Chapter 5

Milestone 4 Part B
The Pompeston Creek Regional Stormwater Management Plan

Supplemental Provisions

Completed by the
Rutgers Cooperative Extension
Water Resources Program
Under the guidance of Christopher C. Obropta, Ph.D., P.E.

Part B:

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An addendum to the Pompeston Creek Regional Stormwater Management Plan

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4B.1.0 Introduction

A Regional Stormwater Management Plan has been created for the Pompeston Creek Watershed, in Burlington County, NJ (Figure 1). Initial steps of this process included the formation of a stakeholder planning committee, a stormwater characterization and assessment, and a compilation of drainage area specific water quality, quantity and recharge objectives. The final steps before the implementation and adoption of a plan is to identify management measures that will achieve the drainage area objectives.

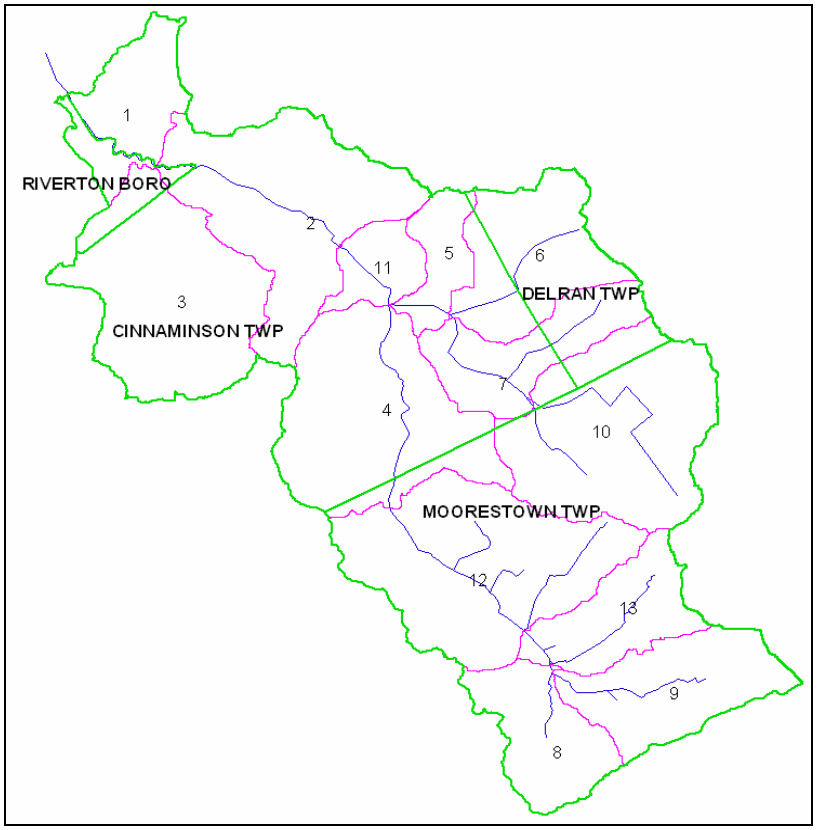

Figure 1: The Pompeston Creek Watershed

The management measures have been separated into two parts that will differ in their implementation. Part A defines the regulatory actions that will be adopted into the Areawide Water Quality Plan to address identified stormwater problems. Part B identifies specific management projects that have been quantified as to their potential in pollutant reduction, stream flow reduction, cost, and other characteristics and are voluntary in nature. This document details those projects recommended in Part B.

The management measures that will be implemented as distinct projects are categorized into nine categories and are detailed in Sections 4B.2, Education; 4B.3, Stormwater Utility; 4B.4, Pathogen Management, 4B.5 Landscaping Professionals, 4B.6 Stressor Analysis, 4B.7 Road Salting and Sanding; 4B.8 Vernal Pool Identification; 4B.9 Wetland

Protection and 4B.10, Specific Projects. The specific projects have been ranked among themselves.

4B.1.1 Ranking of Management Measures (in Section 4B.7)

4B.1.1.1 Stormwater Rules at 7:8-3.4(e)

The management strategies presented as projects that are recommended in this document have been ranked using the protocol in the Stormwater Rules at 7:8-3.4(e). Priority is given to those projects that "may affect public health, safety and welfare as evidenced by history or of potential for flood damage, risk of loss of or damage to water supplies; and risk of damage to the biological integrity of water bodies".

4B.1.1.1.1 Water Quantity

Problems concerning water quantity are generally addressed and prioritized above water quality issues due to these prioritization guidelines. Also, mitigating water quantity problems often alleviates poor water quality by reducing erosion and direct input of stormwater into the stream. Many of these issues were prioritized in the Milestone 2, Stormwater Characterization and Assessment. Both water quality and water quantity issues were initially prioritized in Section IX and X of that document. Prioritization of subbasins by water quantity characteristics were also determined through the use of aerial loading analysis and detailed at the end of Section IV of the Stormwater Characterization and Assessment for the Pompeston Creek Watershed.

4B.1.1.1.2 Water Quality

Section IV of the Pompeston Creek Regional Stormwater Management Plan specifies the pollutant problems that are experienced by the different portions of the watershed. As the benthic community provides an indication of the health of a waterway, the macroinvertebrate data collected at the one AMNET station in the Pompeston Creek Watershed serves to aid in the prioritization of the water quality issues. Aerial loading analysis performed in the compilation of Milestone 2 also serves to provide information on areas requiring greater attention.

The benthic community has been monitored three times in the past 12 years. Based on this information, the monitoring site on the Pompeston Creek at Route 130 in Cinnaminson (ANO177) has had its status lowered from "moderately impaired" to "severely impaired" in 2001 (NJDEP, 2001)" and therefore overall recommendations that have an effect on the biological integrity of the watershed are ranked high in the prioritization schedule of this plan. Pompeston Creek at Route 130 in Cinnaminson (ANO177) was placed on Sublist 5 of the 2004 Integrated List of Waterbodies (NJDEP, 2000) for non-attainment of the biological parameters, benthic macroinvertebrates.

Also in Section IV of the Characterization and Assessment, reference is made to the extent of bacterial contamination in the watershed. The data collected for the bacterial analysis have been acquired under an approved QAPP with the Department of Environmental Protection. These data are expected to be analyzed to determine the need and extent of a TMDL for the Pompeston Creek Watershed. Since this issue relates to

the health and welfare of the people that use this waterway for recreational purposes, it holds a higher degree of importance in the ranking of the projects.

A section of the Pompeston Creek Watershed has recently been recommended for Category One protection. The 2.61 mile section of the Pompeston Creek that is included in this potential designation is the area downstream of the Lakeview Memorial Park Cemetery to Broad Street in Riverton and Cinnaminson. However, the headwaters of this stream begin in Moorestown and Delran. Creating comprehensive protection under a stream corridor protection plan (Part A, Applicable Provisions) will be of primary importance to the entire length of the stream. Other projects that have impact on the reduction of the volume and velocity of stormwater and the reduction of erosion and TSS concentration in the waters will be prioritized in order to meet this significant issue.

4B.1.1.2 Planning Committee

The priorities of the Regional Stormwater Management Planning Committee also played a significant role in the prioritization schedule offered in this document. These priorities heavily correlated with those determined through the above methods.

4B.1.1.3 Prioritization of Other Voluntary Measures

The management strategies other than the specific individual projects have not been ranked together with the projects due to their nature of encompassing the entire watershed and the necessity of having these measures completed concurrently with the projects. It is the intention of the committee to not place education, stormwater utilities, pathogen management, landscaping registration, and stressor analysis on a waiting list, but to proceed directly with implementation as circumstances permit.

4B.1.1.4 Priority Storms

During stormwater analysis of the Pompeston Creek Watershed the 2, 10 and 100-year design storms were investigated as to their effects on the watershed. Combining results of the hydrologic models together with the priorities of the Pompeston Creek Regional Stormwater Planning Committee, the most important critical storm was determined to be the small “nuisance” storms, falling between the New Jersey Water Quality Storm (1.25”/2 hours) and the 2-yr storm (3.5”/24 hours). It was these storms that were primarily addressed by this plan.

4B.1.1.5 Time schedule

A schedule that details the tasks necessary to bring all projects to fruition should be completed by each town according to priorities of the town. Overall, a goal of completing fifty per cent of the projects within the first decade after adoption is a recommended minimum.

4.B.1.2.0 Cost Estimates

The cost estimates of a management measure were not considered in the prioritization procedure. This must be performed on a case by case basis. The cost estimates are preliminary and require a more detailed assessment. These estimates do not include

maintenance of the project, as this will be a highly variable factor and have to be considered on a case by case basis.

Cost estimates for the recommended management measures are given in first table in each municipal section that follows. The cost of the disconnection of impervious surfaces was determined by calculating runoff volumes for the two-year design storm using TR55. This volume was used to size a two-foot deep bioretention basin with an infiltration rate of 0.5 inches per hour. The size of the bioretention basin (i.e., the footprint in square feet) was then used to estimate construction and engineering costs. The lower cost of the bioretention basin was taken as $2 per square foot of basin plus 25% for engineering costs while the higher cost used $4 per square foot plus 25% for engineering costs. The cost to retrofit existing detention basins is slightly lower than the cost to construct bioretention basins. This cost was estimated at $0.50 per square foot to $2 per square foot. Once again, 25% was add to these costs for engineering fees. The cost for educational programs includes the cost to construct demonstration rain gardens and the cost to deliver educational programming at several locations within the subbasin. The costs for the remaining management measures can be found in Table 1, 4 and 7. These estimates are based upon best engineering cost estimates and upon similar projects completed in New Jersey. Please note that these are only estimates. Actual costs will be a function of the market prices during the time of construction.

4B.1.3.0 Management Measures Grouped and Named

Section 4B.7 contains tangible projects that can be created to directly mitigate water quantity and water quality issues. These projects are grouped within each municipality and have a unique numerical identifier. This identifier begins with two letter representing the municipality where the project will be primarily contained (MT=Moorestown; RT=Riverton; DR=Delran and CM=Cinnaminson). The first two numerical digits are the subbasin number in which the project is primarily contained; and the numbers that follow that represent the number of objectives that the project meets from Milestone 3 (one digit) and the final number attempts to indicate the range in which the cost of the project falls (1=less than 100K; 2=less than 200K, etc.). In the case this method does not present a unique ID, the cost digit is adjusted.

4B.2. Education

Many of the water quality and water quantity objectives can be achieved by addressing the impact of existing development in the Pompeston Creek Watershed. Education plays a key role in reducing the impacts from existing development. Several educational programs already exist in New Jersey that can be used to begin this process. It is important to note that often education is not enough to encourage people to change their behavior. To this end, programs need to be established that provide tools and resources to homeowners, businesses and public entities to help them take the actions that are needed.

The programs that are described below can be used to empower local residents to take action to improve the Pompeston Creek. All but one of these programs have been offered throughout New Jersey and have been very successful at training volunteers and encouraging homeowners and municipalities to implement stormwater management strategies. These programs can be customized for many different situations. They also lend themselves to be adapted into "train the trainer" programs where other organizations can assume ownership of the program in different areas and deliver the program as part of their organization's activities. The adoption of some or all of these programs could have a significant impact on reducing flooding and improving the water quality of Pompeston Creek.

New Jersey Educational Programs

The programs listed below are a sample of educational programs that are available in New Jersey. The Pompeston Creek Watershed Association (PCWA) also offers specific educational programs and will work with requests from schools and the community. Details of some of the educational offerings from the PCWA are summarized here. The NJDEP, the New Jersey Audubon Society at Rancocas Nature Center, Delaware Riverkeeper Network and the New Jersey 4H are a few other organizations that also offer educational programs. The educational programs that will create true change in the actions of people must provide stakeholders with hands on activities and contain a strong outreach component. It is for this reason that the Rutgers Cooperative Extension programs play an important role and offers programs can be delivered at the municipality and work with the local stakeholders to educate them on specific concerns in their area.

The Environmental Protection Agency (USEPA) and the NJDEP offer newsletters, brochures and other outreach materials and these can be used by the watershed groups to educate stakeholders. However, priority should be given to hands on instruction.

