Stormwater Financing/Utility Starter Kit

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Prepared for:

The 101 Cities and Towns of Greater Boston

DRAFT
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Stormwater Financing Toolkit: Overview

Stormwater management is a growing challenge for local governments. Municipalities must develop approaches that protect and enhance their water resources while also managing engineered systems to handle precipitation. These approaches to addressing stormwater impacts such as flooding and degradation of water bodies require a stable, long-term funding source.

The purpose of this Stormwater Financing/Utility Starter Kit is to provide municipal officials with the critical background information and tools required to establish a drainage fee and potentially a stormwater utility structure. The Kit provides a brief overview of the impacts of polluted stormwater, and the importance and establishment of this funding mechanism. The Kit is then broken down into discrete modules that municipal officials can reference independently, depending upon their needs:

- Module 1. Financing Options
- Module 2. Developing Rates
- Module 3. Administration Options
- Module 4. Public Education and Outreach Programming

Who?

The Metropolitan Area Planning Council (MAPC)'s Environmental Division provides technical assistance and policy guidance to the 101 municipalities within the Metropolitan Boston Region on a wide range of environmental issues, including non-point source pollution and stormwater management, water resources planning and policy, brownfields assessment, coastal and ocean resources, land conservation and open space planning, and climate change. MAPC has been working with our communities on nonpoint source pollution for decades and has participated on numerous water-related boards and committees, including the Massachusetts Low impact Development Working Group and the Massachusetts Water Infrastructure Finance Commission.

It has become evident that communities continue to struggle to bear the burden of the significant and increasing costs associated with stormwater management. Ultimately, however, nonpoint source pollution is everyone's responsibility: owners or renters of property with impervious surfaces (rooftops, driveways, walkways, and roadways), truck or automobile drivers, and municipalities that own and maintain impervious surfaces. That is why MAPC's approach includes municipal financing strategies as well as public outreach and education.

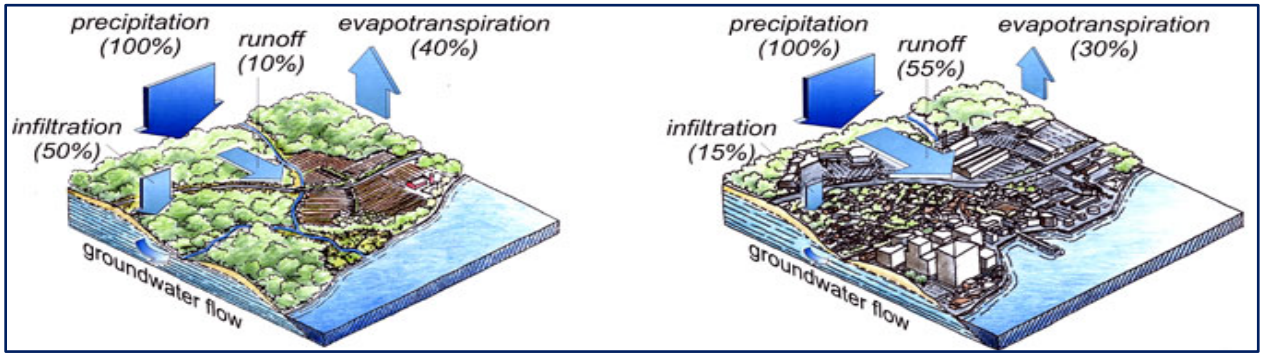
What/When?

Stormwater is the term used for describing the occurrence of rain or snow falling on an impervious surface that "runs off" across these surfaces instead of seeping into the ground. Typically stormwater is collected and conveyed through an engineered drainage system to ultimately

discharge to a nearby water body. Normally, in undeveloped areas, rain or melted snow infiltrates into the ground, allowing for recharge and filtering. However, as more of the landscape is covered with impervious surfaces that prevent these processes, stormwater has become an issue that increasingly affects people's lives and the environment through impacts on a community's water quality and quantity.

The images below show the difference between the natural water cycle where precipitation primarily infiltrates the ground with limited runoff, versus the water cycle in a developed area where impervious surfaces prohibit precipitation from infiltrating, thereby; creating a large amount of runoff – stormwater – that is typically treated like waste in an urbanized area and discharged away from the watershed.

Figure O.1. Natural Water Cycle versus Developed Area



It should be noted that Massachusetts has a high annual rainfall measurement, as compared to other states. Annual precipitation averages about 45 inches, the 12th highest in the nation, and is fairly evenly distributed throughout the state. Average annual evaporation from open water surfaces ranges from about 26 inches in Western Massachusetts to about 28 inches in the eastern half of the state. Yearly runoff ranges from about 20 inches in Cape Cod to about 32 inches in the northwestern corner of the state. The lowest runoff generally occurs during July, August and September, when evaporation rates are high. Runoff is highest in March in the eastern sections of the state and April in the western sections and at higher elevations, when evaporation rates are low and snow melt augments runoff from precipitation.

Nonpoint source pollution (NPS) occurs when rainfall or snowfall accumulates on impervious surfaces and then runs off these surfaces, carrying pollutants that have been deposited on them, eventually discharging them into surface water bodies (lakes, rivers, wetlands, and estuaries) and ground water. Unlike pollution from industrial and sewage treatment plants, NPS pollution comes from many diffuse sources, including various land uses and human activities (see Table 0-1).

Impervious surfaces are impenetrable, thereby not allowing water to infiltrate into the natural ground below. These include soils compacted by urban development, rooftops, roads, sidewalks, driveways and parking lots. Reducing infiltration of stormwater results in less recharge of the underlying groundwater aquifer, which in turn can lead to reduced streamflows within a watershed. For communities that rely on groundwater for their public water supply, this can also result in lower yields from their wells, as well as impacts on fisheries and other aquatic habitat.

