Stormwater Utility Districts: 
A Sustainable and Equitable Way to Fund Stormwater Programs

By

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A MAJOR PAPER SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ENVIRONMENTAL SCIENCE
AND MANAGEMENT
UNIVERSITY OF RHODE ISLAND

May 5, 2011

MAJOR PAPER ADVISOR: Dr. Art Gold
MESM TRACK: Environmental Policy and Management
Acknowledgments:

I would like to acknowledge Dave Prescott from Save the Bay for his continued support during this project. I would also like to thank Dr. Art Gold for his thoughtful critiquing of this paper and his continued guidance throughout the process. I would like to acknowledge Dr. Pete August for his support and guidance during my time in the MESM program. I am also grateful for the support and feedback of my fellow MESM students. I would finally like to thank my wife Julie and my family for their input and unconditional support.
Introduction:

As both population and infrastructure in the United States grow, their impact on water quality also continues to become more relevant. One of the major sources of non-point source (NPS) pollution is stormwater. Stormwater is defined by the EPA as “precipitation from rain or snowmelt that flows over the ground.” (U.S. EPA, 2003) Rain that falls in a field or other non-developed area will be absorbed into the ground and replenish groundwater, be taken up by plants or simply evaporate. Water quality can be affected when rain water flows over the ground instead of being absorbed into it. This stormwater can carry with it toxins, sediments and nutrients harmful to both human health and the environment. These pollutants are generally picked up by the stormwater as it flows over impervious surfaces such as parking lots and roadways. The stormwater can then either absorb into the ground or continue as surface runoff. Stormwater absorbed into the ground can have harmful effects on groundwater and subsequently drinking water, especially in industrial areas. Stormwater that continues as surface runoff frequently enters storm sewers, the majority of which eventually discharge untreated into water bodies. Stormwater accumulates, transports and concentrates contaminants ranging from leaking motor oil left on roadways, to excess nutrients from pet waste and fertilizers, as well as harmful bacteria and industrial chemicals. Stormwater creates a “stew” of potentially harmful substances and deposits them in waterways and groundwater, some of the most vulnerable resources on the planet. (U.S. EPA, 2003; U.S. EPA, 2007; RI Stormwater Solutions, 2009)

Since stormwater originates as non-point source of pollution, it can be very difficult to monitor, reduce or eliminate. The United States government recognizes stormwater pollution as a major problem and has developed approaches to reduce its impact under the auspices of the Clean Water Act (U.S. EPA, 2011). The U.S. government generally requires state implementation of these efforts. In many cases the states have placed the implementation of these laws under the jurisdiction of
municipalities and communities in hopes to further tailor the regulations to the individual area. This has created widely irregular and inconsistent management efforts considering the different levels of regulation imposed by different municipalities and communities. Many municipalities and communities don’t have the resources to keep up with the ever growing stormwater problem. Without consistent federal funding and guidance; stormwater pollution continues to be a major problem. Finding a way to fund state or community wide stormwater programs has proved to be very difficult, especially now when most states face severe budgetary constraints. Funds are needed for everything from improved infrastructure to heightened community awareness and education. Finding steady funding for these issues is near impossible when relying strictly on federal funding and grants. Therefore finding a way for communities to fund their own stormwater projects is vital. (U.S. EPA, 2007; U.S. EPA, 2009)

Throughout the country, one successful approach to generate funding for stormwater issues has been through the implementation of stormwater utilities (Region 3 EPA, 2008). These utilities overcome problems related to inconsistent or one-time funding sources that are geared towards the types of continuous efforts required to address stormwater regulation and facilitate long-term improvements. Even the most modern stormwater elimination systems cost money to maintain and eventually need to be replaced. One-time funding sources can create important improvements but there is a need to assure a consistent revenue stream that can provide capital for stormwater projects now and into that future. There are over one thousand stormwater utilities currently in the United States and their success has lead to new utilities being generated throughout the country at an ever increasing rate. Though New England states have been slow to adopt the utility system, other parts of the country have had success. Creating stormwater utilities in Rhode Island could help the state significantly reduce it’s stormwater impact and create a sustainable funding source that could significantly help clean up our waterways and drinking water. This paper will examine the approaches available for Rhode Island
communities to create a mechanism to fund stormwater improvements and maintenance now and into the future. (U.S. EPA, 2009; National Academy Press, 2008)

**Background:**

As the United States population has grown and cities have expanded, stormwater has played a significant role in development. Before the federal Clean Water Act (CWA) of 1972, most stormwater issues were concerned with reducing flood risks to property and transportation networks. The Clean Water Act was the first national legislature that encompassed some aspects of stormwater quality, though the CWA was developed to mainly deal with point-source pollution. While stormwater pollution is primarily considered non-point source, the CWA did partially address the issue through programs directed at combined sewer overflows. Combined sewer overflows occur in many urban areas where sewage and storm water share conveyance systems. During dry periods the flows can be handled through wastewater treatment plants, but, during storm events, the added volume of stormwater overwhelms the capacity of wastewater treatment plants and can result in large discharges of untreated or partially treated wastewater in receiving waters. As combined sewer overflows were examined more closely during the 1970’s it became clear that much of the excess discharge was being generated by rain water flowing over the ever increasing impervious surfaces of the country’s expanding cities. As investments and improvement in point-source pollution discharge regulations became increasingly more strict, pollution levels in U.S. waterways were found to still be unacceptable in many locations. It was then determined that much of this pollution must be coming from contaminated runoff and actions must be taken to reduce this load. (U.S. EPA, 2003)

During the first fifteen years of the Clean Water Act, only point-source discharges required permitting from the Environmental Protection Agency (EPA) under the National Pollution Discharge
Elimination System (NPDES). As concerns over stormwater pollution mounted, Congress amended the CWA in 1987 to include industrial stormwater discharges and municipal separate storm sewer systems, known as “MS4s”. The amended CWA now includes stormwater from both point and non-point sources. The NPDES stormwater permitting system was implemented in two phases. Phase one required permitting of municipalities of 100,000 or more people, as well as industrial discharges and large construction sites. In 1991 these permits were first issued and the stormwater permitting system started to take effect. The two phase system was designed to first tackle the largest municipal areas to evaluate how this could improve water quality, and then expand regulations to include the stormwater discharges from smaller municipalities. Permits for phase two of the NPDES stormwater permitting system were first issued in 2003 and included all municipalities and small construction sites. (U.S. EPA, 2007; U.S. EPA, 2011)

Though the federal government oversees the NPDES permitting system, individual states are encouraged to customize the programs to their own stormwater needs. In creating their own system, states must comply with the overall NPDES regulations and meet the six minimum measures outlined in the system (U.S. EPA, 2011):