4B.2.1 Rutgers Cooperative Extension Water Resources Program Stormwater Management in Your Backyard Program

This program provides a detailed overview of stormwater management. It introduces the factors that affect stormwater runoff, point and nonpoint source pollution, the impact of development (particularly impervious cover) on stormwater runoff, and the pollutants found in stormwater runoff. An overview of New Jersey's stormwater regulations is presented including who must comply and what they are required to do. Additionally, the concept of Total Maximum Daily Loads (TMDLs) is introduced along with various other requirements of the Federal Clean Water Act that have serious implications on New Jersey. A thorough discussion of different types of best management practices (BMPs) that can be implemented to control stormwater runoff is presented and how these BMPs can be used to achieve the quality, quantity and groundwater recharge requirements of New Jersey regulations. The BMPs discussed include bioretention systems (rain gardens), sand filters, stormwater wetlands, extended detention basins, infiltration basins, manufactured treatment devices, vegetated filters, and wet ponds. The program also

discusses the various management practices that the homeowner can install including dry wells, rain gardens, rain barrels, and alternative landscaping. The protocol for designing these systems is reviewed in detail with real world examples provided. A step by step guide is worked through for designing a rain garden so that homeowners can actually construct one on their property. The students have an opportunity to bring in sketches of their property for the class to review and discuss various BMP options for each site. The course also provides a discussion of BMP maintenance focusing on the homeowner BMPs. The course concludes with a discussion of larger watershed restoration projects and how the students can lead these restoration efforts in their community. The course is very interactive and ample time is set aside for question and answer sessions.

For more information, please contact Christopher Obropta at 732-932-4917 or obropta@envsci.rutgers.edu.

4B.2.2 Rutgers Cooperative Extension's Environmental Stewardship Program

Rutgers Cooperative Extension has formed a partnership with Duke Farms to create a statewide Environmental Stewardship certification program. Participants learn land and water stewardship, best management practices, environmental public advocacy, and leadership. Each group meets twenty times for classroom and field study. They are taught by experts from Rutgers and its consortium partners. Students are certified as Rutgers Environmental Stewards when they have completed sixty hours of classroom instruction *and* sixty hours of volunteer internship. Classes are held throughout New Jersey including at the Essex County Environmental Center in Roseland, Duke Farms in Hillsborough, Somerset County and the Rutgers EcoComplex in Bordentown, Burlington County. Consortium partners can ask students to provide volunteer assistance in the satisfaction of their internship requirements.

Graduates of this program become knowledgeable about the basic processes of earth, air, water and biological systems. They increase awareness of techniques and tools used to monitor and assess the health of the environment. They gain an understanding of the research and regulatory infrastructure of state and federal agencies operating in New Jersey that relate to environmental issues. Unlike some programs, they are also given an introduction to group dynamics and community leadership. Participants are taught to recognize the elements of sound science and public policy based in science while acquiring a sense of the limits of the current understanding of the environment. The goal of the Rutgers Environmental Stewards program is to give graduates knowledge to expand public awareness of scientifically based information related to environmental issues and facilitate positive change in their community.

For more information please log on to: www.rcre.rutgers.edu/envirostewards.

4B.2.3 Rutgers Cooperative Extension Water Resources Program Restore-A-Waterway Program

Restore-a-Waterway is a technical service provider program offered by the Rutgers Cooperative Extension Water Resources Program. The Program is funded jointly by the United States Department of Agriculture Cooperative State Research, Education, and Extension Service (USDA CSREES), New Jersey Sea Grant, and the New Jersey Agricultural Experiment Station (NJAES). The goal of the program is to provide technical assistance to citizen groups that want to take action in restoring the condition of a waterway. Rutgers Cooperative Extension (RCE) provides expertise to these groups to assist them in their efforts. Forms of technical assistance include helping these groups to:

- perform physical waterway characterizations,
- develop and implement chemical and biological quality assurance project plans (i.e. QAPPs),
- interpret and analyze of data,
- identify problems and sources of those problems within a watershed,
- design solutions to mitigate the identified problems,
- secure funds to implement the designed solutions,
- implement the solutions.

In addition to offering workshops to help educate citizen groups on these technical issues, Restore-a-Waterway can be adapted for municipal officials to address their specific needs. The implementation of solutions after monitoring and analysis is an important focus of this program.

Target communities would be those that are mentioned and prioritized in this document. Selection, design and implementation of BMPs recommended within this document can be optimized through the use of this program.

If you are interested in participating in Restore-a-Waterway, please contact: Gregory Rusciano at (732) 932-2739 or greg.rusciano@rutgers.edu.

4B.2.4 Community-Project-Based Learning Educational Program

The RCE Water Resources Program has joined forces with Research in Education Applied to Learning (R.E.A.L.) Science to create a new method of science instruction called "Community-Project-Based Learning." R.E.A.L. Science is a nonprofit organization that provides a support system for innovative standards-based authentic science projects along with effective teacher in-service training programs in science education. Community-Project-Based Learning incorporates the authentic practice of real scientists into the regular classroom setting. Community-Project-Based Learning identifies a real environmental problem in the community and works with the students to address these driving questions: Is there a real problem with our watershed? What is our contribution to the problem? If there is pollution in our watershed, how can we fix it?

The project objectives include the students investigating various aspects of the natural environment on and around the school grounds, students documenting findings, and students communicating these findings to fellow classmates and the community. Working in teams, the students design a solution to a problem and present these solutions to their classmates. The best solutions are selected and built on the school grounds.

These projects expose students to the actual practice of scientists in the fields of ecology and environmental science and cover issues in geology, biology, chemistry, and applied mathematics. Lessons and activities are designed with classroom teachers to instruct students within the state standards-based curriculum. The students work together to address relevant environmental problems in their community.

Students participate as legitimate members of a scientific community. They work with their teachers, parents, local scientists, and other knowledgeable members of the community to create a solution to a relevant environmental problem in their community. As scientists, the students assemble existing data, collect new data, and work with professionals from the community to fully understand the problem, while honing their skills and learning within the guidelines of the New Jersey State Core Curriculum Content Standards.

For more information, please contact Christopher Obropta at 732-932-4917 or obropta@envsci.rutgers.edu.

4B.2.5 Best Management Practices in Landscaping (under development)

Landscapers contribute to the application of fertilizer, the removal of yard waste, the construction of gardens and the maintenance of the grounds surrounding the streams and lakes within a watershed. For these reasons, a program that will be aimed at teaching the best management practices (BMPs) of landscaping could be required as a part of the licensing processes of landscapers.

As yet undeveloped, this program has the potential to be administered through the Environmental Steward or the Restore Our Waterways programs. After initial development of the program, it is possible for the municipality to offer it or have it offered through the box stores that carry lawn maintenance equipment and fertilizers. Key aspects of this educational program will be soil testing and the subsequent application of necessary nutrients; the design, implementation and maintenance of rain gardens; buffer establishment and maintenance and the BMPs of waste disposal.

Addressing the large number of landscaping professionals can have a strong impact on stormwater management and will best be served by a general registration of landscapers. Registration is one recommendation that could be undertaken by the individual municipalities (see Section 4B 5.0 of this report). Requirements for using the best management practices can then be more efficiently delivered to the interested parties.

4B.2.6 Pompeston Creek Watershed Association

Municipal Stormwater Education:

PCWA's interactive water pollution/water resources program has been presented to thousands of residents at Community Day events this year in Delran, Cinnaminson, Moorestown and Delanco. This program fulfills the annual community education program requirement for each township under the new State Stormwater Rules. This program uses the interactive Enviroscape watershed model to illustrate nonpoint source pollution and the Ground Water Model to illustrate man's affects, including increased runoff and decreased infiltration resulting from impervious cover, on our water resources. At these events, we also distributed informational brochures, posters, maps, and literature; we discussed our watershed, stormwater issues, drinking water resources, and simple actions residents can take to protect and improve our water resources.

Wetland Wonders at MUES

Volunteers from the Pompeston Creek Watershed Association (PCWA), in conjunction with 6th grade teacher Linda Tausz-Hannon and parent volunteers, presented an interactive "Wetland Wonders" program to about 350 sixth graders at the Moorestown Upper Elementary School (MUES). The program enhanced learning of their wetlands module. Activities included Wetland Filters, Wetland Web of Life, Macroinvertebrates, the Enviroscape watershed model, the Ground Water model, "Common Water," the Stormwater Detention Basin, and Turtles. The students enjoyed hands-on learning about the wonders and functions of wetlands, as well as the relationships between wetlands and water resources! Some concepts included that all living things are connected; that diversity of organisms is necessary to maintain healthy ecosystems; that wetlands filter and clean water, absorb flood waters, provide critical habitats for a great diversity of plants and wildlife; that everything we do on the land affects our water resources, and that we waste a lot of water.

Macroinvertebrate Programs:

PCWA teaches students to sample macroinvertebrates from the Pompeston Creek, identify them, and then discuss what the macroinvertebrates indicate about the health of our creek. Students learn about the harmful effects of stormwater on the creek, including erosion, sedimentation, bacteria and other nopoint source pollution, and students brainstorm about ways to improve the health of the Creek.

4B.3.0 Stormwater Utility

Voluntary programs are excellent methods of addressing water quality and quantity concerns, but sometimes these programs fail to achieve the required goals, and a regulatory approach is needed. To address flooding related problems and water quality problems, such as those experienced in the Pompeston Creek Watershed, many communities across the country have considered the option of forming a utility specifically for the purpose of managing stormwater. Although the concept of a "Stormwater Utility" was first proposed in the 1970s, it is within the last ten years that the growth of utilities with a specific mandate to manage stormwater has increased rapidly. These utilities perform various services, which may include overseeing the collection, treatment, and disposal of stormwater, and in some cases assuming the responsibility for maintenance of the stormwater collection systems. These Stormwater Utilities are typically funded through a dedicated revenue stream. As of May 2005 there were over 400 utilities operating throughout the U.S. to manage stormwater flows, but to date, no municipality or county within New Jersey has created such a utility (NJDEP 2005). For a municipality or a county to establish a viable Stormwater Utility, enabling legislation must be enacted.

In a 2005 report prepared for Morris County, NJ and the NJDEP entitled *Recommendations for Stormwater Utility Implementation in New Jersey (Camp, Dresser and McKee, 2005)* several suggestions were put forth to apply modifications to existing laws to facilitate the implementation of stormwater utilities. It is recommended that each law that is modified should support the following functions:

- Authorize creation and operation of stormwater utility systems
- Authorize imposition of user fees to finance operation and maintenance and repayment of bonds
- Require that stormwater system user fees be based on the stormwater runoff contribution of each parcel of land
- Reference a stormwater utility manual that provides guidance regarding stormwater utility implementation and establishment of defensible user fee structures. A manual of this type has been circulated describing a hypothetical stormwater utility implementation process for "Greentown Borough".

As a part of these recommendations that were presented to the State, five specific laws were identified for changes that would allow provisions for stormwater function and services that were listed above. The five laws and recommendation modifications are as follows:

1. NJSA 40

   NJSA 40 could have language added that would authorize municipalities to create stormwater utilities by ordinance. Section NJSA 40:62 currently deals with municipal utilities and water districts and would be an ideal area to add

language that would impose user fees and require that the fees be based on the stormwater runoff contribution of each parcel of land.

2. Local Bond Law

   Under the Local Bond Law, NJSA 40A:2-1 et.seq., bond ordinances to finance municipal public utilities may commit the municipality to impose user fees to pay off the bonds and fund the operation of the utility (NJSA 40A:2-15(d)).

3. Municipal and County Sewerage Act

   The Municipal and County Sewerage Act, NJSA 40:A26A-1et seq., currently authorized municipalities and counties. The act currently authorizes imposition of fees on users of "sewerage services", and does not define "sewerage services". NJSA 40A:26A-10 can be amended to specify fees for use of stormwater systems based on the runoff contribution of each parcel of land.

4. Municipal and County Utilities Authority Law

   Stormwater-specific provisions should be added to the Municipal and County Utilities Authority Law, NJSA 40:14B-1 et seq. Definitions of stormwater, stormwater system, and service charges should be amended to refer to stormwater systems.

5. County Improvement Authorities Law

   The County Improvement Authorities Law, NJSA 40:37A-44 et seq., should be modified to specifically authorize implementation of stormwater management functions and provide for imposition of user fees to finance construction, operation and maintenance fo stormwater management facilities.

Municipal stormwater discharges are regulated as point sources under the Clean Water Act (1972). However, control of stormwater is often extremely difficult in urban environments due to both the large volumes of stormwater generated, as well as the space constraints, and so stormwater management is an issue facing urban centers across the country. Uncontrolled stormwater flows pose a danger to both constructed and natural environments, and the collection and rapid routing of water through urban stormwater infrastructure results in problems related to both water quantity and quality. Municipal surface water runoff in urban areas is typically collected in storm sewer systems and conveyed to the nearest receiving water body. The volume of the runoff, the rate of flow, and the water quality are determined by the amount of a watershed's impervious surface, modifications of the landscape, and the natural drainage patterns and topography within a drainage basin. Original storm sewer systems were designed to rapidly route stormwater out of developed areas to the discharge point. As previously undeveloped land is developed with impervious covers such as blacktop, rooftop, and concrete, the volume of stormwater continues to increase.

While older stormwater conveyance systems were built to efficiently move water downstream, the modern approach now views stormwater as an important component in managing integrated urban water resources. Current strategies are multi-dimensional, and

consider water quantity and quality issues, multiple-use facilities, riparian corridors, wetland preservation and creation, and groundwater recharge (NSFMA 2006).