Table O.1. Major Pollutants in Stormwater

Source	Major Pollutants
Public Infrastructure	Bacteria, metals, nitrogen, organics, petroleum products, phosphorus
Pavement Maintenance	Petroleum derivates from asphalt, temperature modification
Pavement Deicing	Chlorides, sediments, cyanide, sulfates
Transportation Vehicles	Fine particles, metals, petroleum products such as oil, grease, and PAH
Residential Activities	Bacteria, pesticides/herbicides, nitrogen, petroleum products, phosphorus, metals
Building Exteriors	Metals (chipped /eroded paints, corrosion of surfaces)
Development	Cement, concrete, high pH, metals, particulate matter, petroleum products, phosphorus
Landscape maintenance	Pesticides/herbicides, humic organics, nitrogen, phosphorus; litter (cans, food, paper, plastics; leaves and yard debris)
Pet Waste	Bacteria, nitrogen, phosphorus

In addition to nonpoint source pollution, increasing the velocity, volume and timing of runoff via hydromodification creates tremendous problems for both municipalities and the natural environment such as extreme flooding, and stream channel instability and streambank or shoreline erosion. As shown in Figure O.2., hydromodification practices include:

- Development of impervious surfaces (asphalt, concrete, most buildings, etc.);
- Deforestation or removal of vegetation;
- Construction of water conveyance structures (channels/ditches, levees, dams); and
- Dredging and/or filling of natural land contours for the purposes of new development (including transportation and other infrastructure) or navigation.

Figure O.2. Hydromodification Examples (Clockwise: Impervious/Deforestation, Ditch, Levee)

Stormwater Utilities versus Fee Structure

The term stormwater utility has been used throughout the country to describe the concept of an administrative entity created to implement a service fee to cover the cost of stormwater management. However, it is important to distinguish that a service or drainage fee can be

implemented in the absence of a stormwater utility. A stormwater utility is a public utility that is very similar in structure to a water/sewer utility that has fulltime staff (superintendent, engineers, administrators, etc.), and that is established to operate and manage a municipality's water/wastewater system. Most importantly, it is an entity that can efficiently manage a service fee and the municipal stormwater system for all residents' and business' benefit. In addition, with increased flooding from changing climate conditions, a stormwater utility can work to protect a community from water related disasters.

There are a number of options, such as general fund allocations and grants, for funding stormwater management projects and programs. However, these are not long-term, sustainable sources of funding. Although this Kit discusses all funding options, our primary recommendation is for municipalities to consider implementing a drainage fee under the administrative set-up of a stormwater utility, which has been found to be the most reliable, effective long-term operation.

Originally implemented by large urban municipalities in the 1970s as an experimental way of funding flood control measures, stormwater utilities have become increasingly popular and effective methods for cities and towns to finance drainage and flooding projects in their communities. Stormwater utilities have proven to provide a stable and equitable source of financing for stormwater programs, which have regularly received short shrift under General Fund allocations.

Instituting the Legal Framework

The first question raised in determining whether a drainage fee and/or utility are viable options is always: "is it legal?" In Massachusetts (and in most all states in the U.S.) municipalities have been granted the authority by state legislation to establish a stormwater fee system/utility. There are state laws that allow a municipality to charge utility fees and grant authority to manage stormwater, just as utility fees are charged for managing and providing drinking water, sewering, and other public services. Massachusetts General Law (MGL) Chapter 40 Section 1A defines the word "district" as "a fire, water, sewer, water pollution abatement…or any other district" formed for the purpose of carrying out any town/city functions allowed under Chapter 40. MGL Chapter 40A Section 5 describes the procedures for approval of zoning, ordinances, and regulations at the local level. Local stormwater regulations can be revised or added in order to authorize a drainage fee and/or utility. It should be noted that changes to a local bylaw (town) or ordinance (city) require a 2/3 majority vote of approval at special or annual town meeting or a 2/3 majority approval by city council and the mayor, respectively. MGL Chapter 83, Section 16 is one of the most critical pieces of legislation in terms of drainage fees, since it authorizes localities to charge fees and develop a utility to support stormwater management activities. Lastly, MGL Chapter 44, Section 53F ½ is also critical since it allows for the establishment of a separate account called an "Enterprise Fund" for the fees and also for utility operation. (The concept of an Enterprise Fund will be discussed in further detail in Section II: Funding Options.)

There are a number of strategies commonly used to formulate equitable fee structures for stormwater utilities. Typically, the utility fee is based on the amount of runoff produced solely by a property's impervious surfaces. Under this model, impervious surface area is calculated statistically based on median impervious areas for different land use types. According to the Natural Resources Defense Council, case law suggests that "a rate will be deemed valid where the:

- Revenue generated benefits for the payers, primarily even if not exclusively;
- Revenue is only used for the projects for which it was generated;
- Revenue generated does not exceed the costs of the projects; and

- Rate is uniformly applied among similarly situated (from a runoff view point) residents."

Municipalities may allow rates that generate surplus funds, as long as the excess money is not diverted for other purposes.

Drainage fees can be levied for any user of a municipal (or regional) stormwater system. Fees can apply for an entire community, if the municipal system covers the whole land area, or only to a portion of the municipality, as long as the rate structure (charges to consumers, often by type) is equitable.

Where?

Stormwater occurs in all developed land areas when precipitation (rain or snow) accumulates. Stormwater is especially prevalent in urbanized areas. The U.S. Environmental Protection Agency (EPA) defines urbanized areas as:

> "Land areas comprising one or more places, and the adjacent densely settled surrounding area that together has a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile."

However, most Massachusetts municipalities must address stormwater management, as authorized under the Clean Water Act Section 402: National Pollutant Discharge Elimination System (NPDES).

