) An application for bank stabilization or stream restoration must be signed by 100% of the owners of the affected property within the limits of the proposed project.

(3) The property owners must dedicate a drainage easement of a width, length, and type as specified by the Director of Public Works. The dedication of such easement will be at no cost to the city.

(4) Materials and construction methods shall be as determined necessary by the City Engineering Division. All authorized work shall be performed by the city, its agents and/or contractors. The city will direct all necessary activities including but not limited to design, engineering, contracting, and construction.

(5) All drainage projects on private property shall be done on a scheduled basis so as not to interfere with other city projects and then only as budgeted funds of the city are available.

(E) Drainage assistance projects listed in subsections (A), (B) and (D) above may be funded with stormwater utility funds or other funds provided that all of the following eligibility criteria are met:

(1) The drainage system is not part of a water quality treatment facility or water quantity control device that was required to be constructed and maintained as part of an approved development.

(2) The drainage system is not located on property which is undergoing development or redevelopment unless the development/redevelopment project is funded in part by other city funds.

(3) The project shall be the most cost effective, reasonable and practical alternative to correct the existing problem, as determined by the Director of Public Works. Any excess costs above the determined most cost effective, reasonable and practical alternative shall be borne entirely by the property owner. Design criteria shall meet, but are not limited to, the following criteria:

(a) The proposed project shall meet current city stormwater design standards to the maximum extent practical;

(b) Existing ditches or non-jurisdictional streams shall not be piped unless engineering reasons require such work or significant cost savings would be realized; and

(c) Jurisdictional streams and their associated buffers shall be protected to the maximum extent practical.

(4) The application of the above factors and the determination as to eligibility for stormwater utility funding or other funding shall be made by the Director of Public Works. Property owners may appeal any decision by the Director of Public Works to the City Manager. If property owners are not satisfied with the decision of the City Manager, property owners may appeal any decision by the City Manager to City Council.

(F) Storm drainage crossing private property, which does not carry storm drainage from existing city or state system streets, dedicated for public street purposes and accepted for maintenance by the city or state, is the responsibility of the property owners and the city will not participate in the installation of storm drains therefore.

(G) No action or inaction of the city pursuant to the policy established by this section shall impose upon the city, its agents, officers or employees any responsibility of liability of any kind, past or future, relating to any person or property. The petitioners shall agree to covenant to and hold the city harmless from any death, personal injury or property damage resulting from the work. No such action by the city shall be considered as a taking or appropriation of any stream, drain or ditch as a part of the city's drainage system.

(H) The conditions set forth in this section shall be binding on the heirs, successors, assigns and grantees of the property owners.

(I) Nothing in this section shall be construed, interpreted or applied in such manner as to aid or assist in the subdivision or development of property in the city. The policy set out herein shall be applicable only to those properties for which no new subdivision or development is anticipated or planned.

(J) The intent of this section is not to transfer responsibility or liability to the city for drainage system components on property not owned by the city that carry stormwater. Rather, it is to establish criteria and priorities to be used when making available funds for work on drainage system components located outside of city-owned rights-of-way.

(K) City participation in work on drainage system components outside of the right-of-way is limited to the extent to which funds are available for such purpose and no entitlement to receive funds for such work arises from this section.
(Ord. No. 11-006, § 4, passed 1-13-2011)

SEC. 9-9-14 ACCEPTANCE OF RESPONSIBILITY FOR CERTAIN STORMWATER CONVEYANCES BY CITY.

(A) The city accepts the responsibility for the maintenance, upkeep and installation of necessary structures, located within a city right-of-way within the city's corporate limits and not within a state right-of-way, in the following natural streams as listed below:

(1) Greens Mill Run, Tar River westerly to city limits west of Memorial Drive;

(2) Fornes Branch, from Greens Mill Run to NC 43;

(3) Reedy Branch, from Greens Mill Run to Greenville Boulevard; and

(4) Any other jurisdictional stream located within the city's corporate limits in which the city has participated in a drainage project pursuant to the provisions of this chapter only within the limits of such project.

(B) The responsibility of the city for the maintenance of streams, located within the city's corporate limits and not within a state right-of-way, includes only the removal of trees that block the flow of the stream. The city will only remove that portion of a tree that is blocking or is an imminent threat to block stream flow. Property owners are responsible for maintaining the vegetation to the standards established by the state (riparian buffer rule). Removal of trash in a stream is the property owner's responsibility including in any adjoining right-of-way.
(Ord. No. 11-006, § 5, passed 1-13-2011)

SEC. 9-9-15 DUTY OF CITY ENGINEER TO MAKE DECISIONS ON APPLICATION OF POLICY.

All decisions concerning application of the stormwater management and control policy and any matters related to the policy shall be the responsibility of the City Engineer.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-16 ILLICIT DISCHARGES AND CONNECTIONS.