In forward-looking communities stormwater is considered a resource, and the management of stormwater is viewed as an important function of local government on par with the oversight of the drinking water supply and sewage treatment operations. Today stormwater management includes planning, design, construction, operation, and maintenance of specific water control structures and dedicated financial resources required to support these activities. The benefits of successful stormwater management include handling of excess drainage, reduction of the damage caused by flooding, protection of transportation systems, protecting property values, providing long term system maintenance, and environmental enhancement (NSFMA 2006). However, the costs of construction, operation, and maintenance of flood control measures is typically beyond the financial resources available to individual property owners, and in many cases individual municipalities.

Although the creation of a stormwater utility would require fees to be assessed on property owners throughout the watershed, it would provide a steady source of funding that could be used to leverage larger grant or loan funds to implement stormwater control projects.

4B.4.0 Management of Pathogens in Recreational Waters

The Pompeston Creek Watershed requires diligence in detecting sources of waste products that could be associated with pathogens. The detection of the sources of the bacteria is critical to the determination on how best to address the issue. The parties involved in testing the watershed for bacteria loads have been working with various source detection methods such as antibiotic resistance and optical brightener. These methods have not been conclusive as of yet and the evaluation of potential sources continues. Due to the existence of aging infrastructure, the implementation of a Microbial Source Tracking (MST) study, in combination with a survey of the integrity of sanitary sewer lines is recommended to differentiate the sources of bacteria.

TMDL

Although there are no official TMDLs in this watershed, the data collected thus far indicate that the levels of bacteria may require a TMDL in the near future. Many of the projects and other proposed management measures have been recommended and ranked according to the need to address these impairments.

The Pompeston Creek Watershed Regional Stormwater Management Plan prioritizes the issues of fecal coliform through projects, pathogen detection and goose management recommendations. No onsite wastewater disposal systems (septic systems) have been identified in the Pompeston Creek Watershed.

Implementation of the recommendations stated in this document and in Part A, Applicable Provisions of the Pompeston Creek Regional Stormwater Management Plan, will address concerns that are expected to be a part of the anticipated TMDL within the watershed. Projects such as terminal catch basin cleaning and installation of infiltration systems will serve to reduce pollutants that contribute to the impaired water quality that leads to an implementation of a TMDL. The estimated improvement in water quality after the adoption of this plan has not been quantified on a whole, but can be inferred from the pollutant reduction estimation that is contained in the project tables for the individual municipalities of this watershed (Tables 2, 5 and 8).

Microbial Source Tracking(MST)/Sanitary Sewer Inspection

An MST survey can provide data that can identify if the source of the bacteria is human or non-human. If the results of an MST study indicate human sources, a targeted analysis can be performed on the sanitary sewers that are up gradient of the detection. The results of the MST survey could also provide information on the animal sources of bacteria and may help to focus source reduction.

With no known septic systems in operation in this watershed, contamination from human waste would be expected to be due to a breech in the transport system of household waste. In conjunction with MST, or as a completely separate function, inspection and maintenance of the sanitary sewer system will help to ensure that bacteria from human waste are not able to enter the watershed proper.

Aging infrastructure requires maintenance, and one component of maintenance for the sanitary sewer system could be regular cleaning and inspection. The inspection would provide information on the integrity of the system and could be performed with a TV camera intended for this job. Although initially costly, sharing of equipment across the towns in the watershed and capitalization over the years will reduce expenditures. Although the primary reason for these inspections will be to find breeches in the structures that would contribute a source of bacteria to the ecosystem, these inspections will also provide information on stoppages that cause backups, odors, and often result in flooded basements and property damage.

The cost of an encased TV unit that will perform this type of inspection varies greatly. It is recommended that an entity that can represent the four towns within the watershed provide a sharing agreement for the cost and usage of this equipment. Scheduling of inspections to detect sewer defects should be performed according to the age of the system. Typical inspections are performed every two to ten years, depending on the bacteria level found in the watershed.

Goose Management

The resident population of Canada Geese in New Jersey has become a focus of several pathogen management programs. In the Pompeston Creek Watershed, pockets of these resident waterfowl exist. These can be particularly located in the corporate parks that contain large detention basin, which are vegetative with turf grass. The geese also flock

to stormwater retention basins and ponds that have a well-manicured turf grass to the water's edge. These animals present unsanitary conditions at public recreation areas and efforts to reduce their numbers would result in a reduction of pathogens being discharged into the waterway.

Each municipality should have a specific plan that details the tasks necessary to keep the resident waterfowl population to a manageable, sustainable number. A key solution includes buffers that are not mowed around waterways. Numerous publications exist on the subject and should be evaluated on a town by town basis.

Sump Pump Ordinance

Each municipality should confirm or implement an ordinance that prohibits the connection of any natural precipitation discharge, particularly sump pumps, to the sanitary sewer line. These connections increase the volume that the sanitary sewer is required to manage during rain events and can ultimately cause an overflow of untreated water into the stream if the volume is too high for the water treatment plant to treat.

A sample ordinance is provided in Appendix A of this document.

4B 5.0 Landscaping Professionals

Landscaping professionals should be required to register with the municipality and be notified of proper procedures to comply with MS4 regulations and additional best management practices related stormwater management.

Hiring a professional landscaper for lawn care in residential areas is a growing practice in New Jersey. Landscapers seek to be permitted for pesticide application and irrigation. Although not all landscapers need to permitted/licensed, beginning an educational program that offers alternatives to traditional management of lawns can have a positive impact on stormwater management.

A program being developed by the Rutgers Cooperative Extension Water Resources Program in cooperation with the Rutgers University Continuing Education will include Best Management Practices and the maintenance that is required. It is expected that this program will increase the use of stream buffers, rain gardens and infiltration in general and become an essential part of the continuing education for professional landscapers.

4B 6.0 Watershed Wide Stressor Identification (SI)

The Ambient Biomonitoring Network stations and the macroinvertebrate surveys performed by Rutgers Cooperative Extension Water Resources Program identify biological impairments ranging from moderate to severe. Additionally, many committee members and members of the public have expressed concern as to the biological integrity

of the stream. For these reasons, it is recommended by this plan that a watershed wide stressor identification program be implemented.

The stressor identification process was developed by the United States Environmental Protection Agency (USEPA) to determine the likely cause or causes of a biological impairment. Various water quality and habitat characteristics are considered in this analysis. The New Jersey Department of Environmental Protection will also have stressor identification guidance available in the near future. This guidance will be similar the guidance proposed by the USEPA, but contains slight modifications that may focus on the urban qualities of the New Jersey watershed.

4B 7.0 Road Salting and Sanding Practices

In the MS4 Tier A permit that all the municipalities in the Pompeston Creek Watershed have for their municipal separate storm sewer systems, it is required that street sweeping be performed on predominantly commercial roads on a monthly basis. The salting and sanding of roads will create increased total suspended solids and change the conductivity of the stream if left to wash off the streets with the rain. With the sensitivity and significance of the biota that has been identified in this watershed, it is recommended that a more complete plan for the cleaning of applied substances to the roadways be addressed and standard operating procedures be implemented to minimize the over application of salt and sand to the roadways within this watershed.

This plan should schedule street sweepings as soon as possible after application of a sand or salt to the roads. This schedule should be included as a follow up to a storm where the public works have applied the substances.

4B 8.0 Vernal Pool Verification

The Pompeston Creek Watershed contains six areas that have been identified as "Potential Vernal Pools". These areas represent possible breeding habitats for amphibians and other vernal pool obligate and facultative species. These areas could be considered population strongholds and may be a crucial element in the survival of some endangered and threatened species. (CRSSA, 2007)

Figure 2 depicts the area where these potential vernal pools have been identified. At this point, it is essential to have these areas "ground truthed" to provide the actual vernal pools with the protection that should be provided to them. This is not a costly endeavor, but may provide essential protection in a timely manner.

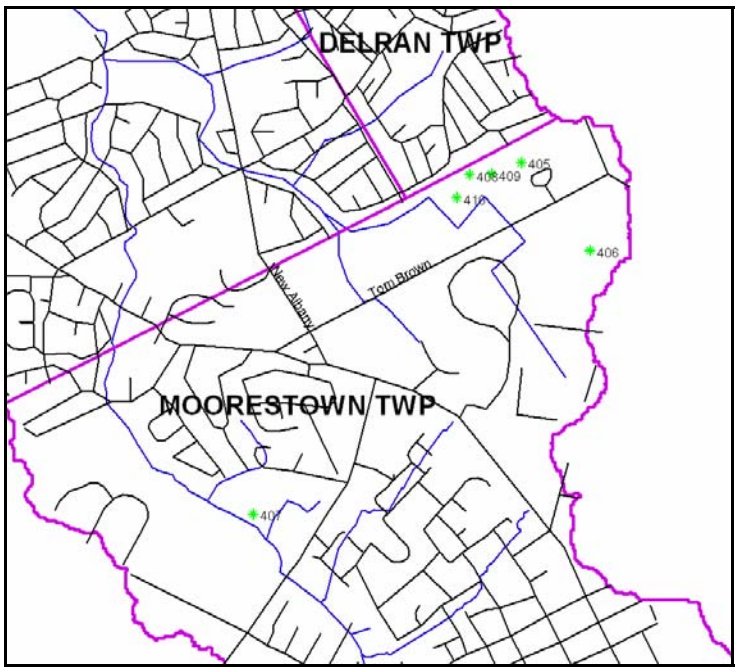

Figure 2: Location of Potential Vernal Pools

4B 9.0 Stormwater Management and Wetland Protection

Although many areas of protection exist for wetland in general, the Pompeston Creek Watershed has characteristics that increase the value of a wetland. Given the potential designation as a Category One protected stream, and given that the infiltration capacity of the watershed is diminished by the glauconitic soils, areas of natural filtration and storage play significant roles in several water quality and water quantity issues that watersheds in New Jersey are facing.

The first priority of this additional wetland protection will be to provide for the protection of the most sensitive wetlands that provide stormwater filtration and storage. The placement of these wetlands cannot be adjusted and provide their full benefit. The development of these sensitive wetlands should be avoided.

In the case that any wetlands require infill or other alteration, the mitigation of the destruction should be applied within this watershed to minimize the negative effects. In addition, past wetland locations should be regarded as primary sites for mitigation plans that cannot be performed in other watersheds. It is recommended that a survey of all past and present wetlands be performed in order to plan for the increase or at minimum, the no loss of wetlands within this watershed. Specific sites within the watershed should be

identified for wetland creation and enhancement so that future mitigation projects in and around the watershed can be easily implemented.

Consideration of the boundaries of a wetland, vernal pool or stream corridor may be enhanced by signage, fencing, and/or posts with educational. This is an ideal project for educational opportunities in addition to minimizing the impact of development.

4B.10.0 Program for Sustainable Car and Bus Washing

Outdoor car washing has the potential to result in high loads of contaminants, including hydrocarbons, nutrients and detergents that traditionally run down the road to the nearest catch basin and are ultimately discharged directly to the nearest stream. Commercial car wash facilities often recycle the water or are required to treat the wash water and discharge to a sanitary sewer line, where the ultimate treatment of the contaminated water takes place. Although loading from various car and bus washing events are difficult to quantify, Dengler and Barsino showed quantified fish mortality with the introduction of car wash runoff (Stormwater, October 2007).

Given that the lower Pompeston Creek has been determined to be severely impaired based on 2002 macroinvetebrate sampling at AMNET site number AN0177 (Route 130 in Cinnaminson), attention to potential contributing factors is essential. A program that identifies measures that the individual municipalities can take can be developed. This program should address residential car washing, fund raising for organizations and the washing of larger commercial vehicles, such as school buses.

The program should begin with a public education component with outreach to residents and businesses that would wash commercial vehicles out of doors. The program should also allow for the introduction of catch basin inserts for treatment or other options that would divert this discharge to the storm sewer system. Above all, the reduction of outdoor vehicle washing should be encouraged, not only for water quality benefits, but as a reduction in the use of potable water.

4B.11.0 Program to Address Leachate from Dumpsters

The bacterial contamination noted in the Characterization and Assessment for the Pompeston Creek Watershed could have a potential source in the discharge of leachate from open dumpsters containing food waste and child or adult waste products. For this reason, the watershed should considered the development of a comprehensive plan that will address the proper containment of dumpster related leachate so that this will not become a discharge to the surface waters of the Pompeston Creek.

The program should begin with a review of currently held waste ordinances for each municipality and advance to provide educational materials to all businesses that have

dumpsters on their property. Educational materials would need to include the necessity of removing the possibility of having precipitation able to reach the contents of the dumpster. Additional information on the ideal drainage of the dumpster area, including draining area to a pervious surface and avoiding the direct discharge to a catch basin.