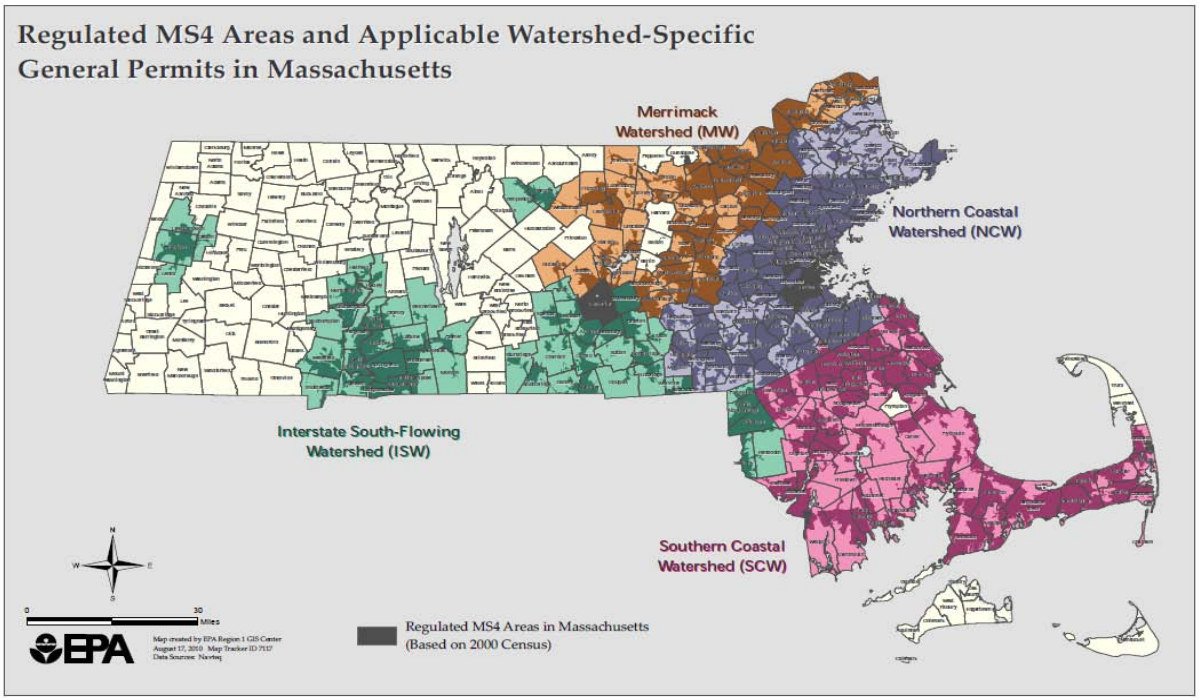
The NPDES program splits permitting into two phases:

- Phase I requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges (in Massachusetts, this applies to Worcester and Boston); and
- Phase II requires regulated small Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas to obtain NPDES permit coverage for their stormwater discharges.

An MS4 is defined by EPA as a storm sewer (stormwater) system that is: 1) owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.; 2) used to collect or convey stormwater (i.e. storm drains, pipes, ditches, etc.); and 3) not a combined sewer system or part of a Publicly Owned Treatment Works (sewage treatment plant).

As shown in Figure 0.3., all but one of the communities within the MAPC Region are included under one of the Commonwealth's MS4 permits, which are grouped into four watershed areas: the Northern Coastal Watershed and the Merrimack, Southern Coastal, and Inter-State Watersheds.

Figure O.3. Regulated MS4 Areas



Why?

The rapid growth and development of many towns and communities throughout the Commonwealth has begun to significantly impact the efficacy and safety of stormwater infrastructures. As additional land is developed and covered with impervious surfaces such as roads, sidewalks, and rooftops, the volume and rate of stormwater runoff generated is increasing faster than existing stormwater facilities and rivers and streams can handle, often causing increased flooding, bank erosion, and scouring. According to a 2007 study by the Oregon Environmental Council; one acre of paved parking space creates sixteen times the runoff for a meadow of the same size.

Environmental Impacts of Untreated Stormwater

Stormwater is the leading source of water quality and quantity problems in the nation and in Massachusetts. Nonpoint source pollution related to stormwater occurs in every Massachusetts community causing great detriment to our surface water bodies and ground water supply. According to the *Final Massachusetts Year 2010 Integrated List of Waters*, approximately 60% of our surface water bodies do not meet Clean Water Act or Massachusetts Surface Water Quality standards. Polluted stormwater entering into our water bodies creates contaminated shellfish beds, causes beach closures, eutrophic conditions, and habitat loss. Polluted stormwater that infiltrates to groundwater can also contaminate drinking water sources. Stormwater management facilities that are not sized for flood conditions create a public health and safety hazard as well as an additional cost burden on the municipality. In addition, treating stormwater as "waste" and sending it away significantly alters the local hydrologic cycle, causing low-flow conditions in vulnerable watersheds.

Figure O.4 Natural Resource Impacts from Stormwater Pollution

Figure O.5. Human/Economic Impacts from Stormwater Pollution

Although the economic and public health and safely costs to society are often difficult to quantify, a study completed by Dodds in 2009[1] determined that the economic impacts of human-induced eutrophication due to stormwater nutrient pollution on US freshwaters were approximately $2.2 billion lost annually in recreational usage, waterfront property values, water treatment costs, and spending on the recovery of threatened and endangered species.

Climate change conditions have added an extra level of complexity to stormwater management that is critical for municipalities to consider. Climate change in coastal communities, primarily in the manifestation of sea-level rise and increased storm surge, results in increased coastal flooding and infrastructure damage. Inland communities have been experiencing more severe flood conditions due to increased intensity and frequency of storms, primarily in developed areas where inadequately sized stormwater management facilities are located. A municipality's sewer system may suffer increased inflow and infiltration during extended periods of flooding and high groundwater, overloading sewers, sewage pump stations, and treatment plants. Creating more natural, off-line stormwater systems designed to reduce velocity and peak-flow of a system (e.g. bioretention, and constructed wetlands) and/or retrofitting existing facilities to provide additional flood retention involves costs for which municipalities may not have the funding in the absence of a drainage fee.