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

If a state’s NPDES permitting system meets these measures and all other overall federal regulations, they can customize this system to fit the conditions of their individual state. This customization allows the state to determine what level of regulation should be associated with each of the six minimum measures. This provides states with a NPDES permitting system that best fits their stormwater and overall water quality needs (U.S. EPA, 2011). The majority of states have taken this
approach to tailor measures to their specific geography, climate and proximity to water bodies. Under the NPDES system, permit holders are required to reduce stormwater pollution to the “maximum extent practicable.” The permitting process includes permit applicants submitting a notice of intent on how they plan to meet the six minimum measures and what Best Management Practices (BMPs) they plan to use to achieve that. These applications are then reviewed by the state and, if approved, permits are issued. (U.S. EPA, 2011)

The Total Maximum Daily Load (TMDL) program is another important piece of legislature that emerged from the CWA and looks at stormwater pollution from a different perspective. The TMDL program required states to inventory their water bodies and determine which ones are impaired. The TMDL program states that an impaired water body is one that cannot meet its specific use due to pollution. These uses are generally drinking, swimming, fishing and other recreation activities. When it is found that a water body is impaired, it is placed on a list of impaired waters (referred to as the 303(d) list), signifying a need for a reduction in pollution before it can be used for its specific use. Roughly forty percent of the nation’s water bodies are currently on this list, and the cause of impairment of forty percent of the water bodies on the list (16% of the total) can be attributed to stormwater pollution (U.S. EPA, 2011). Once a water body is placed on the 303(d) list, a specific TMDL is developed. TMDL programs are specific to whatever contaminant is responsible for the impaired state of the water body. Although many nonpoint sources of contamination, such as cropland, are beyond the scope of punitive approaches, stormwater is recognized as an important component to be controlled. Towns and cities must keep the discharge of the identified contaminant below the set TMDL level or face serious fines. In many cases capital campaigns and considerable infrastructure changes are required to meet these levels. Without consistent funding for stormwater issues it can be very difficult to make these changes. Often towns will borrow money to address these challenges but without consistent funding; maintenance, upkeep and addressing future issues can be very difficult. (U.S. EPA, 2011; U.S. EPA, 2011)
Recently, TMDLs have been approved that focus on controlling the extent of impervious cover rather than controlling inputs of a specific contaminant – a clear recognition of the link between storm water generation and receiving water quality. Impervious cover TMDLs can simplify the process but not having to address specific contaminants, just the means by which the contaminants are delivered. This type of TMDL is effective because of the clear relationship between stream health and impervious cover. For example, the Eagleville Brook in Connecticut has a impervious cover TMDL that’s goal is to reduce the impact of impervious cover to levels equivalent to twelve percent cover. Though the actually percentage of impervious cover may not reach twelve percent, the impacts of pollutants being generated by the impervious cover needs to reduced to that level. This has generated an emphasis on runoff volume reduction, creating a successfully customized TMDL for the Brook (Bellucci, 2010).

Though stormwater conveys non-point sources of pollution, the exact sources are not easily indentified, confounding source control efforts. Stormwater pollution can be reduced in two ways: decreasing the volume of stormwater and/or improving its quality. Reducing the volume of stormwater can be achieved by reducing the impervious surface or creating zones of high infiltration, such as rain gardens, bioretention basins and vegetated swales. The more opportunity the runoff is given to infiltrate into the soil, the less chance it has to transport harmful contaminants. Impervious surface can be reduced with modern paving techniques that allow water to pass through it instead of running off it. Also, runoff can be channeled into vegetated swales and rain gardens that help reduce the nutrient load of the water and promote absorption into the earth. The Green Infrastructure and Low Impact Development initiatives now gaining support throughout the county encompass a number of approaches that can reduce and treat stormwater. (U.S. EPA, 2007; RI DEM, 2005)

The quality of stormwater can be improved by capturing the runoff and treating it before it is discharged or absorbed into the groundwater. Most techniques recharge groundwater or are designed
to retard flow. Many techniques include elements that improve stormwater quality before it enters groundwater or surface waters. Roof runoff can be captured and stored in rain barrels and large cisterns providing water for irrigation of residential landscapes. In certain locations with severe water shortages, advanced systems are in place that capture, treat and reuse stormwater (Begum, 2008). Though treated stormwater can not be used for drinking purposes, there are many uses for this recycled water. Treated stormwater can be used to irrigate grass and plants that surround a business that produces large volumes of runoff. It can also be used to flush toilets and in fire suppression systems. It some cases power plants can use their runoff to help in cooling towers. These stormwater quality improvement techniques actually will reduce the overall water costs of the site, while at the same time reduce its environmental impact. With these added financial benefits, businesses and other facilities with a large volume of runoff have more of an incentive to improve the quality of their stormwater.

(U.S. EPA, 2007; RI DEM, 2005)

Although the benefits of reducing the quantity and improving the quality of stormwater are clear, generating the necessary funds for implementation can be very challenging. Since stormwater pollution is not often visible, gaining public and political support can be hard to achieve. Generally stormwater is low on the list of projects that receive funding out of a state’s general fund, especially with tightening budgets in tough economic times. Funding that does get used for improving stormwater quality and quantity is generally inconsistent and sporadic, making it very difficult to create a sustainable stormwater improvement program. (Benson, 1992; NAFSMA, 2011)

Relying on a state’s general fund to pay for stormwater projects can be extremely inconsistent from year to year and often leave a program with no funding at all. In many cases municipalities are forced to take out bonds and borrow money to fund stormwater infrastructure projects. This can leave the municipalities in debt and without a steady source of dedicated funding to repay these loans. Also,
stormwater management systems need upkeep and without a steady funding source the systems can deteriorate and become less productive. (Benson, 1992; NAFSMA, 2011)

One effective way to secure a steady stream of funding for reducing stormwater pollution is to have the property owners of a town or city pay for pollution abatement. The payment mechanisms and fairness of the approach warrants careful consideration (U.S. EPA, 2009). People are rarely in favor of new taxes, especially for an issue where there is limited public awareness of the personal and community benefits. Some municipalities increased the amount tax payers pay for domestic water use and apply the extra funds to finance stormwater projects (Benson, 1992). This is generally seen as unfair and unpopular amongst tax payers and has not withstood court challenges on the grounds that there is no clear link between household water use and the generation of stormwater (Benson, 1992). Water taken into a house is discharged into a municipal sewer or a septic tank where it does not cause any runoff. Stormwater is primarily generated from precipitation on impervious cover – which does not have a direct tie to the water pumped into a household. Though pegging these two fees together does generate funds for improving stormwater quality, many consider the approach unfair to property owners. (NAFSMA, 2011; Mulcahy, 2006)