4B.12.0 Specific Projects

4B.12.1. Cinnaminson

Introduction to Cinnaminson in the Pompeston Creek Watershed

With nearly four square miles of its land within the Pompeston Creek Watershed, Cinnaminson posses the largest portion of the watershed. All or some of nine subbasins that make up the Pompeston Creek Watershed fall within the borders of Cinnaminson, and with 28% impervious surfaces, the need to manage the effects of stormwater are significantly important. The subbasins contained within Cinnaminson can be identified in Figure 3.

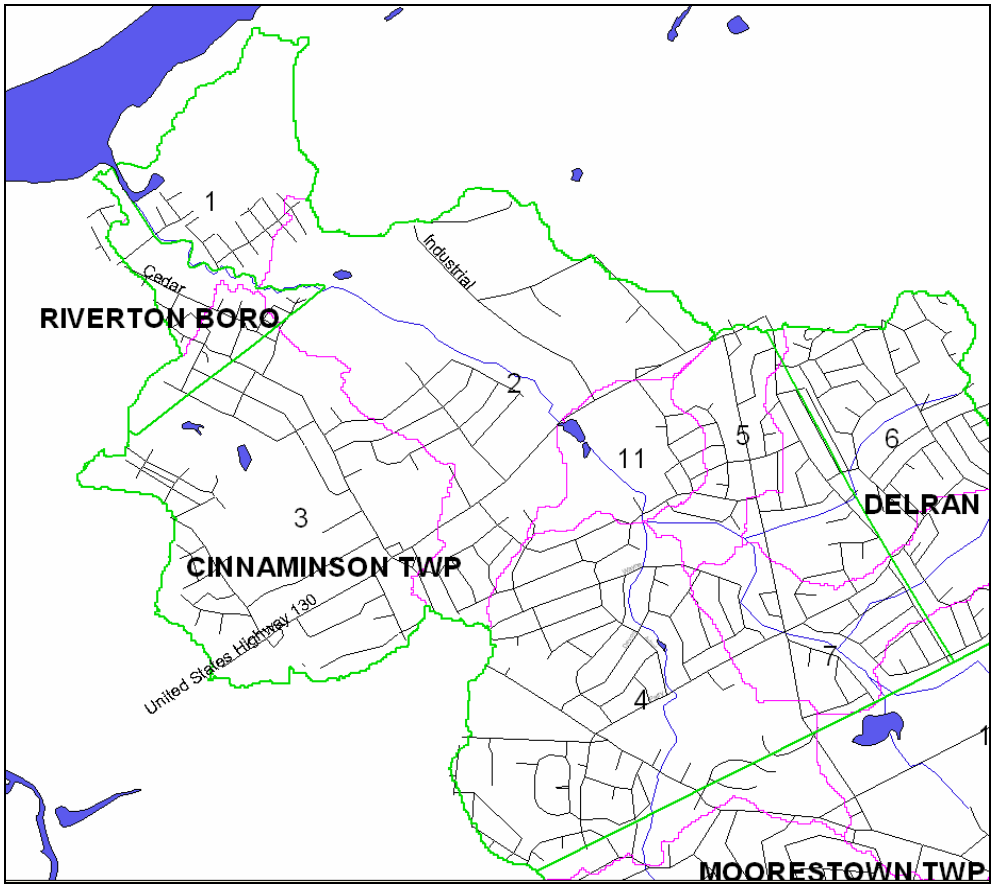

Figure 3: The Subbasins of the Borough of Cinnaminson

Recommendations to Address Water Quality and Loss of Biodiversity Issues for the Borough Cinnaminson

In addition to the provisions in Part A, or the "Applicable Provisions" for the Pompeston Creek Regional Stormwater Management Plan, water quality will benefit from general and site specific projects that have been identified here. As reported in the Milestone 2, Characterization and Assessment Report for the Pompeston Creek Stormwater Management Plan, the AMNET site located on the Pompeston Creek at Route 130 in Cinnaminson (ANO177) was placed on Sublist 5 of the 2004 Integrated List of Waterbodies (NJDEP, 2000) for non-attainment of the biological parameters, benthic macroinvertebrates. Also, a high proportion of water quality samples taken by the Pompeston Creek Watershed Association indicated parameters including fecal coliform and phosphorus were found to exceed water quality standards.

The site specific projects recommended for the Township of Cinnaminson range from the installation of buffers in key areas, the stabilization of steep and eroding banks, to the capturing of stormwater for reuse or recharge.

Buffers are needed around several existing retention (wet) basins. These buffers will serve to reduce resident water fowl populations and will have a significant effect on the fecal bacteria that can enter the system. These buffers are assumed to have an average width of 20 feet and cost approximately $12.50 per linear foot of shoreline. A reduction in phosphorus loading is also expected due to the ability of the buffer to retain the soil around the basin. It should also be noted that having these buffers and reducing these loads will add to the longetivity of the basin by decreasing the sedimentation rate. (See Map 5 Appendix B for location and needs of basins)

Table 1: Cinnaminson Projects and Costs

Ranking of Recommen-dations	Unique Project Identifier	Location (Subbasin No.)	Management Measure	Type of BMP	Cost
1	CMED14XX	All	Educational Programs	Education	Extremely Variable
2	CMSU14XX	All	Stormwater Utility	Regulatory	To be determined
3	CMPM14XX	All	Pathogen Management	Targeted monitoring	To be determined
4	CMLP14XX	All	Registration of Landscaping Professional	Regulatory (local ordinance)	Minimal cost for program administra-tion

5	CMSI14XX	All	Watershed wide Stressor Identification	Targeted monitoring	To be determined
6	CMRS14XX	All	Road Salting and Sanding Procedure Plan	Standard Operating Procedures	Minimal cost to educate DPW staff
7	CMBRA01XX	1	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$4,600 to $18,400
8	CMBRB06XX	6	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$2,050 to $8,230
9	CMBRC30XX	30	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$8,970 to $35,870
10	CMBRD31XX	31	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$12,730 to $50,910
11	CMBBA02XX	2	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$7,500
12	CMBBB03XX	3	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$8,875
13	CMBBC04XX	4	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$4,525
14	CMBBD05XX	5	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$12,040
15	CMBBE11XX	11	Wet Basin Buffer around Lakeview Cemetery	Planting buffer of average width of 20 ft. along shoreline	$16,515

16	CMSBA11XX	11	Stabilization and Buffer Restoration at Fountain Farms Park	Stabilization and vegetated buffer	$20,000
17	CMDIA07XX	7	Disconnection and Infiltration (Pheasant Run Swim Club parking lot)	Pervious Pavement (EcoStone)	$200,000
18	CMDIB03XX	3	Disconnection and Infiltration (Parking area at Wachovia Bank)	Rain gardens, bioretention systems, infiltration systems	$10,625 to $21,250
19	CMDIC02XX	2	Disconnection and Infiltration (Shopping Center at intersection of Route 130 and Willow Drive)	Pervious Pavement, infiltration systems	$250,000
20	CMDID02XX	2 & 3	Disconnection and Infiltration (Cinnaminson Commercial Sites along Route 130)	Rain gardens, bioretention systems, infiltration systems	$1.4 million to $2.8 million
21	CMDIE02XX	2	Disconnection and Infiltration (Cinnaminson Industrial Sites along btw. Industrial Highway and Union Landing)	Rain gardens, bioretention systems, infiltration systems	$845,000 to $1.7 million
22	CMDIF03XX	3	Disconnection and Infiltration (Residential Rain Gardens along US130 and Westfield Drive)	Rain gardens, bioretention systems, infiltration systems	$71,110 to $142,225

It will be important for Cinnaminson to include the implementation and enforcement of a sump pump ordinance. Residents have documented stormwater and sewage overflow from the manholes into the creek during periods of heavy rainfall. By ensuring that the sump pumps are not connected to the sanitary sewer line, no increase in total flow to the wastewater treatment plan should occur. This will allow for normal operation of the treatment facility and will reduce the incidences of sanitary sewer overflow.

Recommendations to Promote Groundwater Recharge in the Borough of Cinnaminson

Many of the projects that have been recommended and enumerated for water quality benefits also provide a groundwater recharge benefit (See Table 2). Retrofits for detention basins and all disconnection projects provide for a greater volume of precipitation to be infiltrated. The detention basin retrofits are assumed to promote groundwater recharge of stormwater runoff volumes for those storms equal to or smaller than the water quality design storm (1.25 inches). It has been assumed that 90% of the rainfall in Burlington County comes in storms less than 1.25 inches.

The vegetative buffers that are recommended for the shoreline of the retention basins and the pond at Lakeview Cemetery are designed to deter geese from using these water bodies and to filter direct runoff entering the lake. These buffers are not intended to promote groundwater recharge. The estimation of the load removed cannot be determined for these buffers since it is a function of the number of geese active in these areas. An analysis should be completed to determine the number of geese active in these areas prior to the buffer implementation and then a post implementation analysis should be completed to document the reduction in goose population. From this analysis, pollutant load reductions can be determined.

Table 2: Cinnaminson Projects and Load Reductions

Ranking of Recommenda-tions	Unique Project Identifier	Drainage Area (acres)	Estimated Total Phosphorus Pollutant Removal (lbs/yr)	Estimated Total Nitrogen Pollutant Removal (lbs/yr)	Estimated Total Suspended Solids Pollutant Removal (lbs/yr)	Estimated Water Quantity Reduction & Groundwater Recharge (Mgal/yr)
1	CMED14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
2	CMSU14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
3	CMPM14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
4	CMLP14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
5	CMSI14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
6	CMRS14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
7	CMBRA01XX	4.2	1.5	2.3	204.1	0.52
8	CMBRB06XX	1.7	0.6	0.9	82.6	0.22
9	CMBRC30XX	2.3	0.8	1.2	111.8	0.51
10	CMBRD31XX	2.5	0.9	1.4	121.5	0.56
11	CMBBA02XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
12	CMBBB03XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
13	CMBBC04XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
14	CMBBD05XX	NA	To Be	To Be	To Be	NA

			Determined	Determined	Determined	
15	CMBBE11XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
16	CMSBA11XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
17	CMDIA07XX	NA	NA	NA	NA	1.5
18	CMDIB03XX	NA	0.46	2.43	66.22	2.55
19	CMDIC02XX	NA	NA	NA	NA	0.30
20	CMDID02XX	NA	475.8327	4906.724	49383.28	338.8
21	CMDIE02XX	NA	253.2822	2637.398	31547.8	214.91
22	CMDIF03XX	NA	2.7	11.25	6.75	7.5

Note: Preliminary hydrographs for these management measures that are recommended in Milestone 4 are presented in Appendix F.

Table 3: Cinnaminson Funding and Objectives

Ranking of Recommendations	Unique Project Identifier	Management Measure	Required permits	Potential funding sources*	Addresses Objective (Milestone 3)**
1	CMED14XX	Educational Programs	No permits are required	1,2,3,6, and 7	1 through 7
2	CMSU14XX	Stormwater Utility	State legislation may be required	2 and 7	All
3	CMPM14XX	Pathogen Management	No permits are required	1,2,3,6, and 7	1
4	CMLP14XX	Registration of Landscaping Professional	No permits are required	1,2,3,6, and 7	2 and 3
5	CMSI14XX	Watershed wide Stressor Identification	No permits are required	1,2,3,6, and 7	4
6	CMRS14XX	Road Salting and Sanding Procedure Plan	No permits are required	1,2,3,6, and 7	2 and 4
7	CMBRA01XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
8	CMBRB06XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
9	CMBRC30XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
10	CMBRD31XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
11	CMBBA02XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
12	CMBBB03XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
13	CMBBC04	Retention (Wet)	Local	All	1, 2, and 3

	XX	Basin Buffer	construction permits		
14	CMBBD05 XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
15	CMBBE11 XX	Wet Basin Buffer around Lakeview Cemetery	Local construction permits	All	1, 2, and 3
16	CMSBA11 XX	Stabilization and Buffer Restoration at Fountain Farms Park	NJDEP Stream Encroachment and Freshwater Wetlands	All	1, 2, 3, and 4
17	CMDIA07 XX	Disconnection and Infiltration (Pheasant Run Swim Club parking lot)	Local construction permits	All	1 through 7
18	CMDIB03 XX	Disconnection and Infiltration (Parking area at Wachovia Bank)	Local construction permits	All	1 through 7
19	CMDIC02 XX	Disconnection and Infiltration (Shopping Center at intersection of Route 130 and Willow Drive)	Local construction permits	All	1 through 7
20	CMDID02 XX	Disconnection and Infiltration (Cinnaminson Commercial Sites along Route 130)	Local construction permits	All	1 through 7
21	CMDIE02 XX	Disconnection and Infiltration (Cinnaminson Industrial Sites along btw. Industrial Highway and Union Landing)	Local construction permits	All	1 through 7
22	CMDIF03 XX	Disconnection and Infiltration (Residential Rain Gardens along US130 and Westfield Drive)	Local construction permits	All	1 through 7

*Potential funding sources:

1. NJDEP 319(h) Program
2. NJDEP Corporate Business Tax for Watershed Projects

3. NJDEP Environmental Services Program
4. United States Department of Agriculture (USDA) Wildlife Habitat Incentives Program (WHIP)
5. USDA Resource Conservation and Development Program
6. Private Foundations
7. Local Stormwater Utility

**Objectives (Milestone 3):

1. Address Fecal Coliform Loading to Affected Water Bodies
2. Address Total Suspended Solids Loading to the Pompeston Creek
3. Address Nutrient Loading to the Pompeston Creek
4. Address Loss of Biodiversity
5. Address Areas of Flooding
6. Address Areas of Increased Stream Volume and Velocity
7. Address Recharge to Aquifer and Baseflow Maintenance
8. Other recommendations

Basement Flooding

Due to the backwater effect from the rising Delaware River and the increases in impervious cover in the Pompeston Creek Watershed, several basements of the homes along the Pompeston Creek in Riverton regularly flood during storm events. As stormwater runoff from impervious surfaces upstream are disconnected and these runoff volumes infiltrated, this basement flooding may decrease. Since these homes are very close to the stream and in some cases within the floodway, additional measures may need to be taken by homeowners to flood proof their basements. Another alternative is to seek FEMA funds to purchase these properties and relocate the homeowners out of harms way.