Municipal Benefits

There are a number of benefits to municipalities from the establishment of a drainage fee or stormwater utility. First and foremost, establishing a drainage fee creates a collective responsibility for a community's water quality protection. The collective responsibility is logical, as all residents, property owners, businesses, and institutions with impervious surfaces on their properties are responsible for the creation of stormwater. Municipalities can also include tax-exempt properties to increase the number of properties contributing to the fund. In addition, depending upon their land management practices, nonprofit property owners could very well also be responsible for associated nonpoint source pollution in stormwater. Therefore, establishing a drainage fee system creates a mechanism by which municipalities can collect funds to use for stormwater management and water quality protection/improvements. Other municipal benefits include:

- A dedicated funding source: revenue generated by a stormwater utility can be used as a new, dedicated source of funds to supplement or replace the community's current stormwater management funding, enabling tax-based funding to be used for other community needs.
- Sustainable revenue: revenue generated by a drainage fee/stormwater utility is based on user fees and provides a constant, sustainable funding source that increases with the community's growth. Sustainable funding allows municipal stormwater programs to operate on a stable basis to support staff and equipment needs, maintain existing infrastructure, and adopt long-term planning for capital investments, maintenance enhancement, and staff development.
- Improved watershed stewardship: Through incentive programs that reduce user fees, a drainage fee/stormwater utility encourages better stormwater management, such as the use of low impact development practices (LID).
- Facilitation of National Pollutant Discharge Elimination System (NPDES) Compliance: Communities with an established drainage fee and/or stormwater utility will be more readily

[1] Dodds, Walter K. et al. Eutrophication of U.S. Freshwaters: Analysis of Potential Economic Damages. *Environ. Sci. Technol.*, **2009**, 43 (1), 12-19• DOI: 10.1021/es801217q. Publication Date (Web): 12 November 2008.

able to comply with the specific permit conditions contained in the impending next generation MS4 permit requirements. These permits are expected to include requirements that will be significantly more costly than the current MS4 permits.

What Fees Can be Used For

There is a large list of programs and projects that a drainage fee/stormwater utility can fund, as shown in Table 0.2 (not an exhaustive list). As indicated, drainage fees collected can be used to hire staff and obtain resources necessary to implement stormwater pollution prevention programs to reduce the amount of polluted runoff associated with development/redevelopment, and to reduce illicit connections and discharges to the storm sewer system. Revenues can also be utilized to implement stormwater planning and implementation projects such as engineering, inspection, construction, repair, maintenance improvement, reconstruction, and administration. Further information regarding how to assess what drainage fees can be used for can be found in Module 2, as well as in the Stormwater Utility Analysis Workbook.

Table O.2. Potential Expenditures

Stormwater Expenditures	**Description**
STORMWATER MANAGEMENT PROGRAM	
General maintenance & operations (DPW)	Routine cleaning, general maintenance, and day-to-day service operations.
Stormwater cleaning & treatment (contractual)	Costs of privately contracted facility to treat stormwater runoff.
NPDES compliance (MA4 permits)	Annual reporting and private consulting services.
Service requests	Reporting and responding to notices, complaints, and reported damage.
Master planning for stormwater	Develop a CIP based on Phosphorous Control Plan and infrastructure needs.
MS4 Stormwater Permit administration	Review of permits annually by consultants paid for by the developer(s).
Illicit discharge detection and elimination	Assume 10% of outfalls have illicit discharge. Estimate cost to identify source at approximately $1200 per hit. Removal costs should be the owner's responsibility.
Erosion/sediment control inspections	Estimate a 50% increase in workload due to additional maintenance and construction.
Catchbasin inventory plan	Field crews to inspect, record, and clean catchbasins on a regular schedule. Two to four times per year is recommended.
Septic, inflow and infiltration program	Cost of coordination between board of health and stormwater program.
Pesticide, herbicide and fertilizer program	Implement fertilizer optimization program. Assume coordination with multiple depts.
Spill cleanup program	Develop a priority response program based on high accident areas, significant pollutant potential, and proximity to receiving waters.
Groundwater and drinking water program	Technical review memo of drinking water quantity and quality in priority areas. Conclusions of reports to be considered in the improvement of the system.
Drainage monitoring	Schematic mapping of water drainage system with field verification of performance.
Code development and zoning support services	Review and update ESC, SW, IDDE as needed, report on local regulations affecting impervious areas and report on feasibility of green practices and other green techniques.

Stormwater Expenditures	Description
Hazard mitigation and flood insurance updates	Allowance for high hazard analysis by private consultant for specific areas of concern identified during the permitting process.
Waterfowl & pet waste management programs	Install waterfowl education signs at congregation areas and implement waterfowl deterrents. Install pet waste stations in strategic locations.
Street cleaning	Increase effort, fuel, supplies, and disposal to sweep streets.
Stream restoration/stabilization	Complete at least one stream restoration project every set number of years.
Ditch and channel maintenance	Assume cost of removal is borne by owner or sewer dept., cost of illicit discharge removal infrastructure improvements.
ADMINISTRATION EXPENSES	
Fee/utility implementation costs	Capital expenses associated with establishing HR to manage the program.
Billing costs	Costs associated with preparing and distributing invoices.
Administrative fees	General office operations and overhead.
Credits	Costs for administering and deducting expenses for properties that meet set compliance standards to reduce runoff.
Collection fees, delinquencies	Costs for processing receivables with contingencies for late or non-payments.
Legal support services	Legal review of regulatory changes every set number of years
Inter-municipal coordination	Adjacent municipalities to meet every set number of years to review and coordinate programs.
NPDES public education programs	Distribute at least two messages to residents, commercial, industrial, and construction constituencies and measure and report message effectiveness.
NPDES public engagement programs	Host public forums, regularly update websites and host regular workshops.

Proposed Next Generation EPA MS4 Permit Requirements

While most states are authorized to implement the NPDES Stormwater Program and administer their own MS4 stormwater permitting programs, EPA Region 1 is the permitting authority in Massachusetts due to the fact that the state has not accepted "delegation" of permitting authority under the Federal Clean Water Act.