As mentioned above, the amount of stormwater a property generates can be most closely linked to the amount of impervious surface on the property. Impervious surface is the amount of surface area on the property that is impenetrable to water. The most common impervious surface on a property is generally the roof of any buildings and any paved area such as driveways and parking lots. The more impervious surface on a property, the more runoff is created and the greater chance it has to accumulate and transport contaminants. Therefore an equitable way to determine a stormwater fee is to base it on the amount of impervious surface on a property. This can be a difficult task, but it has been proven to be a successful basis for funding stormwater utility district systems. Stormwater utility
districts have been implemented in over 1,200 locations throughout the United States and have become the most effective and equitable way to generate funding for stormwater projects. (U.S. EPA, 2003; Campbell, 2010)

**Stormwater Utility Districts**

The concept of a utility district has been in place in the United States for a long time, with the most common being for drinking water. Most property owners in America pay a monthly user fee for the amount of water consumed. This fee is not a tax and relates to the amount of household water used by the assessed property, though some commercial, high volume users get a reduced rate. This requires metering and data collection. A less expensive alternative would be to distribute the costs equally throughout all users or households regardless of their water consumption. Although far less expensive to implement, but it penalizes those who use less water and, in essence, rewards those who use more. The concept of a user fee levels the playing field and holds the user accountable for what they consume. (NAFSMA, 2011)

The concept of a stormwater utility works in a similar fashion to a consumption based strategy. The fee per household or property owner is related to the amount of stormwater their property generates based on attributes of each site such as impervious cover or the existence of runoff abatement structures. The benefit of this type of a utility fee structure is the equity it provides the user as well as an incentive to reduce. In the water district example, a household that conserves or uses less water will pay a lower fee. This incentive to reduce can be an important part of a stormwater utility, but it requires the use of approaches that calculate the amount of stormwater a property generates. With
water use or stormwater discharge, providing the user an incentive to reduce is important in distinguishing a utility fee from a tax. (National Academy Press, 2008)

Unlike a general tax fund, fees collected from a stormwater utility are only used to fund stormwater related projects. These include improving and maintaining existing infrastructure, building new infrastructure, public education, hiring staff dedicated solely to stormwater issues and policy, as well as enforcement and regulation. The National Association of Flood and Stormwater Management Agencies defines a stormwater utility as, “providing a vehicle for consolidating or coordinating responsibilities previously dispersed among several departments; generating funding that is adequate, stable, equitable and dedicated solely to the stormwater function; and developing programs that are comprehensive, cohesive and consistent year-to-year” (NAFSMA 2011). Having a reliable funding source means that long-term and multi-phased projects can be developed. In contrast to a utility if money from a general fund is used to finance stormwater projects, funds initially allocated to stormwater projects can be diverted to another department. A stormwater utility allows for more sustainable planning since other departments cannot use money left in the fund.

Though a utility seems like a logical choice as a means to generate consistent and sustainable funding for stormwater projects, developing and implementing a utility can be a difficult project. The utility must generate enough funds to support the necessary projects, be fair to property owners, withstand legal challenges and gain public support. Attaining these goals requires careful planning and implementation. The following are typical steps to create and implement a successful stormwater utility.

**Feasibility Study:**

A feasibility study is the first step in creating a stormwater utility. It addresses the needs of the municipality and the methods that will be taken to achieve desired outcomes. A municipality will
typically contract an experienced consulting firm to perform the study. Some municipalities have succeeded in creating a feasibility study in-house, but since many stormwater programs around the county are underfunded, this can be a difficult task. The data collection needed in a feasibility study alone can be costly and time consuming; especially considering typical stormwater programs have a limited full-time staff. Though hiring a consulting firm can be costly, it can be the most effective way to create a successful stormwater utility plan. In cases where there is no money available to hire a consulting firm, municipalities can borrow the money and incorporate paying the loan back into the future utility fees. A suitable and extensive feasibility study is essential to creating a properly functioning utility that meets the needs of the individual municipality. (Cyre, 2011) (Mulcahy, 2006)

If borrowing money is not an option and there are not enough funds available to hire a consulting firm, a utility can be implemented before all of its aspects are fully developed. In this situation, for the first year the utility can charge a flat fee to users and use the funds generated to hire a consulting firm to create a more equitable and customized structure to fit the individual municipality. Therefore year one of the process would have a very simplistic fee structure but this would allow a customized structure to be in place by year two. Finding the up-front funding to finance a feasibility study is extremely important because it will be the basis of the entire utility system and mistakes made in the feasibility study will be compounded later on the in the process. (Mulcahy 2006)

A feasibility study should examine the ability of the municipality to implement a stormwater utility from several different angles. The NAFSMA states that the “tracks” that need to be addressed when considering the implementation of a stormwater utility are: public, program, finance and database. (NAFSMA, 2006). The public track involves four phases; “planning the public involvement and information process; conducting the involvement and public education process; carrying out the implementation campaign; and monitoring utility implementation and customer service (NAFSMA, 2006).”
The creation of a citizen’s stakeholder group can help address these phases and go a long way towards improving public support for the utility. Providing reduced fees to school systems if they incorporate stormwater education into their curriculum can also help raise public awareness to student’s parents and the community in general. How to implement these credits will be discussed later in the paper.

The program track addresses whether the utility is realistic for the community, if property owners are willing to pay and if the utility meets the perceptions of the citizens. Making sure the utility is a good match for the community is vital to its eventual implementation.

The finance track addresses the legality of the utility as well as its equity for property owners, and whether it provides adequate funding for the stormwater program. Making sure the utility will not be the subject of considerable legal challenges and provides the necessary funding is important to address before implementation.

The database track addresses the validity of the data used to develop the utility and whether this data is legally accurate. It also considers the feasibility and costs of maintaining the database and the steps necessary to uphold database accuracy. Addressing all these “tracks” will help prepare the municipality for any issues that will come up in the actual implementation of the utility (NAFSMA, 2006; U.S. EPA, 2009).

It also needs to be determined if the creation of a stormwater utility is politically feasible. Does the state have legislature that would allow for the development of a utility? Is the political body of the town receptive to the idea of a stormwater utility? Without political support it will be very difficult to gain public support for the project. The feasibility study will also need to address the financial and technical aspects of the utility to see if it is viable within the municipality.