(A) *Illicit discharges.*

(1) No person shall cause or allow the discharge, emission, disposal, pouring or pumping directly or indirectly to any stormwater conveyance, the waters of the state, or upon the land in such proximity to the same (such that the substance is likely to reach a stormwater conveyance or the waters of the state), of any fluid, solid, gas or other substance, other than stormwater; provided that non-stormwater discharges associated with the following activities are allowed and provided that they do not significantly impact water quality:

(a) Filter backwash and draining associated with swimming pools;

(b) Filter backwash and draining associated with raw water intake screening and filtering devices;

(c) Condensate from residential or commercial air conditioning;

(d) Residential vehicle washing;

(e) Flushing and hydrostatic testing water associated with utility distribution systems;

(f) Discharges associated with emergency removal and treatment activities, for hazardous materials, authorized by the federal, state or local government on-scene coordinator;

(g) Uncontaminated ground water (including the collection or pumping of springs, wells, or rising ground water and ground water generated by well construction or other construction activities);

(h) Collected infiltrated stormwater from foundation or footing drains;

(i) Collected ground water and infiltrated stormwater from basement or crawl space pumps;

(j) Irrigation water;

(k) Street wash water;

(l) Flows from fire fighting;

(m) Discharges from the pumping or draining of natural watercourses or waterbodies;

(n) Flushing and cleaning of stormwater conveyances with unmodified potable water;

(o) Wash water from the cleaning of the exterior of buildings, including gutters, provided that the discharge does not pose an environmental or health threat; and

(p) Other non-stormwater discharges for which a valid NPDES discharge permit has been approved and issued by Department of Environmental Management, and provided that any such discharges to the Municipal Separate Storm Sewer System shall be authorized by the city.

(2) Prohibited substances include but are not limited to: oil, anti-freeze, chemicals, animal waste, paints, garbage and litter.

(B) *Illicit connections.*

(1) Connections to a stormwater conveyance or stormwater conveyance system that allow the discharge of non-stormwater, other than the exclusions described in subsection (A) above, are unlawful. Prohibited connections include but are not limited to: floor drains, waste water from washing machines or sanitary sewers, wash water from commercial vehicle washing or steam cleaning, and waste water from septic systems.

(2) Where such connections exist in violation of this section and the connections were made prior to the adoption of this provision or any other ordinance prohibiting such connections, the property owner or the person using the connection shall remove the connection within one year following application of this regulation; provided that this grace period shall not apply to connections which may result in the discharge of hazardous materials or other discharges which pose an immediate threat to health and safety, or are likely to result in immediate injury and harm to real or personal property, natural resources, wildlife or habitat.

(3) Where it is determined that the connection:

(a) May result in the discharge of hazardous materials or may pose an immediate threat to health and safety, or is likely to result in immediate injury and harm to real or personal property, natural resources, wildlife or habitat; or

(b) Was made in violation of any applicable regulation or ordinance, the City Engineer or his or her designee shall designate the time within which the connection shall be removed. In setting the time limit for compliance, the city shall take into consideration:

1. The quantity and complexity of the work;

2. The consequences of delay;

3. The potential harm to the environment, to the public health, and to public and private property; and

4. The cost of remedying the damage.

(C) *Spills.*

(1) Spills or leaks of polluting substances discharged to, or having the potential to be indirectly transported to the stormwater conveyance system, shall be contained, controlled, collected and removed promptly. All affected areas shall be restored to their preexisting condition.

(2) Persons associated with the spill or leak shall immediately notify the City Fire Chief or his or her designee of all spills or leaks of polluting substances. Notification shall not relieve any person of any expenses related to the restoration, loss, damage or any other liability which may be incurred as a result of the spill or leak, nor shall such notification relieve any person from other liability which may be imposed by state or other law.

(D) *Nuisance.* Illicit discharges and illicit connections which exist within the city limits or within one mile thereof are hereby found, deemed and declared to be dangerous or prejudiced to the public health or public safety and are found, deemed and declared to be public nuisances. Such public nuisances shall be abated in accordance with the procedures set forth in section 12-3-4.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-17 ENFORCEMENT.

(A) *Authority to enter.*

(1) Any authorized city personnel shall be permitted to enter upon public or private property for the purposes of observation, inspection, sampling, monitoring, testing, surveying and measuring for compliance. Should the owner or occupant of any property refuse to permit such reasonable access, the City Engineer or his or her designee shall proceed to obtain an administrative search warrant pursuant to G.S. 15-27.2 or its successor.

(2) No person shall obstruct, hamper or interfere with any such representative while carrying out his or her official duties. For the purpose of enforcing this chapter, the City Engineer or any employee so designated by him or her may at any time enter upon a property to inspect or repair any part of the stormwater system.