Phase II MS4s are covered by a general permit, and all but one MAPC community have all or a portion of their most populated areas covered under Phase II General Permits. Massachusetts MS4s are currently covered under the 2003 NPDES General Permit for Storm Water Discharges for Massachusetts and New Hampshire. All MAPC communities have submitted a Notice of Intent for permit coverage, as listed on EPA's NPDES website. Each regulated MS4 is required to develop, document, and implement a stormwater management program (SMP) to reduce the contamination of stormwater runoff and prohibit illicit discharges. Overarching requirements of the SMP include, but are NOT limited to:

Development of a stormwater management program implementing six (6) minimum measures:

1. Public education and outreach: must provide information concerning the impact of stormwater discharges on water bodies, address steps and/or activities that the public can take to reduce the pollutants in stormwater runoff.

2. Public involvement and participation: comply with state public notice requirements in MGL Chapter 39 Section 23B and local public notice requirements and provide opportunity for the public to participate in the implementation.

3. Illicit discharge detection and elimination: develop, implement, and enforce a program to detect and eliminate illicit discharges to the municipal separate storm sewer that is not composed entirely of stormwater.

4. Construction site stormwater runoff control: develop, implement, and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to one acre.

5. Post construction stormwater management in new development and redevelopment: develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb greater than one acre and discharge into the municipal system.

6. Pollution prevention and good housekeeping in municipal operations: employee training; maintenance activities for parks and open space, fleet maintenance, building maintenance; new construction and land disturbance; and roadway drainage system maintenance and stormwater system maintenance.

Permittees can utilize the Massachusetts Storm Water Management Policy, as authorized by the Massachusetts Wetlands Protection Act (MGL Chapter 131, Section 40), to implement some of the minimum measures.

The original 2003 MS4 permit was intended to be renewed by EPA with additional requirements every five years, but there has been a delay in the issuance of a permit renewal in Massachusetts. In the interim, the 2003 permits are still in effect.

A new generation of the MS4 permit has been developed by EPA, starting in New Hampshire. It is anticipated that this permit will serve as the model for the revised Massachusetts General Permits: the Northern Coastal Watershed and the Merrimack, Southern Coastal, and Inter-State Watersheds (see Figure 0.3). The new permits will be more rigorous and will likely include a number of additional more costly requirements, as summarized in Table 0.3.

Table O.3. Anticipated Requirements Based on the 2013 New Hampshire General Permit

Existing (2003 MA Permit)	**Anticipated Changes (2013 NH Permit)**
AREA OF COVERAGE	
MA, NH, Indian Country Lands, VT Federal Facilities.	MS4s owned by MA Cities and Towns, a state, county, or federal entity, and MA transportation agencies.
NOTICE OF INTENT REQUIREMENTS	
Due in 180 Days	Due in 90 Days
Stormwater Management Program (SWMP)	
Program implementing the 6 Min. Control Measures	Written plan that meets the terms and conditions of new permit
	List of receiving waters for all outfalls and interconnection, and the status of waters as impaired or TMDL
	Adequate funding source maintained for the implementation of the Program.
NON-NUMERIC EFFLUENT LIMITATIONS (e.g. Discharge to Impaired Waters)	

Existing (2003 MA Permit)	**Anticipated Changes (2013 NH Permit)**
Determine whether stormwater discharges contribute to a 303(d) listed water body.	Evaluate MS4 discharges to impaired waters and, if applicable, prepare Water Quality Response Plan within 1 year
	Fix any discharge "causing or contributing" to a violation of Water Quality Standards within 60 days of discovery.
	Implementation of WQRP, structural BMPs between 18 mo. & 3 yrs., nonstructural BMPs in 2 years, reassess in 4 years and if further reductions needed propose additional BMPs in 5 years.
Ensure that discharges will not cause an instream exceedance of MA water quality standards.	No net increase in discharges to impaired waters from new or increased sources (will also likely apply to other waters in MA).
BMP recommendations for stormwater discharges for TMDLs w/ a pollutant waste load allocation.	Discharges must be consistent with TMDL waste load allocation where applicable.
PUBLIC EDUCATION AND OUTREACH	
Info on the impact of discharges on water bodies and steps/actions to reduce the pollutants in runoff	Educational program to: residents, businesses, institutions, commercial facilities, developers, and industrial facilities.
Minimum of 2 educational messages over the permit term to the 4 audiences.	Number of messages same but within 5 yrs. & must define goals and evaluations methods and report on effectiveness.
PUBLIC PARTICIPATION AND INVOLVEMENT	
Opportunities for the public to participate in implementation and review of SMP program	Minimum 1 annual opportunity to participate in "review and implementation" of SWMP and post documents online.
ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE) PROGRAM	
Develop, implement, and enforce program to detect and eliminate illicit discharges.	Written IDDE Program in 1 year that includes:
	Assessment/ranking of outfalls for contamination potential and health risk
	SOP for outfall screening and sampling. Include ammonia, chlorine, conductivity, temp, salinity, surfactants, and bacteria, plus TMDL or impairment parameters.
	SOP for catchment investigations and to prevent illicit discharges (employee training, spills, etc.)
	Indicators to track IDDE program progress.
	Annual training for employees involved in IDDE.
	Inventory all known SSOs within 120 days, notify EPA/DEP of activations, report annually, eliminate ASAP.
	System map in 2 years with full details (connectivity).
	Outfall/interconnection inventory: location and condition in 1 year and label in field in 5 years.
	Dry weather screening/inspection/sampling done in 3 years.
	80% of PROBLEM catchments (by acres) investigated in 3 years, 100% in 5 years.
	40% of ALL catchments (by acres) investigated in 5 years, 100% in 10 years.
CONSTRUCTION SITE STORMWATER RUNOFF CONTROL	
Reduce pollutants from construction projects disturbing 1 or more acres	Review and update any existing materials as needed and include:
	Ordinance – covers land disturbance of 1 acre.
	SOP's for site inspection and enforcement.
	Standards for BMPs and design.
	Control of wastes (solid waste, truck washing).
	SOP for site plan review in 1 year.