**Creating a Fee System:**
Developing a fee structure for a stormwater utility is a difficult process but is paramount in creating a successful utility. Fees that are set too low will not provide enough funding for stormwater projects and will not allow a stormwater program to be independent, which will defeat the point of the entire process. Fees that are set too high will have adverse reactions from property owners and reduce public support; no one wants to pay more than is necessary. Finding this balance is important in creating a successful utility. (U.S. EPA, 2009)

The most common fee system used in stormwater utilities around the country is based on the Equivalent Residential Unit (ERU). More than eighty percent of stormwater utilities use an ERU system because of its balance of equity and feasibility. The ERU system is based on the average amount of impervious surface of a single family residential home in a municipality or town. In an ideal world the impervious surface on every property would be determined and fees would be based on the exact amount of impervious surface a property contains or a true average of all properties in the municipality. Due to the time and cost of surveying the impervious surface of every property, it is more common to use a representative sample. Some stormwater utilities like Tampa, Florida actually do determine the impervious surface of every parcel in the city, but this was only possible after the utility was operational for several years and there were enough funds generated to finance the surveying. (U.S. EPA, 2009; Campbell, 2010)

Most municipalities generate an ERU by randomly selecting a sample of residential properties and determining their average impervious surface. The impervious surface of the selected sample properties is determined using Geographic Information System (GIS). Using GIS is very accurate, but is time consuming and expensive. An analyst has to trace the impervious surface of a property to determine the square footage that it contains. Typically the largest areas of impervious surface in a residential property are the roof and driveway or other paved areas. Once the sample properties are
mapped, an average impervious surface for residential properties in the municipality is determined. A 2010 Western Kentucky University survey sampled 572 utilities throughout the United States that used the ERU system and determined that the average ERU was 3,000 square feet, with a median of 2,700 square feet (Campbell, 2010). Some municipalities that do not have the resources to conduct GIS analysis instead chose to base stormwater fees on assessed property value. The Metropolitan Washington Council of Governments that oversees the stormwater fees for the Chesapeake Bay region does this for over half of its property owners due to feasibility considering assessed property value is already calculated for property tax use. Though implementing this system is less complicated and costly then the ERU system, it does not contain the same level of equity considering impervious cover is not considered. (Bonnaffon, 2011)

After the size of the ERU has been set, ERUs for commercial and non-single dwelling properties need to be developed. Determining commercial ERUs is very important since commercial properties typically contain far more impervious surface then residential properties do. To make sure these commercial properties are fairly charged for their stormwater discharges, all commercial and public properties are mapped using GIS to determine their exact amount of impervious surface. If the commercial property’s impervious surface exceeds that of one ERU then the property owner will be charged accordingly. For example, if a commercial property is determined to have 9,000 square feet of impervious surface and the municipalities ERU is set at 3,000 square feet, the commercial property owner will be charged three ERUs for every one ERU a residential property owner is charged. This allows for equity between residential and commercial property owners without overcomplicating the system. (U.S. EPA, 2009; Campbell, 2010)

An ERU formula for non-single family residences like multiple-family dwellings and apartments needs to be developed. Typically a percentage of an ERU is assigned to apartments based on how many
dwelling units there are in the building and the overall size of the building. A normal sized house that contains three apartments will carry a fee of 0.33 ERUs per apartment. A normal sized home serving as an apartment is determined by whether that house was originally determined to be a single property, not a commercial apartment building. Duplexes, condominiums and mobile homes can be broken down in the same fashion. Multiple-family houses or building that are owned by a single person and rented out will be charged based on their dwelling units and the overall size and impervious surface compared to a single-family residence. Determining these fees can be difficult and time consuming but will provide equity to residents and maximize the funds a utility can generate. (U.S. EPA, 2009)

Once the size of the ERU and the total number of ERUs in the municipality is determined, the fee associated with the ERU needs to be developed. To develop this fee a municipality first needs to determine the yearly budget required to support their stormwater needs. These needs include maintenance of existing infrastructure, creation of new infrastructure, community awareness, policy and legal issues, as well as monitoring and enforcement. The new infrastructure and maintenance costs are estimated by the engineering firm responsible for the design and installation of the stormwater infrastructure. Community awareness, policy and legal issue costs, as well as monitoring and enforcement are estimated by the municipality in conjunction with any firms hired to help develop community awareness. As discussed earlier, setting the correct budget is a delicate balance between not collecting enough funds to have an effective utility, and not overcharging property owners and creating negative public perception of the stormwater program. Once the yearly budget is set it can be divided by the total number of ERUs in the municipality giving the cost of a single ERU per year. Most municipalities then take the yearly fee and divide it into monthly fees. The Western Kentucky University survey of stormwater utilities throughout the United States determined the average monthly ERU fee to be $4.12 and the median to be $3.50 (Campbell, 2010). Once the size and fee for the ERU is set,
Property owners will begin to receive stormwater utility fees on their municipal bills, in a similar fashion to water and sewer charges.

**Credit System:**

A credit system is one way for a utility district to distinguish its fee from a tax. The credit system allows property owners to reduce their stormwater utility fee through improvements in stormwater quantity and quality on their property, as well as through investments in education and public awareness. Allowing property owners to apply for credits provides them with an incentive to improve their property’s stormwater impact while placing minimal stress on the municipality’s resources. Though approving credits for property owners reduces the amount of funding being generated by the utility, it does increase the quality and reduce the quantity of stormwater generated on the property, and therefore the town or city. These are improvements that are funded and implemented by the property owner, therefore the municipality in only responsible for funding the credit approval process and monitoring property owner’s compliance. In the end, the net gain of these improvements is in favor of both the municipality and the environment, while also raising public awareness about the utility and stormwater reduction in general. Implementing a credit system can be difficult but it is extremely beneficial to the public perception and credibility of the utility. (Reese, 2007; Doll, 1999)

The most common stormwater utility credits given out are for commercial properties. Commercial properties tend to generate the most stormwater and pay the highest fees. Typically credits are given out for reductions in stormwater quantity, though some municipalities provide credits for stormwater quality improvements. It is easier to estimate changes in stormwater quantity compared to quality. Quantity can be estimated by impervious surface and the overall number of ERUs a property contains, as well as the properties ability to retain and detain runoff. Measuring a property’s
stormwater quality can also be done by ascribing treatment levels to different types of structures.