(B) *Civil penalties.*

(1) *Illicit discharges.* Any designer, engineer, contractor, agent or any other person who allows, acts in concert, participates, directs or assists directly or indirectly in an illicit discharge in violation of this chapter shall be subject to civil penalties as follows.

(a) For first-time offenders, if the quantity of the discharge is equal to or less than five gallons and consists of domestic or household products in quantities considered ordinary for household purposes, the person shall be assessed a civil penalty not to exceed $100 per violation or per day for any continuing violation, and if the quantity of the discharge is greater than five gallons or contains non-domestic substances, including but not limited to process waste water, or if the person cannot provide clear and convincing evidence of the volume and nature of the substance discharged, the person shall be assessed a civil penalty not to exceed $1,000 per violation or per day for any continuing violation.

(b) For repeat offenders, the amount of the penalty shall be double the amount assessed for the previous penalty, not to exceed $10,000 per violation or per day for any continuing violation.

(c) In determining the amount of the penalty, the City Engineer or his or her designee shall consider:

1. The degree and extent of harm to the environment, the public health, and public and private property;

2. The cost of remedying the damage;

3. The duration of the violation;

4. Whether the violation was willful;

5. The prior record of the person responsible for the violation in complying or failing to comply with this chapter;

6. The costs of enforcement to the public; and

7. The amount of money saved by the violator through his, her or its noncompliance.

(2) *Illicit connections.* Any person found with an illicit connection in violation of this chapter and any designer, engineer, contractor, agent or any other person who allows, acts in concert, participates, directs or assists directly or indirectly in the establishment of an illicit connection in violation of this chapter, shall be subject to civil penalties as follows:

(a) First-time offenders shall be subject to a civil penalty not to exceed $500 per day of continuing violation.

(b) Repeat violators shall be subject to a civil penalty not to exceed $1,000 per day of continuing violation.

(c) In determining the amount of the penalty, the City Engineer or his or her designee shall consider:

1. The degree and extent of harm to the environment, the public health, and public and private property;

2. The cost of remedying the damage;

3. The duration of the violation;

4. Whether the violation was willful;

5. The prior record of the person responsible for the violation in complying or failing to comply with this chapter;

6. The costs of enforcement to the public; and

7. The amount of money saved by the violator through his, her or its noncompliance.

(d) Procedures for assessing penalties pursuant to illicit connections.

1. The penalties shall be assessed by the City Engineer or his or her designee. No penalty shall be assessed until the person alleged to be in violation is served written notice of the violation by registered mail, certified mail-return receipt requested, or personal service. Refusal to accept the notice shall not relieve the violator of the obligation to pay the penalty. The notice shall describe the violation with particularity and specify the measures needed to come into compliance. The notice shall designate the time within which the measures must be completed. In setting the time limit for compliance, the city shall take into consideration:

a. The quantity and complexity of the work;

b. The consequences of delay;

c. The potential harm to the environment, the public health, and public and private property; and

d. The cost of remedying the damage.

2. The notice shall warn that failure to correct the violation within the specified time period will result in the assessment of a civil penalty and/or other enforcement action. If after the allotted time period has expired, and the violation has not been corrected, the penalty shall be assessed from the date of receipt of notice of violation and each day of continuing violation thereafter shall constitute a separate violation under this section.

(3) *Other violations.* Any person found in violation of other provisions of this chapter, not specifically enumerated elsewhere, shall be subject to a civil penalty not to exceed $250 per violation or per day for any continuing violation.

(4) *Payment/collection procedures.* Penalties shall be assessed by the City Engineer or his or her designee. No penalty shall be assessed until the person alleged to be in violation is served written notice of the violation by registered mail, certified mail-return receipt requested, or personal service. Refusal to accept the notice shall not relieve the violator of the obligation to pay the penalty. The City Engineer or his or her designee shall make written demand for payment upon the person in violation. If the payment is not received or equitable settlement reached within 30 days after demand for payment is made, the matter shall be referred to the City Attorney for institution of a civil action in the name of the city, in the appropriate division of the general court of justice in Pitt County for recovering the penalty.

(C) *Injunctive relief.*

(1) Whenever the City Engineer has a reasonable cause to believe that any person is violating or threatening to violate this chapter, rule, regulation, order duly adopted or issued pursuant to this chapter or making a connection to a stormwater conveyance or stormwater conveyance system other than in accordance with the terms, conditions, and provisions of approval, the city may, either before or after the institution of any other action or proceeding authorized by the code, institute a civil action in the name of the city for injunctive relief to restrain and abate the violation or threatened violation.

(2) The institution of an action for injunctive relief under subsection (C) shall not relieve any party to such proceeding from any further civil or criminal penalty prescribed for violations of this Code.