Existing (2003 MA Permit)	Anticipated Changes (2013 NH Permit)
	Tracking/reporting # of site plan reviews.
STORMWATER MANAGEMENT IN NEW DEVELOPMENT/REDEVELOPMENT (Post Construction Management)	
Address runoff from new development and redevelopment disturbing 1 or more acres.	Smaller parcels is advisable.
Pass a bylaw/ordinance to address post construction runoff in new development/redevel.	Modify existing ordinance as needed to comply in 2 years.
	Report on street and parking design and potential LID changes in 2 years.
	Report on zoning and other changes to allow: green roofs, LID infiltration, and water harvesting in 3 years.
	Track changes in impervious sub-basin or catchment annually beginning with year 2.
	Inventory and prioritize town-owned infrastructure for retrofit potential (onsite & offsite imperv.) in 2 years.
GOOD HOUSEKEEPING AND POLLUTION PREVENTION	
Inspection procedures and schedules for long term structural controls.	Inventory owned "facilities" (parks and open space, buildings and facilities, and vehicle/equipment storage/fueling) in 6 months.
	Written O&M plan for owned infrastructure in 1 year, including:
	Plan to "optimize" and document catch basin cleaning/inspection.
	Procedures for sweeping and/or cleaning streets, sidewalks, and permittee-owned parking lots.
	SOP for sweeping everything once per year in the spring and reporting miles swept and volume of cleanings.
	SOP for appropriate storage of sweepings and CB cleanings.
	SOP for storage of salt/sand and minimization of salt and use of salt alternatives.
	SOP for inspection frequency of structures (CB, swale, detention, etc.) – at least annually for everything except CB.
	Written stormwater pollution prevention plan for owned maintenance garages, DPW yards and transfer stations in 2 yrs.
EVALUATION/RECORDS	
None	Annual self-evaluation that includes:
	Outfall monitoring data.
	Standard Methods for bacteria.
	Impairment and TMDL parameters.
	Additional samples to support effectiveness of evaluation.
	lst annual report 90 days after 1st yr anniversary of permit date. Annual reports to include:
	Cumulative data reported annually (previous years).
	Monitoring data by outside parties.
	Retain all records for 5 years – available to public on request.

EPA has recognized the critical importance of keeping water local, and therefore encourages the use of "green infrastructure or low impact development techniques; using vegetation and soil to manage rainwater where it falls, for stormwater management, which is less costly and more prescriptive.

How: Five Steps (The Five Ds)

In developing an effective stormwater drainage fee program, it is helpful for municipalities to follow MAPC's five general planning and implementation phases. Beginning with *defining needs* by assessing current water quality problems and conducting an accurate inventory of existing treatment strategies in town, municipalities should then *determine* an appropriate fee structure to cover improvement expenses. Subsequent to the study and design of the fee structure, it is recommended that municipalities *deliver* and implement a thorough public participation program and *develop* a clear management plan. These efforts should finally be consolidated and refined by *drafting* and implementing a comprehensive and actionable bylaw or set of regulations to implement and manage the mechanism of the new stormwater drainage fee program. This section summarizes MAPC's five planning and implementation recommendations with a particular focus on how to determine appropriate fee structures and how to draft effective regulations to help meet municipalities' unique political and fiscal challenges. These recommendations are described in more detail in the modules that follow this section.

1. Define Needs

It is critical for municipalities to determine what stormwater issues they are facing in terms of both natural resources and physical infrastructure prior to beginning a planning process for establishing a drainage fee or stormwater utility. Municipalities must gather and assess both water quality and quantity data to determine the state of subwatershed drainage, surface water bodies, and groundwater. As noted previously, stormwater has a great impact on both surface water and ground water; therefore the development of a drainage fee and a revised Stormwater Management Plan depends on this data for determining the amount of revenue needed to address these issues. In addition, determining the status of existing public stormwater management facilities, and possibly some private systems within a right-of-way or drainage easement, is critical to developing an appropriate revenue plan. For example, if there are a number of facilities failing and in need of repair, as well as a need to construct new facilities that will ensure water quality/quantity improvements, the revenue-generating plan must take this into account, possibly calling for a phased fee (e.g., higher fees for years 1-10, and gradually lowered fees after year 10 when most of the upgraded infrastructure has been paid-off). Further information regarding how to assess need can be found in Module 1.

2. Determine Funding/Fee Structure

There are a number of potential financing options to consider, with two primary fee structures to choose from. Fee structures for utilities and government programs, as in private businesses, can vary greatly depending on the type of service being provided and where the service is being provided. Setting an appropriate fee structure is crucial to ensuring the success and efficacy of any program. Regardless of the structure chosen, it is critical that the fee structure promotes credibility and ensures equity. While there are a number of strategies commonly used to formulate equitable fee structures for stormwater utilities, typically the fee is based on the amount of runoff produced by a property's impervious surfaces. Under this model, impervious surface area is calculated statistically based on the cumulative area of median building footprints and paved surfaces on a property. Further details regarding the methods to set a billing metric are discussed in Module 2.

3. Deliver Education and Outreach Program

Creating a successful outreach program requires a thorough understanding of your different audiences and researching and strategizing how best to reach them. Public outreach goes beyond just informing the public and moves them to action. This outreach takes a social marketing approach to water quality goals and focuses on increasing participation in water quality improvement efforts. Public outreach requires an understanding of the community, and the ability to create incentives and motivate people to take action. This type of intensive public analysis will allow Towns to customize their public education and outreach activities to meet situation-specific needs. Community groups and demographics will vary from town to town, but will generally include several types of groups that include students, business owners, young families, church groups, single adults, elderly and retired individuals. Each of these groups is characterized by different lifestyles, income and education levels, and different ideas and expectations about what home and community should be. Being able to speak cogently and respectfully to each of these groups without marginalizing the positions of others is a delicate and important skill that can determine the ultimate success of the campaign. Further information regarding developing and implementing an internal (municipal officials and boards) and external (public) participation program can be found in Module 3.