Regardless of the contaminant concentration (mass per volume) of the stormwater, the overall contaminant loading (mass per time) of the discharge rises and falls with the quantity of the discharge. Some municipalities give up to a one hundred percent credit for stormwater quantity reductions, though typically credits range from fifteen to fifty percent. (Reese, 2007; U.S. EPA, 2009)

In some utilities commercial property approved for a stormwater quantity reduction credit, must prove that in a peak flow storm the runoff from the property is released at a lower rate than before the improvements were made. As an example, New Glarus, Wisconsin calculates the peak flow reductions by comparing the runoff flow before and after the improvements to get a percent change in stormwater peak flows. Though this calculation is also applicable to flood mitigation, it can be a simplistic look at a reduction in runoff volume. This percent change can then be multiplied by the number of ERUs that are applicable to that section of the property. For example, if the part of the property where the improvements were made was originally billed one hundred ERUs and it was determined that the onsite improvements reduced the runoff peak flows by twenty percent; the property owner would be given a twenty ERU credit. In the New Glarus example, the calculations are based on the one hundred year, twenty-four hour, SCS Type II distribution rainstorm of six inches. Using calculations based on peak storm events ensure even the heaviest storms will be covered in the calculations. (Village of New Glarus)

Stormwater quantity improvements can be made through various ways to retain or detain runoff from the property’s impervious surface. Stormwater detention systems usually have a detention pond or underground tank where runoff is stored during a heavy rain event (Scott, 1999). The detained runoff is later released at a slow rate during dry weather. Detention systems are designed to reduce the harmful effects of the volume and velocity of runoff during a heavy rain event. Stormwater retention
systems also store runoff in an underground tank but instead of slowly releasing the stormwater, it is allowed to infiltrate into the ground. Underground stormwater retention systems have permeable bottoms that allow the water to be slowly absorbed into the ground. Stormwater retention has the added benefits of using the soil to filter out potential contaminants in the water, but can only be used in areas where the soil allows for this level of infiltration. Choosing whether a retention or detention system is best for the site is very important and requires prior research of the hydrologic conditions of the soil. (U.S. EPA, 2010; RI DEM, 2005)

Though not as common, some municipalities provide stormwater credits for improvements in stormwater quality as well as quantity. There are many products and systems that are available to reduce the levels of contaminants and sediments in a property’s runoff. The most common are infiltration basins, infiltration strips, rain gardens and bioretention cells that rely on modifications to site drainage and soil enhancement. These systems retain stormwater and filter out contaminants as the water is absorbed into the soil. Rain gardens and bioretention cells also use native plants to absorb contaminants out of the water before it filters into the soil. Credits are also given for devices that remove sediments from stormwater before it is released off site. These products pass the runoff through a filter that removes sediments and debris before the stormwater is retained or discharged. Manufactured systems are available that serve as a component in storm drainage conveyance systems. These can also be equipped with an oil/water separator that will trap oil and grease present in the runoff. (U.S. EPA, 2010; RI DEM, 2005)

Each of these stormwater quality improvement systems can be assigned a treatment rating that is then used to provide property owners credits to reduce their stormwater utility fee. By combining multiple systems on a property the fee reductions credits can accumulate. As an example, New Glarus allows for up to a twenty percent reduction for infiltration systems (infiltration basins, rain gardens,
bioretention cells), a fifteen percents reduction for manufactured contaminate filtering systems and a ten percent reduction for oil/water separation systems. Outfitting a commercial property with multiple stormwater quality improvement systems, as well as quantity reductions systems, can lead to a considerable reduction in a property’s stormwater utility fees. (Village of New Glarus)

Schools, both public and private, are also candidates for stormwater credits both from infrastructure improvements and through educations credits. A utility may consider providing schools with education credits if they agree to include stormwater issues as part of their curriculum. Schools will benefit by reducing or eliminating their stormwater utility fees, while the utility will benefit from a better educated and conscious population. Educating students about stormwater issues in school increases the likelihood that they will attain a better understanding of the concepts during adulthood and will be more likely to use this knowledge on their own property. As an example, the New South Wales government in Australia has an elementary school stormwater education package called “Stormwater – Everyone’s Responsibility Everyday” that aims to raise awareness of stormwater issues at an early age. The goal of this program is to generate a population that is more informed of stormwater issues in the future (New South Wales Government, 2011). Indirectly this could lessen a municipality’s stormwater impact in the long run and reduce the amount of money that has to be put into public awareness. Though this would occur in the long run, there is potential for students to inform their parents of these issues and cause them to make more short term improvements. Overall, since public awareness is an important part of a stormwater utility, giving schools incentives to provide some of this awareness through education would reduce the amount of funds the utility would have to directly devote to this cause. (Doll, 1999; Reese, 2007)

Though not as prevalent as commercial credits, some utilities offer residential credits to homeowners. Like commercial credits, residential credits are provided to homeowners who reduce
their property’s stormwater impact. Residential credits are generally provided for a reduction in stormwater quantity since reductions in quality are too expensive and do not make a big enough impact on runoff from small residential parcels. Residential credits are most commonly related to the largest areas of impervious surface in a residential parcel, a house’s roof and the driveway. Roof improvements are typically related to the velocity and volume of water draining off the roof and through the gutters. The most common way to reduce the impact of roof runoff is to install a rain barrel. Rain barrels are used to collect a portion of the water that is running off the roof during a rain event. The barrels are connected to the houses gutter system and store the first flush water for lawn watering and other landscaping needs. The first flush of runoff often contains higher concentrations of contaminants such as feces from birds and squirrels. Rain barrels only make a modest impact on total water lost – a 55 gallon rain barrel only collects about 0.18” of rain from a 500 square foot roof. However, rain barrels are a tangible activity and can connect a property to stormwater abatement, much as recycling bins raised awareness of sustainable solid waste management during prior decades. Like commercial properties, installing rain gardens in areas of high runoff can also quality for credits. (U.S. EPA, 2010; Reese, 2007)

Unlike commercial credits, residential credits rarely are allowed to exceed a fifty percent reduction because inspection and enforcement of property improvements needs to be funded. Property owners must prove that they are properly installing and maintaining these improvements in order to get their application approved and renewed. This is typically done but sending a municipal employee out to the property to perform this inspection. Some municipalities like the city of Oshkosh, Wisconsin require extensive photographs of these systems to be included in the application as well as any manufacture’s literature if the system is store bought. These homeowners also face the threat of a random inspection to see if the system is in compliance. Though enforcement and regulation will use
funds, the overall reduction in stormwater impact should create a positive net result. (City of Oshkosh, WI, 2010)

Overall, having an equitable credit system that allows property owners to reduce their utility fee is vital to a successful stormwater utility. Using the credit system to provide incentive to property owners to lower their bill will also hopefully reduce long term stormwater abatement costs and raise public awareness. Though there are costs associated with monitoring and enforcement, the overall improved water quality resulting from property owners self-financed stormwater improvements should outweigh those costs. A utility system without the ability to apply for credits can look more like a tax and increase negative public reaction. Showing property owners that the utility fee is flexible and can be reduced will create a more equitable utility that has a far greater chance of success.