4B.12. 2. Moorestown

Introduction to Moorestown in the Pompeston Creek Watershed

With a significant acreage of parklands, wetlands and low density residential, Moorestown still has 22% impervious surface. Moorestown contains all the headwaters of the West Branch and a portion of the headwaters of the East Branch of the Pompeston Creek. Large land areas contribute to high volumes of runoff to the stream making stormwater management in this area critical to the health of the waterway. The area of Moorestown contained within the Pompeston Creek Watershed is shown in Figure 4

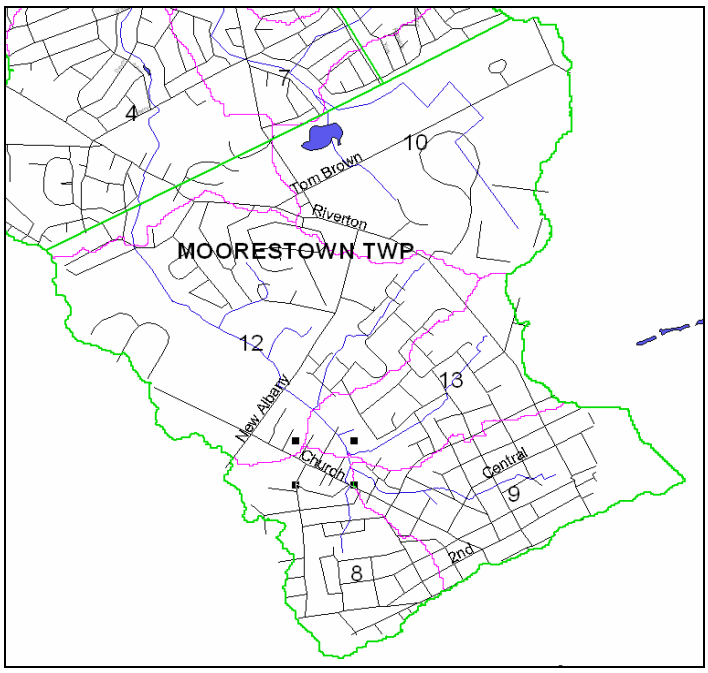

Figure 4: The Subbasins of Moorestown

Recommendations to Address Water Quality and Biodiversity Issues for the Township of Moorestown

Moorestown will benefit by the education of landscapers and the general public. The number of detention/retention basins that require updating for optimal water quality control will also provide benefits to the municipality. All methods to infiltrate precipitation in Moorestown will provide benefits throughout the watershed.

Pompeston Creek Park: The Pompeston Creek upstream of New Albany Road in Moorestown had been straightened and channelized. This has limited the stream's access to the flood plain, which results in flashy hydrology (i.e., rapidly rising water surface and high stream velocities). This flashy hydrology has resulting in stream bank erosion along this section of stream and transport of sediment downstream, which is ultimately deposited on downstream macroinvertebrate habitat. Additionally, the high stream velocities discharge through the culverts under New Albany Road, resulting in severe stream bank erosion immediately downstream of the bridge. The sediment from this stream bank erosion is also carried downstream and deposited over important macroinvertebrate habitat.

A couple of solutions exist to this problem. The section of the stream that has been straightened and channelized can be restored. This would involve recreating the meanders in the stream and re-establishing access to the flood plain. Since this section of

stream is surrounded by open space, this restoration would be possible but existing trees would be lost during the construction and would need to be replanted. The initial loss of trees may make this project unattractive to local stakeholders.

Another option would be to install instream habitat along this section of stream. If constructed properly, this instream habitat could reduce velocity and allow for sediment deposition upstream of New Albany Road, which may require a long-term maintenance plan for removal of this sediment. The installation of instream habitat would increase the biological integrity of this section of stream, thereby converting it from an open stormwater ditch into a living ecosystem.

If the section upstream of New Albany Road is restored, stream bank erosion downstream of New Albany Road could be minimized. Soil bioengineering techniques have been used downstream of New Albany Road with limited success. Additional measures could be installed to stabilize this section of stream but most likely hard structures would be needed to complement the soil bioengineering restorations.

Table 4: Moorestown Projects and Costs

Rank	Unique Identifier	Location (Subbasin No.)	Management Measure	Type of BMP	Cost
1	MTED14XX	All	Educational Programs	Education	Extremely Variable
2	MTSU14XX	All	Stormwater Utility	Regulatory	To be determined
3	MTPM14XX	All	Pathogen Management	Targeted monitoring	To be determined
4	MTLP14XX	All	Registration of Landscaping Professional	Regulatory (local ordinance)	Minimal cost for program administration
5	MTSI14XX	All	Watershed wide Stressor Identification	Targeted monitoring	To be determined
6	MTRS14XX	All	Road Salting and Sanding Procedure Plan	Standard Operating Procedures	Minimal cost to educate DPW staff
7	MTVP10XX	10	Vernal Pool Verification	Regulatory	To be determined
8	MTBRA09XX	9	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$11,000 to $43,995
9	MTBRB14XX	14	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$11,475 to $45,905
10	MTBRC16XX	16	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$6,965 to $27,855

11	MTBRD18XX	18	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$1,720 to $6,880
12	MTBRE23XX	23	Detention Basin Retrofit	Possible soil replacement and re-vegetation	$39,765 to $159,050
13	MTBBA20XX	20	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$21,250
14	MTBBB47XX	47	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$7,100
15	MTBBC55XX	55	Retention (Wet) Basin Buffer	Planting buffer of average width of 20 ft. along shoreline	$1,700
16	MTDIA12XX	12	Disconnection and Infiltration (Moorestown Industrial Sites)	Rain gardens, bioretention systems, infiltration systems	$2 million to $4 million
17	MTDIB09XX	9	Disconnection and Infiltration (Moorestown Commercial Sites)	Rain gardens, bioretention systems, infiltration systems	$492,000 to $984,000
18	MTSBA09XX	9	Stabilization and Buffer Restoration at Dawson St. and Maple St. Vegetative Buffer	Stabilization and vegetated buffer	$75,000
19	MTDIC09XX	9	Disconnection and Infiltration (Parking Lot at Municipal Bldg. and Public Library)	Rain gardens, bioretention systems, infiltration systems	$11,040 to $22,075
20	MTDID09XX	9	Disconnection and Infiltration (Municipal Parking Lot across from Municipal Bldg. and Public Library)	Rain gardens, bioretention systems, infiltration systems	$100,000
21	MTUSA12XX	12	Underground Storage (Moorestown Corporate Park)	Underground storage	$500,000

22	MTDIF12XX	12	Disconnection and Infiltration (Moorestown Corporate Park)	Rain gardens, bioretention systems, infiltration systems	$53,020 to $106,035
23	MTDIG12XX	12	Disconnection and Infiltration (Residential area off Riverton Road)	Rain gardens, bioretention systems, infiltration systems	$90,000 to $180,000

Recommendations to Address Water Quantity and Groundwater Recharge Issues for the Township of Moorestown

Water quality measures such as optimal retention/detention basins and disconnection and infiltration of impervious areas also provide benefits to the water quantity issues that the entire watershed faces. Any reduction in precipitation runoff will increase the groundwater recharge and decrease the volume and velocity of the stream from headwaters to mouth.

Table 5: Moorestown Projects and Load Reductions

Ranking of Recommendations	Unique Project Identifier	Drainage Area (acres)	Estimated Total Phosphorus Pollutant Removal (lbs/yr)	Estimated Total Nitrogen Pollutant Removal (lbs/yr)	Estimated Total Suspended Solids Pollutant Removal (lbs/yr)	Estimated Water Quantity Reduction & Groundwater Recharge (Mgal/yr)
1	MTED14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
2	MTSU14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
3	MTPM14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
4	MTLP14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
5	MTSI14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
6	MTRS14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
7	MTVP10XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
8	MTBRA09XX	4.9	1.8	2.6	238.1	0.61
9	MTBRB14XX	23.0	8.3	12.4	1117.8	5.16
10	MTBRC16XX	23.1	8.3	12.5	1122.7	2.90
11	MTBRD18XX	1.1	0.4	0.6	53.5	0.14

12	MTBRE23XX	16.9	6.1	9.1	821.3	2.12
13	MTBBA20XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
14	MTBBB47XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
15	MTBBC55XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
16	MTDIA12XX	295.761	355.2229	3664.008	44433.64	320.56
17	MTDIB09XX	82.776	167.6322	1753.464	16104.48	89.7
18	MTSBA09XX	4.75	To Be Determined	To Be Determined	To Be Determined	NA
19	MTDIC09XX	0.914	NA	NA	162	0.9
20	MTDID09XX	2.49	NA	NA	300	2.55
21	MTUSA12XX	6.1	NA	NA	NA	To Be Determined
22	MTDIF12XX	1.632	NA	NA	293	1.66
23	MTDIG12XX	38	4.5	37.5	450	7.5

Note: Preliminary hydrographs for these management measures that are recommended in Milestone 4 are presented in Appendix F.

Table 6 : Moorestown Project Funding and Objectives

Rank	Unique Identifier	Management Measure	Required permits	Potential funding sources	Addresses Objective (Milestone 3)
1	MTED14XX	Educational Programs	No permits are required	1,2,3,6, and 7	1 through 7
2	MTSU14XX	Stormwater Utility	State legislation may be required	2 and 7	All
3	MTPM14XX	Pathogen Management	No permits are required	1,2,3,6, and 7	1
4	MTLP14XX	Registration of Landscaping Professional	No permits are required	1,2,3,6, and 7	2 and 3
5	MTSI14XX	Watershed wide Stressor Identification	No permits are required	1,2,3,6, and 7	4
6	MTRS14XX	Road Salting and Sanding Procedure Plan	No permits are required	1,2,3,6, and 7	2 and 4
7	MTVP10XX	Vernal Pool Verification	No permits are required	1,2,3,6, and 7	4
8	MTBRA09XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
9	MTBRB14XX	Detention Basin Retrofit	Local construction	All	1 through 7

			permits		
10	MTBRC16XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
11	MTBRD18XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
12	MTBRE23XX	Detention Basin Retrofit	Local construction permits	All	1 through 7
13	MTBBA20XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
14	MTBBB47XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
15	MTBBC55XX	Retention (Wet) Basin Buffer	Local construction permits	All	1, 2, and 3
16	MTDIA12XX	Disconnection and Infiltration (Moorestown Industrial Sites)	Local construction permits	All	1 through 7
17	MTDIB09XX	Disconnection and Infiltration (Moorestown Commercial Sites)	Local construction permits	All	1 through 7
18	MTSBA09XX	Stabilization and Buffer Restoration at Dawson St. and Maple St. Vegetative Buffer	Local construction permits	All	1, 2, 3, and 4
19	MTDIC09XX	Disconnection and Infiltration (Parking Lot at Municipal Bldg. and Public Library)	Local construction permits	All	1 through 7
20	MTDID09XX	Disconnection and Infiltration (Municipal Parking Lot across from Municipal Bldg. and Public Library)	Local construction permits	All	1 through 7
21	MTUSA12XX	Underground Storage (Moorestown Corporate Park)	Local construction permits	All	5, 6 and 7
22	MTDIF12XX	Disconnection and Infiltration (Moorestown Corporate Park)	Local construction permits	All	1 through 7

23	MTDIG12XX	Disconnection and Infiltration (Residential area off Riverton Road)	Local construction permits	All	1 through 7

*Potential funding sources:

1. NJDEP 319(h) Program
2. NJDEP Corporate Business Tax for Watershed Projects
3. NJDEP Environmental Services Program
4. United States Department of Agriculture (USDA) Wildlife Habitat Incentives Program (WHIP)
5. USDA Resource Conservation and Development Program
6. Private Foundations
7. Local Stormwater Utility

**Objectives (Milestone 3):

1. Address Fecal Coliform Loading to Affected Water Bodies
2. Address Total Suspended Solids Loading to the Pompeston Creek
3. Address Nutrient Loading to the Pompeston Creek
4. Address Loss of Biodiversity
5. Address Areas of Flooding
6. Address Areas of Increased Stream Volume and Velocity
7. Address Recharge to Aquifer and Baseflow Maintenance
8. Other recommendations

4B. 12.3. Delran

Introduction to Delran within the Pompeston Creek Watershed

The Pompeston Creek Watershed contains a 110 acre portion of the Township of Delran. The individual subbasins located in Delran can be seen in Figure 5. Essentially land use consists of medium density residential on soils that low in recharge capacity. However, every attempt should be made to reduce the traditional conveyance of stormwater directly to the street catch basins, and provide every opportunity for recharge available.