4. Develop Administrative Program

It is necessary to determine the capacity to take on additional responsibilities under a new drainage fee system/stormwater utility program. Other reasons to assess organizational capacity are to determine if the existing work is well-coordinated among departments and if efficiency can be increased either for the existing department or multi-department task force. Steps to assess capacity include:

- *Document existing conditions*. Determine what is being done currently to address stormwater, and what staff are assigned. Document person hours/budget. Determine if there are gaps in existing service delivery (e.g., whether different departments or divisions are clear on who is to perform specific tasks). Interviews with key staff should help determine this.
- *Review initial required work program under the new regulations*. Estimate the amount of hours/budget for the proposed program. (Note: There are dozens of required activities, but not all of them will be done simultaneously; some will already be in place, some may be phased over the life of the permit.)
- *Review the existing and proposed costs.* Determine how much more funding and how much more time – and whose time – will be needed to accomplish the initial work program.

5. Draft Bylaw/Ordinance/Regulation

In order for a municipality or multi-municipal entity to implement a drainage fee, the administrative department or new utility must be authorized via a local bylaw or ordinance. Often times, municipalities have already adopted their own Stormwater Bylaw or Ordinance in which language stipulating this authority can be inserted. In the absence of a local stormwater bylaw or ordinance a municipality could include statements regarding stormwater management within its wetlands bylaw or ordinance, including the authorization of a drainage fee or utility. However, it is advised that a municipality consider creating a new bylaw or ordinance in this instance, as a wetlands bylaw or ordinance is typically limited in its jurisdiction to areas within jurisdiction under the Massachusetts

Wetlands Protection Act. Therefore, municipalities would not be able to impose a drainage fee town or city wide. In addition, creating a separate stormwater or Low Impact Development (LID) bylaw presents an opportunity for the municipality to establish minimum requirements and procedures to control the adverse effects of stormwater runoff and nonpoint source pollution associated with new development and redevelopment.

There are a number of resources available regarding creating a proactive, authorizing bylaw or ordinance. First, the Massachusetts Smart Growth/Smart Energy Toolkit includes a model LID Bylaw that can be downloaded, altered, and utilized by municipalities for this purpose. A similar Model Stormwater Management Bylaw was created by the Horsley Witten Group for the Towns of Duxbury, Marshfield and Scituate. Last, MAPC established an online Stormwater Bylaw Toolkit webpage, which displays model bylaws and regulations that MAPC has created in partnership with six communities in the region.

Stormwater Financing Kit Module 1: Needs

This Module of the Starter Kit provides guidance regarding how to determine the needs for the program: water quality improvements, water quantity enhancements, stormwater management system improvements, and long-term operations. Guidance is provided regarding the data collection and analysis needed to determine the existing costs and potential additional expenditures for the stormwater management program. The cost information from that exercise will be utilized to determine the fee scale (Module 3).

Although this Kit is geared towards municipalities that have already determined that a drainage fee and/or utility is something they would like to explore, it should be mentioned that some communities conduct what has been called a "DIMS" (Does It Make Sense) Study in the initial planning stages. This type of study is merely a quick concept study that identifies key issues, potential barriers, and assesses political feasibility. Typically a DIMS study concludes with a Go or No Go recommendation regarding a fee/utility and lays out next steps. Often a stormwater professional will lead this study. An example of a DIMS study is the Town of Yarmouth, MA DIMS Study. Regardless of the process undertaken to get to the point of exploring a drainage fee/utility, it's important to ask the following critical questions regarding need:

- What is the status of the municipality's water quality/quantity and what are the existing threats?
- What are some other reasons that the municipality would want to pursue this funding mechanism?
- What comprises the municipality's stormwater management plan/practices?
- What are the short- and long-term current and projected expenditures (i.e., what would this fund)?
- What are the major challenges to developing a fee system and/or utility?

Using an outside expert at this stage offers a number of benefits, including bringing an objective, external perspective to the process. They also can provide guidance on what's worked and what hasn't in other communities.

One of the most clearly related needs for developing a long-term funding source is to protect and restore water quality and quantity. Unfortunately, most of the surface waters within Eastern Massachusetts are impaired due to traditional development and stormwater management practices. In addition, although Massachusetts benefits from robust annual precipitation, quantity issues linger from development impacts both within our watershed systems, as well as between watershed systems as transfer. These critical issues are discussed briefly within the sections below.

Water Quality

Water quality is a general term used to describe the chemical, physical, and biological characteristics of water. Under the Clean Water Act, it typically refers to the water's suitability to support particular uses, like drinking, swimming, fishing, and boating. Assessment of contaminants that can harm

water quality, such as nutrients and pesticides, requires a nuanced understanding of the complicated natural and urban ecosystems that impact surface and ground water: climate and atmospheric contributions; natural landscape features such as geology, topography, and soils; human activities related to different land uses and land-management practices, and aquatic health.

Rural areas may also contribute to water-quality problems, often generating a great deal of chemical runoff from animal feed, manufactured fertilizers, and manure, which are sources of nitrogen and phosphorus pollution. These excess nutrients have the potential to degrade water quality if incorporated into runoff from farms into streams and lakes. Whether urban or rural, cities and towns need to be diligent in analyzing what contaminants their properties, residents, businesses, and farms are producing and where, and understand that it is not just a municipal problem, but a systemic, regional issue requiring collaboration and cooperation with adjacent cities and towns as well.

Regulatory requirements for water quality improvement are based on the Massachusetts Surface Water Quality Standards, which define the Clean Water Act goals for the rivers, streams, lakes, and coastal waters of the state. The status of each watershed's compliance with the water quality standards is listed in the 2012 Integrated List of Waters. These are key documents for municipalities in understanding the status of their water bodies and the monitoring, protection, and improvements that are needed in order to meet their water quality standards.

It should also be noted that selected watersheds in Massachusetts have additional requirements under a Total Maximum Daily Load (TMDL) analysis for specific pollutants. In the MAPC region this inculdes a TMDL for phosphorus in the Charles River watershed and for pathogens in the Neponset River watershed. MS4 permits for communities in those and other TMDL watersheds will include additional requirements to control those pollutants.