Implementing the Utility

Once the feasibility study, billing structure and credits system have been established, the last major hurdles is to implement the stormwater utility. Though much of the public will have become aware of the stormwater utility during the development process due to media coverage and word of mouth, it is vital to educate the public as much as possible during the implementation phase. Generally, considerable public backlash can occur when the first round of utility bills are sent out, particularly if property owners are unaware of the new fee on their utility bill. Creating a media campaign during the few months before the first bills are sent out can lessen the negative public reaction. Efforts are required to harness local television, print, radio and internet news outlets to assure that the first bill does not surprise residents. Some municipalities opt to hire a media consulting firm experienced with stormwater utilities to handle informing the public of the impending utility fee. These firms are experts
in reaching as many of the municipal residents as possible and highlighting the positive aspects of the new utility fee. (U.S. EPA, 2009; Mulcahy, 2006)

One of the major problems that municipalities face when implementing the utility is start up costs that accrue before the start of fee payments. Small loans or government funding are often used during start up. Before implementing the utility, the municipality should have a firm estimate of its funding stream. (U.S. EPA, 2009; Mulcahy, 2006)

When implementing the utility, start up costs need to include developing a system for answering the public’s questions should be created. A few months before the first bill is sent out, all municipal residents should receive a mailing that explains what the stormwater utility is and why it is being created. There should also be a link to a website created to explain all potential public issues more in-depth and contain a section of frequently asked questions that will clear up some of the public’s issues. The mailing should also contain a newly created toll-free hotline and email address to address public concerns not answered by the website. The more accessible the utility is, the more favorable the public reaction will be. Also, the longer the stormwater utility is in places, the more comfortable the public will be with it. Being prepared for the initial public reaction to the new fee is very important to the smooth implementation of the utility. (U.S. EPA, 2009)

Local politicians and decision makers need to be engaged and well-informed on all aspects of the utility. Creating a transparent process for the fee and credit structure is particularly important. The support of informed community leaders is a requisite for implementation. Since political tension is bound to occur, it is important to have community leaders champion the issue. Town hall-style meetings should be scheduled to permit the public to ask questions, express concerns and make recommendations directly to politicians and those who are responsible for the creation of the utility.
Keeping an open and honest dialog with public will make the implementation process as smooth as possible and will create the maximum amount of public support. (Campbell, 2010; Cyre, 2011)

Case Studies:

South Burlington, VT.

The stormwater utility district in South Burlington, Vt. was created in 2006 to combat the increasing runoff pollution issues facing the city. South Burlington contains five streams that are impaired by runoff pollution and have also battled phosphorus runoff into Lake Champlain, the primary source of drinking water for the Burlington area. The city has also had to deal with the issue of old failing septic systems that also add to the water pollution issues. Before the creation of the stormwater utility, the city had a hard time finding consistent funding to deal with these issues. Funding changed drastically from year to year, especially in the recent economic times. In order to deal with these stormwater issues properly, South Burlington became the first city or town in the state of Vermont to adopt a utility district for stormwater. (City of South Burlington website)

Since its implementation, the South Burlington stormwater utility district has been extremely successful. The city now funds its entire stormwater management program through the utility. The program has had a budget between $1.3 and $1.8 million dollars since the utility has been adopted and all of the funding has been brought in through stormwater utility fees. The utility is administered by the Municipal Stormwater Services Division and now has six full time employees dedicated strictly to stormwater issues. The utility has funded capital project construction, system maintenance, enforcement, as well as public outreach and education. (Dipietro, 2010) The utility is also responsible for financing many specific stormwater programs that have included:
- Catch basin cleaning: All 633 catch basins in South Burlington have now been cleaned at least once since the utility’s implementation. Additionally, all catch basins also have been digitally mapped.

- Street sweeping: The scope of the street sweeping program has been increased with stormwater utility funding and. Three hundred and seven cubic yards of sediment and debris was removed in 2010 alone.

- Stormwater treatment facility maintenance: The stormwater utility has taken over the maintenance of these facilities which were previously funded by inconsistent and dwindling grants from the American Recovery and Reinvestment Act. The utility also funds free tours of these facilities to increase public awareness.

- Discount rain barrel sales: In 2010 the utility sold 200 rain barrels to residents at a discount rate of $35.

- Free pet waste bags: The utility funded a program that gives out free pet waste bags to residents that renew their dog licenses. Over 19,000 were distributed in 2010 alone.

- Maintenance: The utility funds the maintenance of 112 miles of stormwater pipes and more than 5,000 storm drains.

- Stormwater Utility Website: The utility has created an extensive and informative website that explains how the utility works, how to apply for credits, what improvements the utility has completed to date, as well as general information on stormwater and water quality. (Dipietro, 2010)

The South Burlington stormwater utility district uses the ERU system to determine fees for its residents. The size of one ERU was determined by the average impervious surface of a sample of residential homes in the city. Through this process one ERU was determined to be 2,700 square feet. All single family residential properties are required to pay one ERU per month, while duplexes and triplexes are assessed 0.5 and 0.33 ERU’s respectively. All commercial buildings have their impervious surface mapped and pay accordingly. The charge for one ERU is $4.50. The South Burlington utility also offers an extensive credit program. Credits are approved for both commercial and residential properties that can demonstrate site alterations that reduce their properties’ stormwater impact. The application process involves an extensive description of the improvement to the property, including pictures and an
engineer’s certification for more extensive improvements. The utility also sends an employee to inspect the improvements and reserves the right to conduct additional inspections at any time. Credits are also given to public and private schools that educate their students about stormwater and water quality issues. They also offer credits to municipal separate storm sewer systems that include the Burlington International Airport, the University of Vermont and the Vermont Agency of Transportation. These municipal separate storm sewer systems are granted credits because of the runoff containment they provide. (Dipietro, 2010)

Overall the stormwater utility district in South Burlington has been very successful. It has made great strides in improving water quality in the city and has also gained the support of the residents. The utility plans to create a ballot measure for the creation of a Special Assessment District (SAD) for the funding of a stormwater improvement project for a specific location that suffers from periodic flooding, the Stonehedge neighborhood. Stonehedge’s existing runoff drainage systems are failing and in need of upgrading. The neighborhood is in desperate need of a stormwater treatment pond, bio-retention facilities, replacement of stormwater piping, and swale maintenance and improvement. The total cost of the project would be $933,000. This is more then the utility could devote to one neighborhood, so they utility district had to find a creative way to raise the funds. The Army Corp of Engineers agreed to pay for all but $245,000 of the project. The utility decided to raise the rest through the creation of a SAD. They feel this approach will be well received since public awareness about stormwater issues is high in this neighborhood and the area is relatively affluent. If the majority of neighborhood residents vote to approve the SAD, the residents would then pay out the $245,000 over a ten year period. This would increase yearly stormwater fees by $155.14 (or $12.93 a month) per home and would have no effect on stormwater fees outside of the neighborhood. If passed the SAD will serve as an example of how to fund additional, more costly projects that are of specific concern to residents of particular areas within a municipality. (Dipietro, 2011)
Overall the residents of South Burlington have embraced their stormwater utility district and all the work it has been doing. This utility, though relatively young, merits consideration as an example for municipalities that are looking for an example of a successful and equitable utility.