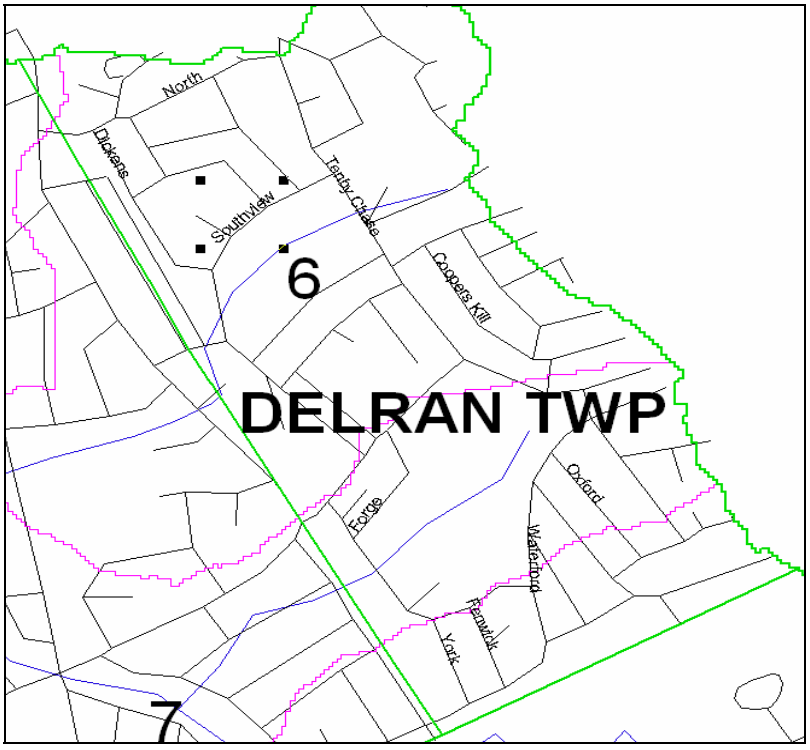

Figure 5: The Subbasins of Delran Township

Recommendations to Address Water Quality and Biodiversity Issues for the Township of Delran

Delran contains several areas of horse farms that require adequate manure management to ensure that the stream does not become contaminated with the runoff from these areas. With the watershed suffering from high fecal bacteria counts, high phosphorus and sedimentation, practices ensuring proper management of these horse farms are important. This goal may best be obtained by education of the farmer and farm workers, with ensuring that this education contains the use of Best Management Practices that can be implemented. Rutgers University County Extension Agents can provide this information and ensure the optimal management of the area.

Table 7: Delran Township Projects and Costs

Rank	Unique Identifier	Location (Subbasin No.)	Management Measure	Type of BMP	Cost
1	DTCR10XX	10	Channel and pipe cleaning and culvert replacement to address flooding issues at Waterford Ave.	Engineering Study and culvert replacement	$300,000
2	DTED14XX	All	Educational Programs	Education	To be determined
3	DTSU14XX	All	Stormwater Utility	Regulatory	To be determined
4	DTPM14XX	All	Pathogen Management	Targeted monitoring	To be determined
5	DTLP14XX	All	Registration of Landscaping Professional	Regulatory (local ordinance)	Minimal cost for program administration
6	DTSI14XX	All	Watershed wide Stressor Identification	Targeted monitoring	To be determined
7	DTRS14XX	All	Road Salting and Sanding Procedure Plan	Standard Operating Procedures	Minimal cost to educate DPW staff
8	DTVP10XX	10	Vernal Pool Verification	Regulatory	To be determined

Recommendations to Address Water Quantity and Groundwater Recharge Issues for the Township of Delran

All the BMPs selected to address the water quantity and water quality issues also promote groundwater recharge. The educational programs will also result in BMPs that promote groundwater recharge and will help encourage residents to take action to infiltrate more stormwater runoff.

Delran's largest problem is contained in the area of Waterford Drive, York Road and Fenwick Road. Given that Waterford Drive runs parallel to a tributary to the Pompeston Creek, and given that the drainage from developed lands upgradient of Waterford Drive drain to this area, large volumes of precipitation runoff have been an issue that threatens the health, welfare and property of the residents there.

Waterford Drive Flooding: The stormwater runoff from the residential area around Waterford Avenue, approximately 73 acres, discharges through one six foot diameter stormwater outlet pipe into a tributary on a piece of property that is commonly know as Whitesell's Farm. This stormwater outlet is partially clogged with sediment that has resulted in standing water, which provides breeding ground for mosquitos. Also, since half of the outlet is blocked with sediment, the outfall can only flow at half of its capacity, thereby creating a backwater effort that causes upstream flooding. Additionally, over the years at least two road crossing have been installed across the tributaries on Whitesell's Farm, downstream of this discharge. Each crossing consists of three pipes each with a diameter of 30 inches. These pipes are partially clogged with sediment, thereby restricting flow and creating a backwater effect, which causes upstream flooding.

An initial engineering analysis indicates that even if the outlet pipe can be cleared of all the standing water and restored to convey flows at full capacity, flooding will still be a chronic problem between the outlet and the pipes underneath the roads on Whitesell's farm. Although cleaning the pipes and removing the accumulated sediment will help minimize some of the flooding problems for the smaller storm events, a more solution to this problem may be needed such as replacing existing culverts with larger culverts, especially for the road crossings on Whitesell's Farm or subdividing the existing watershed into smaller watersheds with several more discharge points so that all the flow does not discharge through the six foot diameter pipe into the single tributary.

Table 8: Delran Township Projects and Load Reductions

Rank	Unique Identifier	Drainage Area (acres)	Estimated Total Phosphorus Pollutant Removal (lbs/yr)	Estimated Total Nitrogen Pollutant Removal (lbs/yr)	Estimated Total Suspended Solids Pollutant Removal (lbs/yr)	Estimated Water Quantity Reduction & Groundwater Recharge (Mgal/yr)
1	DTCR10XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
2	DRED14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
3	DRSU14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
4	DRPM14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
5	DRLP14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
6	DRSI14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
7	DRRS14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
8	DRVP10XX	NA	To Be Determined	To Be Determined	To Be Determined	NA

Note: Preliminary hydrographs for these management measures that are recommended in Milestone 4 are presented in Appendix F.

Estimated Load Reductions and Groundwater Recharge for Delran Management Measures

Load reductions were estimated for each of the management measures that were recommended for the Township of Delran. Aerial loading coefficients were used to determine the load reductions for total phosphorus, total nitrogen, and total suspended solids. These loading coefficients were multiplied by the area treated by the infiltration systems for each of the management measures. Since the management measures were designed to infiltrate all of the runoff from the two-year rainfall event, each management measure was assumed to reduce the annual load by 90% based upon a volume reduction. These load reductions are presented in Table 8. Also presented in Table 8 are the estimated groundwater recharge volumes. Once again, each management measure was estimated to infiltrate 90% of the annual rainfall or 40 inches per year. These volumes are presented in million of gallons.

Estimated Load Reduction for Delran Management Measures

Table 9: Delran Township Projects Objectives and Funding

Rank	Unique Identifier	Management Measure	Required Permits	Potential Funding Sources*	Addresses Objective (Milestone 3)**
1	DTCR10XX	Channel and pipe cleaning and culvert replacement to address flooding issues at Waterford Ave.	Local construction permits and possibly NJDEP Stream Encroachment and Freshwater Wetlands Permits	All	5
2	DRED14XX	Educational Programs	No permits are required	1,2,3,6, and 7	1 through 7
3	DRSU14XX	Stormwater Utility	State legislation may be required	2 and 7	All
4	DRPM14XX	Pathogen Management	No permits are required	1,2,3,6, and 7	1

5	DRLP14XX	Registration of Landscaping Professional	No permits are required	1,2,3,6, and 7	2 and 3
6	DRSI14XX	Watershed wide Stressor Identification	No permits are required	1,2,3,6, and 7	4
7	DRRS14XX	Road Salting and Sanding Procedure Plan	No permits are required	1,2,3,6, and 7	2 and 4
8	DRVP10XX	Vernal Pool Verification	No permits are required	1,2,3,6, and 7	4

Potential funding sources:

1. NJDEP 319(h) Program
2. NJDEP Corporate Business Tax for Watershed Projects
3. NJDEP Environmental Services Program
4. United States Department of Agriculture (USDA) Wildlife Habitat incentives Program (WHIP)
5. USDA Resource Conservation and Development Program
6. Private Foundations
7. Local Stormwater Utility
8. NJ Green Acres
9. County Open Space Preservation

Objectives (Milestone 3):

1. Address Fecal Coliform Loading to Affected Water Bodies
2. Address Total Suspended Solids Loading to the Pompeston Creek
3. Address Nutrient Loading to the Pompeston Creek
4. Address Loss of Biodiversity
5. Address Areas of Flooding
6. Address Areas of Increased Stream Volume and Velocity
7. Address Recharge to Aquifer and Baseflow Maintenance
8. Other recommendations

4B. 12.4. Riverton

Introduction to Riverton within the Pompeston Creek Watershed

The Borough of Riverton borders the western bank of the most downstream portion of the Pompeston Creek. Within the Borough of Riverton, 22.7 acres falls within the boundary of the Pompeston Creek Watershed. Parts of Subbasin 1 and Subbasin 3 of the Pompeston Creek Watershed are contained in Riverton.

Land use in Riverton is mixed between wetlands closer to the stream, recreational areas and residential. The last reach of the Pompeston Creek courses between Riverton and Cinnaminson and is allowed an amount of natural meander. An area of earthen dike has provided for the natural creation of a functioning wetland in this tidal area.

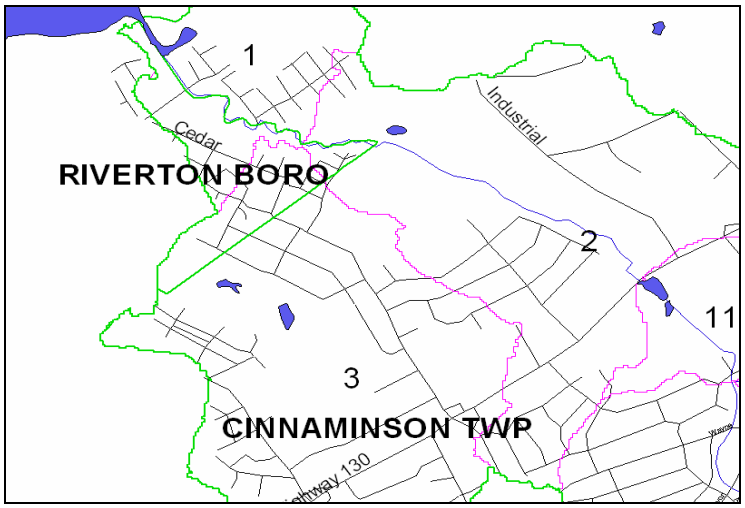

Figure 6: The Subbasins of Riverton

Recommendations to Address Water Quality and Biodiversity Issues for the Township of Riverton

The water quality in Riverton is highly dependent on the loading that it receives from the upper reaches of the watershed. The most significant practices that Riverton should engage in is the protection of the stream corridor, providing for stabilization of the stream bank and protection of the wetlands.

Table 10: Riverton Township Projects and Costs

Rank	Unique Identifier	Location (Subbasin No.)	Management Measure	Type of BMP	Cost
1	RTED14XX	All	Educational Programs	Education	To be determined
2	RTSU14XX	All	Stormwater Utility	Regulatory	To be determined
3	RTPM14XX	All	Pathogen Management	Targeted monitoring	To be determined
4	RTLP14XX	All	Registration of Landscaping Professional	Regulatory (local ordinance)	Minimal cost for program administration
5	RTSI14XX	All	Watershed wide Stressor Identification	Targeted monitoring	To be determined

6	RTRS14XX	All	Road Salting and Sanding Procedure Plan	Standard Operating Procedures	Minimal cost to educate DPW staff
7	RTDI12XX	1	Disconnection and Infiltration (Residential Area)	Rain gardens, bioretention systems, infiltration systems	$12,980 to $25,960

Recommendations to Address Water Quantity and Groundwater Recharge Issues for the Township of Riverton

All the BMPs selected to address the water quantity and water quality issues also promote groundwater recharge. The educational programs will also result in BMPs that promote groundwater recharge and will help encourage residents to take action to infiltrate more stormwater runoff.