(D) *Criminal penalties.* Any person who knowingly or willfully violates any provision of this chapter, rule, regulation, order duly adopted or issued pursuant to this chapter shall be guilty of a misdemeanor, punishable by a fine not to exceed $500 or imprisonment for not longer than 30 days. Each violation shall be a separate offense.
(Ord. No. 04-112, passed 9-9-2004)

SEC. 9-9-18 VARIANCES.

The Board of Adjustment as established by the city shall hear and decide requests for variances from the requirements of this chapter. When practical difficulties or unnecessary hardships would result from carrying out the strict letter of this chapter, the Board of Adjustment may vary or modify any provision of this chapter so that the spirit of the chapter shall be observed, public safety and welfare secured, and substantial justice done.
(Ord. No. 04-112, passed 9-9-2004)

Appendix F. Illicit Discharge Screening Report Forms

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This appendix contains several forms developed by the City of Greenville for use in its illicit discharge detection and elimination program. The following forms are provided:

1. Outfall Reconnaissance Inventory/Sample Collection Field Sheet
2. Water Quality Complaint/Inspection Record

Appendix G. Sample Public Education Action Report and Plan

Public Education Action Report and Plan

Jurisdiction:_____Date Submitted:_____

	Activity	Point Value	# Done Last Yr (10/__ - 9/__)	Points	Cost	# Planned Next Yr(10/__ - 9/__)	Points Anticipated	Anticipated Cost
1	Demonstration Sites (for BMPs)	4 each						
2	Local Newspaper Article	2 each						
3	Technical Workshop (1st year, 2 required)	4 each						
4	Environmental Contest / Field Day	4 each						
5	Arrange Speakers For Civic Organizations	1 each						
6	Clean Water Proclamation, with Newspaper Article	2						
7	Web Page / Web Site Links	2 / year						
8	Pet Waste Ordinance	5 / year						
9	Factsheets/Brochures/Flyers/Enviro freebies (public places)	2 / year						
10	Utility Bill Inserts or Messages on Bills	3 / year						
11	Close-out Packages / Info for New Homeowners	3 / year						
12	Storm Drain Marking (24 minimum per year)	2 / year						
13	Sponsor new/expand Adopt-A-(Street-or-Stream) Program	4 / year						
14	Recognition Program (environmentally friendly participants)	1 / year						
15	Toll Free Environmental Hotline (1-800 or Local)	3 / year						
16	VWIN Monitoring Force (Water Quality Reporting)	6 / year						
17	Other Water Quality Reporting Program	3 / year						
18	Major Media Advertising	6 / year						
19	Local Access TV or Radio Spots	3 / year						
			Total Points Reported:			Total Points Planned:		

Please attach copies of articles, flyers, photographs, etc. documenting your activities, labeled for each type of activity.

Note: Ongoing Activities will continue to receive the education points for each year that they are in effect.

Note: If your locality has put together an exceptional effort for any of the above activities, you may be entitled to additional points for that activity. Please attach a description of the activity, a merit rationale, and a point proposal.

Submitted By:	Title:
	Date:
	Signature:

Detail of Reported Activities				
Brief Description of Activity	Targeted Audience	Date	Cost	Comments / Attachments

Detail of Planned Activities				
Brief Description of Activity	Targeted Audience	Date Planned	Anticipated Cost	Comments / Attachments

Proposed Action Plan for 2004-2005

Jurisdiction: City of Greenville, NC Dated Submitted: June 4, 2004

	Activity	Point Value	# Done Last Yr (10/__ - 9/__)	Points	Cost	# Planned Next Yr(10/04 - 9/05)	Points Anticipated	Anticipated Cost
1	Demonstration Sites (for BMPs)	4 each				1	4	$38,000
2	Technical Workshop (1st year, 2 required)	4 each				2	8	$1,000
3	Arrange Speakers For Civic Organizations	1 each				3	3	
4	Web Page / Web Site Links	2 / year				1	2	
5	Factsheets/Brochures/Flyers/Enviro freebies (public places)	2 / year				2	4	$2,500
6	Utility Bill Inserts or Messages on Bills	3 / year				4	12	
7	Storm Drain Marking (24 minimum per year)	2 / year				2	4	$250
8	Sponsor new/expand Adopt-A-(Street-or-Stream) Program	4 / year				1	4	$500
9	Recognition Program (environmentally friendly participants)	1 / year				1	1	
10	Toll Free Environmental Hotline (1-800 or Local)	3 / year				1	3	
			Total Points Reported:			Total Points Planned: 45		$42,250

Please attach copies of articles, flyers, photographs, etc. documenting your activities, labeled for each type of activity.

Note: Ongoing Activities will continue to receive the education points for each year that they are in effect.

Note: If your locality has put together an exceptional effort for any of the above activities, you may be entitled to additional points for that activity. Please attach a description of the activity, a merit rationale, and a point proposal.

Submitted By: David T. Brown, P.E.	Title: City Engineer
	Date: June 4, 2004
	Signature:

This is a draft plan, and costs are estimated.