Newton, MA

The city of Newton, Massachusetts has a population of 82,000 people and is located west of the city of Boston. Newton consists mostly of high and medium density residential areas with some commercial and industrial land use. The city covers 18.1 square miles but also contains 11.5 miles of riverfront. Newton has five perennial streams and seventeen intermittent streams. The majority of runoff in the city eventually ends up in the Charles River. Newton has been faced with both rising water quality problems and aging city infrastructure. The city has been responsible for maintaining 12,750 catch basins and 320 miles of drainage pipe that were mostly constructed in the 1800s. As this infrastructure ages and water quality worsens, the city has come under increasing pressure to make improvements, yet there was insufficient funding to do so. In 2006 the city of Newton created a stormwater utility district to create a consistent funding source to improve infrastructure, reduce the pollutant load on the Charles River and improve the overall water quality in the area. (Charles River Watershed Association, 2007; City of Newton Public Works, 2011)

To create the utility, the city of Newton did a feasibility study to determine what the utility’s budget should be and what kind of fee structure should be used. It was determined that a yearly operating budget of $700,000 was needed and that a version of the ERU system would be the most equitable way to set user fees. The area for one ERU was determined by mapping the impervious surface of a sample of residential properties. The area for one ERU was determined to be 3,100 square feet. Since municipal funds in Newton were already stressed, there was not enough money to map the impervious surface of all commercial properties in the city, therefore like residential properties a sample
was used to estimate commercial impervious areas. This sampling showed that the average commercial property had six times as much impervious surface as the average residential property. Therefore all commercial properties were assessed six ERUs vs. one ERU for a residential property. The utility encompassed 23,762 residential and 848 commercial fee-paying parcels. To determine the fee rate the $700,000 budget was divided by the total number of ERUs; 23,762 for residential ERUs and 5,088 commercial ERUs (6 ERUs per commercial property). Therefore the total number of ERUs in Newton was 28,850. Dividing the $700,000 budget by the 28,850 ERUs yielded a per ERU fee of roughly $25 a year. This fee was added to the quarterly municipal bill at a charge of $6.25 for residential properties and $37.5 for commercial properties. (City of Newton Public Works, 2011)

The city of Newton also created a credit system to give both commercial and residential property owners an incentive to improve their properties stormwater impact. This fee abatement system offers credits for on-site stormwater management systems and stormwater quality treatment. Applications to the city must include design plans, pictures and engineering reports. An onsite inspection is required after the application is approved. Roof runoff capture and infiltration systems can bring up to a fifty percent reduction in stormwater utility fees. Driveway and parking lot runoff capture and infiltration can provide up to a fifty percent reduction for commercial properties and a twenty-five percent reduction for residential properties. Stormwater pre-treatment systems can reduce fees for both commercial and residential properties by up to twenty percent. The exact level of abatement is determined by the city during the application and inspection process. (Charles River Watershed Association, 2007; City of Newton Public Works, 2011)

Once the fee structure and credit system was determined, the city of Newton made an effort to increase public awareness of the utility. The issue was covered by the print and television media in the months before the first bills were issued. There were inserts placed in the utility bills informing customers of the stormwater utility fee to be included in upcoming bills. An informative website was
created to answer the most frequently asked questions and provided an email address for further questions and concerns. The utility was successfully enacted in 2006. Many improvements to the city’s infrastructure and water quality have been made since. (Charles River Watershed Association, 2007; City of Newton Public Works, 2011)

Though the Newton stormwater utility district has been successful, the city is now considering amending the rate structure to make it more equitable to residents. Since commercial properties are responsible for considerably more runoff pollution than residential properties and there are far fewer parcels, it was decided to collect site specific data on all commercial properties rather than billing them with a simple flat. The city is also trying to increase the stormwater budget from $700,000 to $1.1 million per year. The previous budget no longer covers all the city’s stormwater and water quality needs. The utility expects that individually mapping all commercial properties should bring in more revenue in the long run, though the act of mapping them will be costly in the short term. The structure of the utility is ever evolving and should be able to be adjusted as new issues emerge and the current system is evaluated. The city of Newton is a good example of how a utility need to be customized to meet the demands of a specific location and population. (Charles River Watershed Association, 2007; City of Newton Public Works, 2011)

**Rhode Island and Stormwater Utility Districts:**

Though there are over 1,200 stormwater utility districts operating in the United States, there are very few in New England and none in Rhode Island (Campbell, 2010). There is now increasing interest by municipalities to develop approaches to manage and fund stormwater improvements. Water quality is extremely important in Rhode Island. Most of Rhode Island’s population borders the coast of its tributaries. The historic settlement patterns have left the state with aging infrastructure and densely settled neighborhoods surrounding old mill developments. These conditions combine to create areas
with high impervious cover and adjacent to waterways. Rhode Island has more coastline as a percentage of total area than any other state. With all the industry and impervious surface surrounding the Bay, mitigating stormwater pollution is very important. Stormwater pollution in Rhode Island affects everything from the commercial shellfishing industry within Narragansett Bay to drinking water sources inland. Also, stormwater degrades the recreational values, habitats and organisms of the state’s ponds and streams. The tourism industry has long been affected by beach closures resulting from high bacteria counts caused by runoff from heavy rain events. Rhode Island could greatly benefit from a steady funding source to help reduce the impact of this pollution.

Though there are no stormwater utility districts in Rhode Island, the state has been working to improve water quality. This is highlighted by the massive, recently completed Combined Sewer Overflow (CSO) project in Providence. Previously, during a heavy rain event the majority of runoff that entered city storm drains was jettisoned directly into Narragansett Bay since the wastewater treatment plant could not handle the high volume of water. The large Combined Sewer Overflow tank that was built underneath the city can now store runoff from heavy rain events and slowly pump it through the wastewater treatment plant during dry weather times. This project will save millions of gallons of contaminated runoff from being released directly into Narragansett Bay and could possibly save the shellfish industry that has been severally limited by contamination from runoff. (Narragansett Bay Commission, 2011)

Currently stormwater related issues and problems are being funded by the state’s general fund and through special grants and bonds. These revenue streams are not steady or secure. In 2010 the Rhode Island Department of Environmental Management awarded $745,700 in federal Clean Water Act grants for water quality improvements throughout the state. The funds were divided amongst six projects state wide with individual funding ranging from $265,000 for the design and construction of a gravel wet vegetated treatment system for stormwater treatment from Two Mile Corner in Middletown,
to $25,711 for the city of Warwick to connect Fire Station #5 to the public sewer system after their onsite wastewater treatment system failed. Though this may seem like substantial funding, the results are piecemeal and do not result in a comprehensive approach. A stormwater utility could bring in considerable more. For instance the city of South Burlington brings in over a million dollars a year just for city stormwater projects, more than all the Clean Water Act grants for the entire state of Rhode Island. If stormwater utilities were able to improve stormwater issues, these federal Clean Water Act grants could be used for other non-point source water quality issues, thereby extending the reach of these funds. Also, only six of the thirty-six applications were awarded funding, showing the limits of these funds. (RI DEM 2010)