Estimated Load Reduction for Riverton Management Measures

The management measures that have been recommended for Riverton are those that are generalized and not localized, so load reductions are not able to be calculated at this time. The possibility exists to implement these measures and provide for a before and after analysis to aid in the quantification of these proposed projects.

Table 11: Riverton Township Projects and Load Reductions

Rank	Unique Identifier	Drainage Area (acres)	Estimated Total Phosphorus Pollutant Removal (lbs/yr)	Estimated Total Nitrogen Pollutant Removal (lbs/yr)	Estimated Total Suspended Solids Pollutant Removal (lbs/yr)	Estimated Water Quantity Reduction & Groundwater Recharge (Mgal/yr)
1	RTED14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
2	RTSU14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
3	RTPM14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
4	RTLP14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
5	RTSI14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
6	RTRS14XX	NA	To Be Determined	To Be Determined	To Be Determined	NA
7	RTDI12XX	0.377	NA	NA	NA	0.38

Note: Preliminary hydrographs for these management measures that are recommended in Milestone 4 are presented in Appendix F.

Estimated Load Reductions and Groundwater Recharge for Riverton Management Measures

Load reductions were estimated for each of the management measures that were recommended for the Township of Riverton. Aerial loading coefficients were used to determine the load reductions for total phosphorus, total nitrogen, and total suspended solids. These loading coefficients were multiplied by the area treated by the infiltration systems for each of the management measures. Since the management measures were designed to infiltrate all of the runoff from the two-year rainfall event, each management measure was assumed to reduce the annual load by 90% based upon a volume reduction. These load reductions are presented in Table 8. Also presented in Table 8 are the estimated groundwater recharge volumes. Once again, each management measure was estimated to infiltrate 90% of the annual rainfall or 40 inches per year. These volumes are presented in million of gallons.

Table 12: Riverton Township Projects Objectives and Funding

Rank	Unique Identifier	Management Measure	Required Permits	Potential Funding Sources*	Addresses Objective (Milestone 3)**
1	RTED14XX	Educational Programs	No permits are required	1,2,3,6, and 7	1 through 7
2	RTSU14XX	Stormwater Utility	State legislation may be required	2 and 7	All
3	RTPM14XX	Pathogen Management	No permits are required	1,2,3,6, and 7	1
4	RTLP14XX	Registration of Landscaping Professional	No permits are required	1,2,3,6, and 7	2 and 3
5	RTSI14XX	Watershed wide Stressor Identification	No permits are required	1,2,3,6, and 7	4
6	RTRS14XX	Road Salting and Sanding Procedure Plan	No permits are required	1,2,3,6, and 7	2 and 4
7	RTDI12XX	Disconnection and Infiltration (Residential Area)	Local construction permits	All	1 through 7

Potential funding sources:

1. NJDEP 319(h) Program
2. NJDEP Corporate Business Tax for Watershed Projects
3. NJDEP Environmental Services Program
4. United States Department of Agriculture (USDA) Wildlife Habitat incentives Program (WHIP)

5. USDA Resource Conservation and Development Program
6. Private Foundations
7. Local Stormwater Utility
8. NJ Green Acres
9. County Open Space Preservation

Objectives (Milestone 3):

1. Address Fecal Coliform Loading to Affected Water Bodies
2. Address Total Suspended Solids Loading to the Pompeston Creek
3. Address Nutrient Loading to the Pompeston Creek
4. Address Loss of Biodiversity
5. Address Areas of Flooding
6. Address Areas of Increased Stream Volume and Velocity
7. Address Recharge to Aquifer and Baseflow Maintenance
8. Other recommendations

4B 13.0 Next Steps

The Lead Planning Agency (LPA) of the Pompeston Creek Regional Stormwater Management Plan, the Water Resources Program of Burlington County, will submit this plan for acceptance into the Areawide Watershed Management Plan. Working with the New Jersey Department of Environmental Protection, the LPA and other stakeholders will provide the municipalities with the information that they need to implement the plan in their towns. The Water Resources Program of Rutgers Cooperative Extension will continue to participate in advising stakeholders and assisting with the implementation of the final plan.

The steps needed to be taken are general concepts that could be executed by the parties mentioned above, but can also be used by other groups including municipal governments, county governments, environmental commissions and similar agencies. These projects could play an important role in the mitigation plans, which are contained in the Municipal Stormwater Management Plans that have been created by each municipality. By incorporating these projects into the mitigation plans, funding from developers may be available for implementing these projects. Ultimately, the County of Burlington will be the essential group that disseminates the information in the plan.

In general, the next steps that need to be taken for each of the project types are as follows:

Disconnection Projects: All disconnection projects initially require the proper identification of the property owner. Once this is determined, the property owner should be contacted and inquiry should be made as to whether the property owner would consider BMPs on the property. After this is confirmed, a site specific concept plan can be drawn up by an interested contracted partner. With this concept plan, funding can be applied for and implementation can be planned. In the past, contractors have prepared concept plans and assisted in writing grant applications free of charge, provided they were incorporated into the project as a partner and had an opportunity to get funding from the grant to complete the final design.

Bioretention Basin/Detention Basin Retrofit: A concept plan for one site has been completed and submitted as a portion of this plan. This concept plan should be finalized with the owner of the property. It must be ensured that only native species are used in the vegetation for optimal results for watershed health. Discussions should also take place with municipal officials to determine discussions that have taken place prior to the presentation of this concept plan. If required, a person that has links to the creation of the concept plan should communicate the benefits of this particular design to the property owners. Once this has been confirmed, funding sources should be approached.

Microbial Source Tracking (MST): Although a relatively new technique, MST should provide beneficial knowledge on the origination of pathogens within the watershed. Presently this technique is primarily in the hands of research institutions, and therefore a university should be contacted to begin the process. However, PCWA and NJDEP Leeds Point Lab have initiated a program to detect sources in the Pompeston Creek Watershed and an interpretive report is expected to be published in 2008 that will detail the Fecal Coliform, E. coli, virus coliphage, and multiple antibiotic resistance analyses that have been performed up to this point.

Catch Basin Inserts: The Township of Cinnaminson has previously applied for funding to install catch basin inserts into critical catch basins to improve water quality. To move toward getting this implemented, that proposal should be revised and updated with assurance that the technology being requested will adhere to NJCAT standards and provide a quantifiable water quality improvement.

Extra Catch Basin Cleaning: As the municipality is already required to clean the catch basins yearly, this additional cleaning should only require the cooperation of municipal employees. It will be necessary to connect with key personnel in the municipality, whether that be a public works employee or an overseeing municipal engineer, and provide a plan of inspection and additional cleaning if the basin is more than 50% full upon yearly cleaning.

Education Programming: Initial steps in implementing a successful educational program includes the identification of a local partner who wants to participate and ultimately take ownership of the program. This partner could be the Pompeston Creek Watershed Association, an environmental commission or a homeowners association, among others. The Pompeston Creek Watershed Association has numerous established community and school education programs, some of which are described in Section 4B.2.6 of this document. Once the group is identified, application for funding should take place.

Goose Management: The first step that needs to be taken in order to implement an effective goose management plan is to have someone at the township level identify where management practices would be helpful. Advice on goose management may be acquired from Cinnaminson, who has had a plan in place and has learned what methods provide the most effective results. Many useful documents exist to provide education on goose

management, including a NJ DEP 2001 paper entitled, "Management of Canada Geese in Suburban Areas, A Guide to the Basics", and a 1999 publication out of Cornell University entitled, "Managing Canada Geese in Urban Environments, A Technical Guide".

Streambank Restoration: To proceed with any streambank restoration project, one must first identify a contractor that will provide a concept plan that will be used when applying for funding. Once again, some contractors will provide concept plans for free if they ultimately anticipate receiving a contract to complete the final design. A competent contractor ensures the sole use of native species for optimal results.

Program for Sustainable Car and Bus Washing: Identification of a group willing to initiate the program can begin by viewing the tasks of the environmental commissions and available watershed associations. The Pompeston Creek Watershed Association is one viable option for initiating this program and working with the municipalities to provide oversight of the program. Funding may needed to be sought for materials and hours that are necessary to promote this program.

Program to Address Leachate from Dumpsters: An individual or group will need to engage an agent of Burlington County or the separate municipalities to clarify waste management strategies that are active. A willing group (PCWA, environmental commission, etc.) would then need to create an educational program for dumpster owners. This program could have value to any area that currently has a bacterial impairment and funding should be sought.

References

Camp, Dresser & McKee, prepared for the Morris County Planning Board (c/o Ray Zabihach), and submitted to NJDEP Bureau of Nonpoint Pollution Control (c/o Barry Chalofsky), "Recommendations for Stormwater Utility Implementation in New Jersey", submitted September 2005.

Center for Remote Sensing and Spatial Analysis (CRSSA), "New Jersey Coastal Conservation and Restoration Targets", Coastal Data Summary, January, 2007.

NJ Department of Environmental Protection Division of Watershed Management, "Management of Canada Geese in Suburban Areas, A Guide to the Basics" DRAFT, March, 2001.

Smith, A.E., S.R. Craven, and P.D. Curtis. 1999. "Managing Canada geese in urban environments." Jack Berryman Institute Publication 16, and Cornell University Cooperative Extension , Ithaca, N.Y.

Ahn, Jong Cheon, "Stormwater Runoff Effects in a Low to Medium Density Residential Area in the Whippany River Watershed", Ph.D. thesis, May 2004.

Appendix A: Sump Pump Ordinance

Sump Pump Ordinance

Township of Borough of _____

ORDINANCE NO. 269

AN ORDINANCE PROHIBITING DISCHARGES INTO THE SANITARY SEWER SYSTEM AND TO PROVIDE FOR INSPECTION OF PROPERTY TO DETERMINE ILLEGAL CONNECTIONS TO THE SANITARY SEWER SYSTEM AND TO PROVIDE A SURCHARGE FOR NON-COMPLIANCE WITH INSPECTION AND CONNECTION REQUIREMENTS.

WHEREAS, the Township or Borough of _____ finds that the discharge of water from any surface, groundwater sump pump, roofs, yards, lawns, streets, alleys, footing tile, or other natural precipitation into the sanitary sewer contributes to the flooding and overloading of the sanitary sewer system. Such overloading of the sanitary sewer system may result in sewage flowing into basements and/or residences and businesses, creating hazardous public health conditions and significant damage to properties. The Township or Borough, therefore, determines that this ordinance is necessary to protect the health, safety, and welfare of its citizens through the regulation of connections to the Township or Borough's sanitary sewer system.

NOW THEREFORE, the Township or Borough of _____ does ordain:

SECTION I – DISCHARGE PROHIBITED. Except as otherwise expressly authorized in this Section, no ponds, water fountains, water from any roof, surface, groundwater sump pump, swimming pool, or other natural precipitation shall be discharged into the sanitary sewer system. Dwellings and other buildings and structures which require, because of infiltration of water into basements, crawl spaces, and the like, a sump pump discharge system shall have a permanently installed discharge line which shall not at any time discharge water into a sanitary sewer system. A permanent installation shall be one which provides for year round discharge capability to either the outside of the dwelling, building, or structure, or is connected to a storm sewer or discharge through the curb and gutter to the street. Within the home or business, the sump pump discharge pipe shall consist of a rigid discharge line, without valves or quick connections, that would alter the path of discharge. However, if the line is directly connected to a storm sewer line or catch basin a check valve and an air gap are required.

SECTION II – INSPECTIONS. Property owners shall allow an employee of the Township or Borough or a designated representative of the Township or Borough to inspect the buildings to confirm that there is no sump pump or other prohibited discharge into the sanitary sewer system. The Township or Borough may periodically re-inspect any building or premise to determine compliance with the requirements of this ordinance.

SECTION III – REMOVAL OF CONNECTIONS. Any property owner who previously made any connection or installation in violation of this ordinance shall immediately remove such connection or correct such an installation. If not removed or corrected within 30 calendar days after notice of the violation has been delivered personally or by certified mail to the owner, the Township or Borough may impose a surcharge in the amount provided in Section V of this Ordinance. Such a surcharge may also be imposed upon any property owner, after a 30 calendar day notice has been delivered, and if the owner refuses to allow their property to be inspected. The owner of a building or premises found to be not in conformance with this ordinance during periodic re-inspections may be subjected to a surcharge as provided in Section V of this Ordinance.

SECTION IV- FOUNDATION DRAIN TILE

Future Homes and Businesses: Groundwater from foundation drain tile for future homes and businesses shall not discharge to the sanitary sewer system. The groundwater shall flow through the tile and drain to a

sump basket and shall then be pumped and discharged to the exterior of the structure with the use of a sump pump.

Existing Homes and Businesses: Some existing homes and businesses may have been constructed with groundwater from foundation drain tile discharging to the sanitary sewer. If the connection of the foundation drain tile to the sanitary sewer pipe is on the exterior of the home, the connection will be considered grand-fathered and disconnection will not be required. If the connection of the foundation drain tile to the sanitary sewer pipe system is on the interior of the home or business, the connection is considered "not in compliance" and the owner is required to correct the improper connection. Any connection considered "not in compliance" shall abide by the sections contained in this ordinance.

SECTION V – SURCHARGE. A surcharge of One Hundred and 00/100 Dollars ($100.00) per month is hereby imposed on every sewer bill to property owners for the following conditions:

1.) not in compliance with this ordinance
2.) refusal of property inspection

SECTION VI- NON-PAYMENT OF SURCHARGE If the surcharge is not received by the _____, the Township or Borough reserves the right to assess the property owner the unpaid balance.

SECTION VII – EFFECTIVE DATE. This ordinance shall be in full force and effect from and after its passage and publication.

A MOTION WAS PASSED AND ADOPTED THIS _____ by the following vote:

YES:

NO:

Township or Borough SEAL:

_____ _____

Appendix B: Maps

Map List
(Map 1-4 Areas of Potential Disconnection and Infiltration)

Map 1 Cinnaminson Industrial
Map 2 Cinnaminson Commercial
Map 3 Moorestown Commercial
Map 4 Moorestown Industrial
Map 5 Pompeston Creek Detention/Retention Basins

LEGEND

- Watershed Boundary
- Municipalities
- Lakes
- Rivers & Streams
- Cinnaminson Industrial

MAP 1 - Cinnaminson Industrial

Pompeston Creek Regional Stormwater Management Plan

Data Source: NJDEP GIS Data CD-ROM, 1996

N
W E
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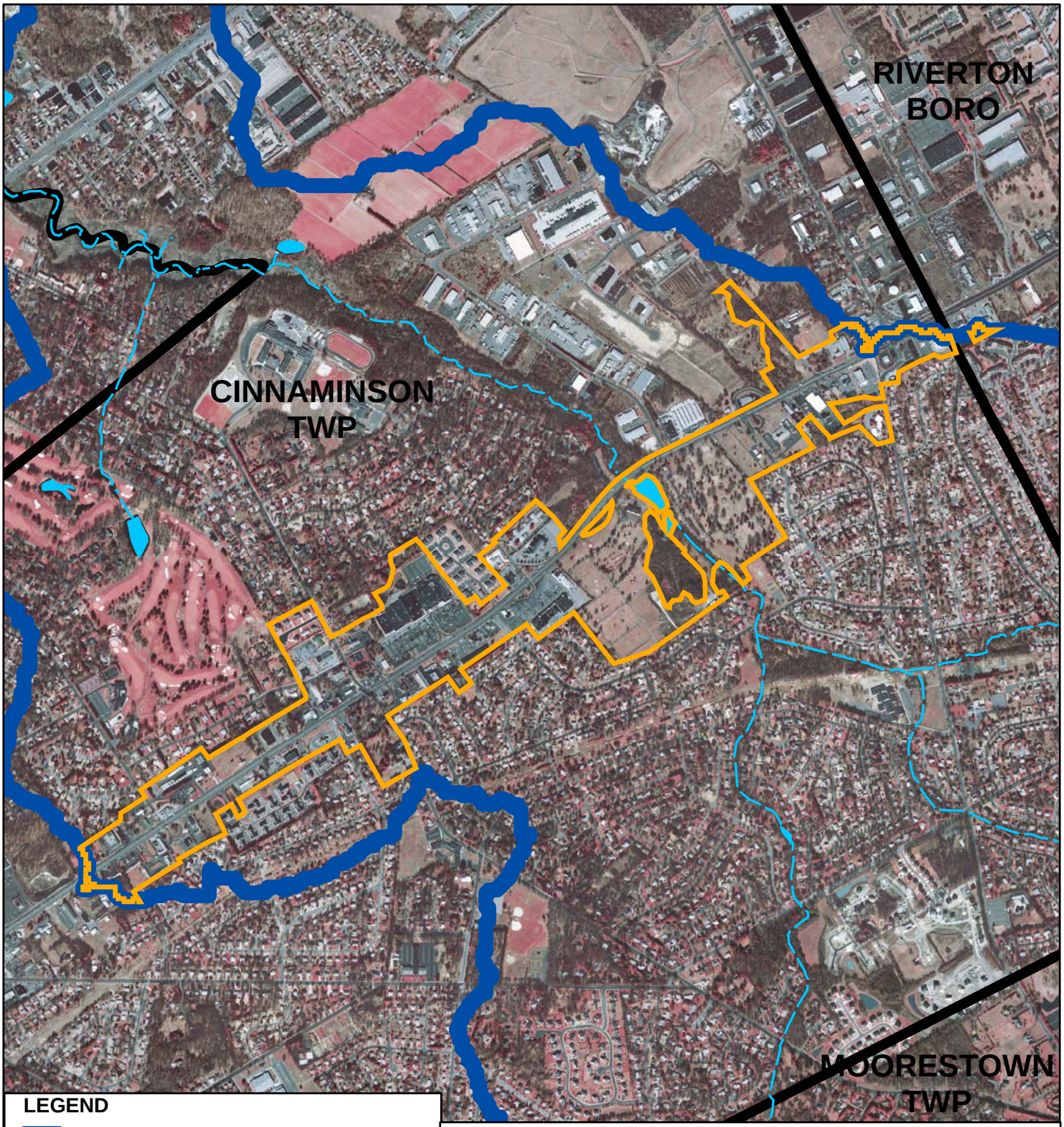
0 1,180 Feet

RUTGERS
New Jersey Agricultural Experiment Station

Rutgers University
RCRE Water Resources Program
14 College Farm Road
New Brunswick, NJ 08901
T: 732-932-9011
F: 732-932-8644



LEGEND

- Watershed Boundary
- Municipalities
- Lakes
- Rivers & Streams
- Ciniminson Commerical

MAP 2 - Cinnaminson Commerical

Pompeston Creek Regional Stormwater Management Plan

Data Source: NJDEP GIS Data CD-ROM, 1996

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Feet

RUTGERS
New Jersey Agricultural Experiment Station

Rutgers University
RCRE Water Resources Program
14 College Farm Road
New Brunswick, NJ 08901
T: 732-932-9011
F: 732-932-8644

LEGEND

- Watershed Boundary
- Municipalities
- Lakes
- Rivers & Streams
- Moorestown Commerical

MAP 3 - Moorestown Commerical

Pompeston Creek Regional Stormwater Management Plan

Data Source: NJDEP GIS Data CD-ROM, 1996

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RUTGERS
New Jersey Agricultural Experiment Station

Rutgers University
RCRE Water Resources Program
14 College Farm Road
New Brunswick, NJ 08901
T: 732-932-9011
F: 732-932-8644

LEGEND

- Watershed Boundary
- Municipalities
- Lakes
- Rivers & Streams
- Moorestown Industrial

MAP 4 - Moorestown Industrial

Pompeston Creek Regional Stormwater Management Plan

Data Source: NJDEP GIS Data CD-ROM, 1996

0 1,040 Feet

RUTGERS
New Jersey Agricultural Experiment Station

Rutgers University
RCRE Water Resources Program
14 College Farm Road
New Brunswick, NJ 08901
T: 732-932-9011
F: 732-932-8644

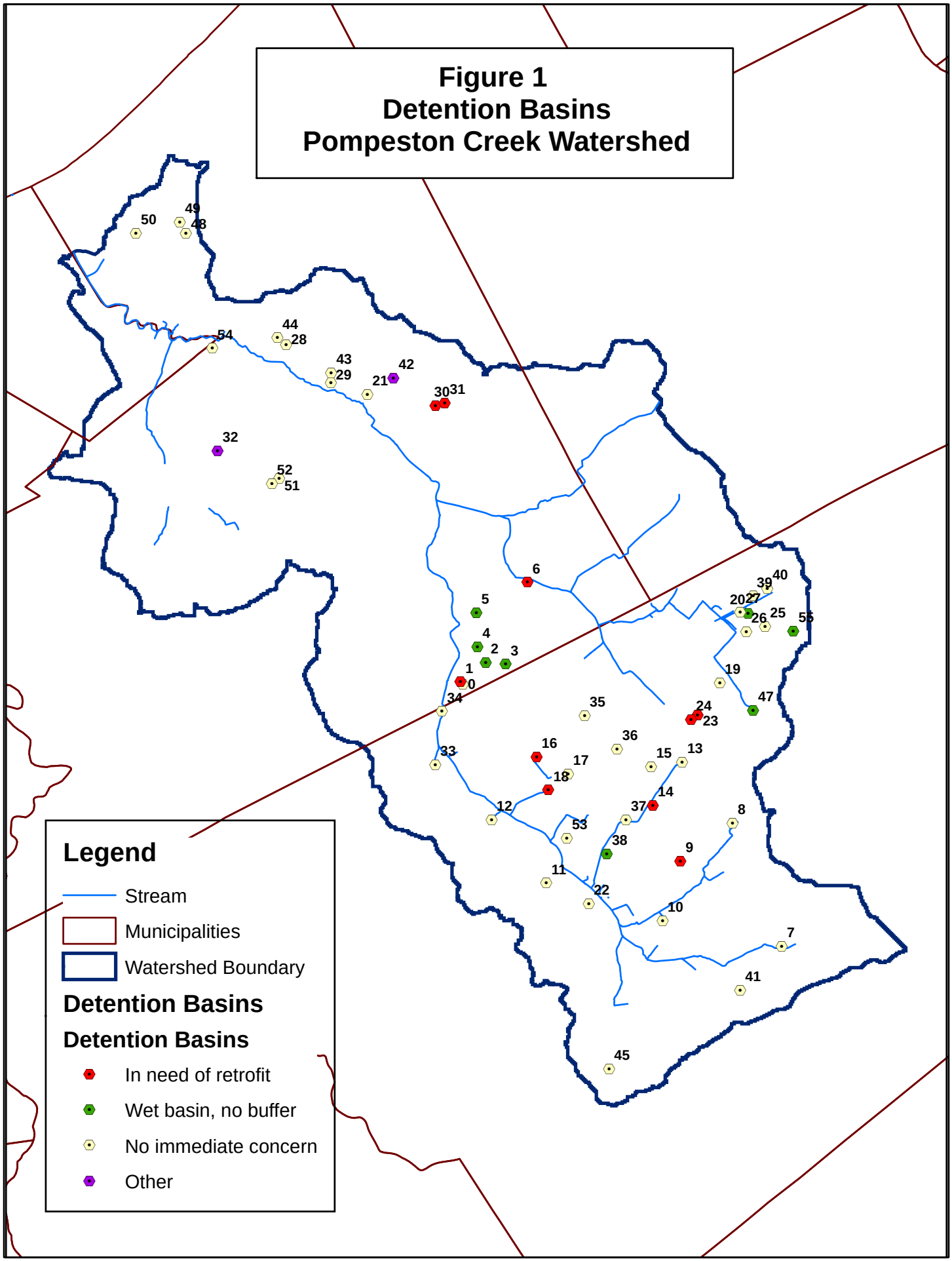
Figure 1
Detention Basins
Pompeston Creek Watershed
Legend
Stream
Municipalities
Watershed Boundary
Detention Basins
Detention Basins
In need of retrofit
Wet basin, no buffer
No immediate concern
Other

Appendix C: Engineering Drawings

Engineering Drawing 1: Rain Garden Retrofit at Wachovia
Engineering Drawing 2: Pervious Pavement Pheasant Run Parking Lot
Engineering Drawing 3: Rain Garden Program for Residential Community
Engineering Drawing 4: Stream Bank Stabilization
Engineering Drawing 5: Flooding on Waterford Drive
Engineering Drawing 6: Detention Basin Naturalization
Engineering Drawing 7: Underground Storage and Rain Garden Infiltration for Industrial sites
Engineering Drawing 8: Disconnection of Commercial and Public Parking Lots
Engineering Drawing 9: Vegetative Buffer along portions of a Stream
Engineering Drawing 10: Rain Gardens Retrofit at Residential Community
Engineering Drawing 11: Disconnection of Commercial Parking Lot
Engineering Drawing 12: High Density Residential Retrofit with Rain Gardens

These AutoCAD drawings are too large for this format and can be provided upon request. The full 36X24 Concept Plans can be viewed and printed from the website of the Rutgers Cooperative Extension Water Resources Program found at:
http://www.water.rutgers.edu/Projects/Pomp/Pomp.htm