In an attempt to give towns and cities authority to manage their own stormwater issues and projects, the state passed the Rhode Island Stormwater Management and Utilities District Act of 2002 (SWM Act). This legislature clearly states that individual towns and cities can enact stormwater utilities to generate funds for stormwater projects. The Declaration of Purpose section of the legislation states that, “the purpose of this chapter is to authorize the cities and towns of the state to adopt ordinances creating stormwater management and utility districts (SMUD), the boundaries of which may include all or part of a city or town, as specified by such ordinance. Such ordinances shall be designated to eliminate and prevent the contamination of the state's waters and to operate and maintain existing stormwater conveyance systems.” Therefore a town or city that needs consistent stormwater funding could enact a utility district to do so. The legislation gives the power to create these utility districts to city or town councils of any city or town within the state. The utility districts can also only occupy certain sections of cities and towns if the city or town councils feel that is the most effective method of implementation (SWM act, 2002). The legislation also states that a stormwater utility district will have the power to issue ordinances such as:

- establish a fee system;
- prepare long range stormwater management master plans;
- retrofit existing structures to improve water quality or alleviate downstream flooding or erosion;
- properly maintain existing structures within the district;
- borrow for capital improvement projects by issuing bonds or notes of the city or town;
- hire personnel to carry out the functions of the districts;
- receive grants or funding from state and federal water quality programs. (SWM act 2002)

Since the legality of creating stormwater utility districts in Rhode Island has already been handled by this legislation, enacting one should not be too difficult a proposition. Rhode Island’s population is generally receptive to environmental issues. Stormwater utility districts within Rhode Island might be piloted within coastal communities that have seen degradation of coastal waters in recent years. Once one utility district is created and functioning, it can serve as an example to the rest of the state and show what kind of progress could be made towards limiting runoff pollution when a steady, equitable funding source exists.

One of the most costly aspects of developing a stormwater utility district is the digital mapping of impervious cover throughout the state, something that has already been accomplished in Rhode Island. The Rhode Island Geographic Information System (RIGIS), “a consortium of government and private organizations employing computer and communications technology to manage and use a collective database of comprehensive geographically related information (Rhode Island Geographic Information System, 2011)”, has already created a statewide, seamless digital dataset of impervious cover. The dataset was created in 2006-2007 using 2003-2004 scanned orthorectified imagery and has a spatial resolution of two feet. This dataset could be used as the basis of an ERU utility fee system for Rhode Island. Since the mapping is done, determining the average impervious cover for residential
properties would be a much more simple task then if impervious cover data was not available for the state. Having this dataset available makes the implementation of a stormwater utility in Rhode Island considerably more realistic. (Rhode Island Geographic Information System, 2011)

Feasibility studies have been done for the Town of Narragansett and the waterfront area of East Providence. Both studies stated that a stormwater utility district would be feasible and would generate the critical funding the towns need. Unfortunately beyond the feasibility studies, no further action has taken place and it has been over five years (Fuss and O’Neill, 2006; Mulcahy, 2006). Though creating a stormwater utility would require considerable legwork, including the possibility of taking out a loan and a campaign to gain public approval; the benefits would far outweigh these initial costs. A utility district, based on the Rhode Island Stormwater Management and Utilities District Act of 2002 would allow Rhode Island towns and cities to create equitable, long term stormwater and runoff pollution plans that would make a considerable difference in water quality throughout the state.

**Concluding remarks:**

In order for Rhode Island to address the problem of stormwater pollution it needs to find a reliable, long term source of funding. Stormwater utility districts could provide this funding source. They would give Rhode Island the ability to undertake long term projects that would make a considerable difference in water quality in the state. Not having to compete for scarce grants against all types of non-point source water quality issues would enable a much more sustainable stormwater program that would have the resources to produce results throughout the state. Though implementing a stormwater utility can require considerable effort, the ground work is already in place for the state. (RI SWM Act, 2002; Mulcahy, 2006; RI DEM Office of Water Resources, 2011)
Appendix – Helpful Websites for Rhode Island Towns Considering Stormwater Utility Districts:

Examples of Stormwater Utility Websites in the United States:


Examples of Stormwater Credit Manuals:

- Lake County Ohio -
  http://www.lakecountyohio.gov/LinkClick.aspx?fileticket=FCSjt3%2bmIeM%3d&tabid=1155
- New Glarus, WI. -
- Oshkosh, WI-
  http://www.ci.oshkosh.wi.us/Public_Works/Storm_Water_Utility/assets/pdf/Residential_Credit_Policy_and_Application_2010.pdf

Environmental Protection Agency Guidance Documents:

- Funding Stormwater Programs -
  http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/FundingStormwater.pdf
- Stormwater Best Management Practices -
  http://www.epa.gov/piedpage/pdf/sg_stormwater_BMP.pdf
- After the Storm - http://www.epa.gov/weatherchannel/stormwater.html
- Fact Sheet: Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices -
  http://www.epa.gov/owow/nps/lid/costs07/factsheet.html
- Laws and Regulations: Summery of the Clean Water Act -
  http://www.epa.gov/lawsregs/laws/cwa.html
- National Pollutant Discharge Elimination System (NPDES): Stormwater Frequently Asked Questions -
  http://cfpub.epa.gov/npdes/faqs.cfm?program_id=6
- Stormwater Outreach Materials and Reference Documents -
  http://cfpub.epa.gov/npdes/stormwatermonth.cfm

Public Information and Outreach Documents:

- Sample Public Outreach Door Hanger -
  http://www.epa.gov/npdes/pubs/after_the_storm.pdf
- Public information document for the South Burlington Utility -
- Sample Frequently Asked Questions (FAQ) for the Palm Bay, FL Utility -

Rhode Island Specific Documents:

- RI DEM RIPDES Stormwater Program -
- RI DEM Nonpoint Source Funding -
  http://www.dem.ri.gov/programs/benviron/water/finance/non/index.htm
- RI DEM Urban Environmental Design Manual -
  http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/urbman
- Rhode Island Stormwater Management and Utility District Act of 2002 -
  http://www.rilin.state.ri.us/Billtext/BillText02/HouseText02/H7327.pdf
- Rhode Island Geographic Information Systems (RIGIS) Website -
  http://www.edc.uri.edu/rigis/
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http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/listing.cfm

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http://www.epa.gov/lawsregs/laws/cwa.html

http://cfpub.epa.gov/npdes/home.cfm?program_id=6


http://cfpub.epa.gov/npdes/faqs.cfm?program_id=6