Although it is beyond the scope of this Kit to provide detailed guidance regarding water quality monitoring, a summary of key elements in developing a monitoring program are listed below, most of which were taken from the EPA's *Monitoring Guidance for Determining the Effectiveness of Nonpoint Source Controls* document.

Water Quantity

Water quantity issues are also important to determine and document, as they are equally important to watershed function as well as human needs (recreation, fishing, drinking/irrigation water availability). Most often, guidance related to water quantity monitoring will be discussed in the context of stream flow, as it is a marker of amount of water moving through the watershed. The United States Geological Survey (USGS) provides stream flow data for stream segments in all major river basins in Massachusetts, which municipal officials can use as baseline data. For municipal staff who wish to monitor and calculate stream flow on their own, the EPA has developed an online guidance document regarding stream flow, which includes monitoring methodologies: *What is stream flow and why is it important?*

Stormwater Management System Inventory

In order to make connections between water quality and stormwater impacts and determine needs, it will be important for the municipality to inventory existing stormwater management and treatment facilities. The inventory should include a list of all facilities, locations (mapped, showing discharge points), type of treatment, maintenance completed, and cost.

A drainage fee and/or utility is developed to support the necessary, and often desired, work under a stormwater management plan, from programmatic elements to capital improvement projects. As part of developing a fee, municipalities should review the relationship between where the built and natural elements of the stormwater management system exists (and may be planned) and the geographic areas contributing runoff to the system. There are cities and towns where the entire area contributes runoff to and is served by the storm sewer system, but there may also be municipalities where large areas are undeveloped and contributing little to no runoff to the system. An EPA measure that speaks to this consideration is Directly Connected Impervious Areas (DCIA). According to the EPA's *Estimating Change in Impervious Area (IA) and Directly Connected Impervious Areas (DCIA) for Massachusetts Small MS4 Permit* document, the DCIA "is considered the portion of impervious area (IA) with a direct hydraulic connection to the permittee's MS4 or a waterbody via continuous paved surfaces, gutters, drain pipes, or other conventional conveyance and detention structures that do not reduce runoff volume." As a companion to this document, the EPA has created information specific to regulated municipalities, including maps of impervious cover and tables with statistics about DCIA.

In addition to assessing the natural and physical systems, it is also important to list all potential expenditures that will be financed by the drainage fee. Although not an exhaustive list, the table below shows likely stormwater-related expenditures incurred by the municipality. Not all categories will apply to every community.

Table 1.1. Potential Expenditures

Potential Expenditures	Description
STORMWATER MANAGEMENT PROGRAM	
General Maintenance & Operations	Routine cleaning, general maintenance and day to day service operations by DPW.
Stormwater Treatment (Contractual)	Costs of privately contracted facility to treat stormwater runoff (if any).
Service Requests	Reporting and Responding to notices, complaints and reported damage
Illicit Discharge Detection and Elimination	Assume 10% of outfalls have illicit discharge. Estimate cost to identify source at appx. $1200 per hit. Removal costs should be the owner's responsibility.
Erosion/Sediment Control Inspections	Estimate a 50x% increase in workload due to additional maintenance and construction
MS4 Requirements for Water Quality Monitoring	Not included in the 2003 permit, but expected to be in the next MS4 permit. Specific requirements and costs are not currently known.
Catchbasin Inventory/Maintenance	Field crews to inspect, record and clean catchbasins on a regular schedule. Two to Four times per year is recommended.
Septic, Inflow and Infiltration Program	Cost of coordination between board of health and stormwater program.

Potential Expenditures	Description
Spill Cleanup Program	Develop a priority response program based on high accident areas, significant pollutant potential and proximity to receiving waters.
Waterfowl & Pet Waste Management Programs	Install waterfowl education signs at congregation areas and implement waterfowl deterrents. Install pet waste stations in strategic locations.
Street Cleaning	Increase effort, fuel, supplies,& disposal to Sweep streets.
Stream Restoration/Stabilization	Complete at least one stream restoration project every set number of years.
PLANNING AND REGULATORY COMPLIANCE	
NPDES Compliance	Includes annual reporting, mapping, Stormwater Management Plan (SMP). Often includes private consulting services.
Master Planning for Stormwater	Develop a CIP based on Phosphorous Control Plan and Infrastructure Needs.
MS4 Stormwater Permit Administration	Review of permits annually (often by consultants)
Groundwater and Drinking Water Program Coordination	Technical review memo of drinking water quantity and quality in priority areas. Conclusions of reports to be considered in the improvement of the system.
Code Development and Zoning Support Services	Review and update zoning codes and other local regulations as needed, report on local regulations affecting impervious areas and report on feasibility of green practices and other green techniques.
Hazard Mitigation and Flood Insurance Updates	Allowance for high hazard analysis by private consultant for specific areas of concern.
ADMINISTRATION	
Utility Fee Implementation	Capital expenses associated with establishing HR to manage the new program.
Billing	Costs associated with preparing and distributing fee invoices.
Administrative Fees	General office operations and overhead.
Utility Fee Credits	Costs for administering and deducting expenses for properties that meet set compliance standards to reduce runoff.
Collection Fees, Delinquencies	Costs for processing receivables with contingencies for late or non-payments.
Legal Support Services	Legal Review of Regulatory changes every set number of years
Inter-Municipal Coordination	Adjacent municipalities to meet every set number of years to review and coordinate programs.
NPDES Public Education/Engagement Programs	Distribute at least two messages to residents, commercial, industrial, and construction constituencies and measure and report message effectiveness. Host public forums, regularly update websites and host regular workshops

Capital Improvements

In addition to the costs for operations and maintenance, planning and regulatory compliance, and administration summarized above, needs for long term capital improvements should be considered. In some communities this may already be addressed (partially or in full) in a Capital Improvement Plan or program. If not, the future needs for stormwater capital improvements should be estimated and considered as part of the costs to be addressed by the stormwater fee/utility.

After determining the water quality issues that the municipality is facing, and assessing the status of the existing treatment facilities in the community, a municipality can now make some assumptions

regarding the type of additional treatment facilities needed to improve water quality and quantity conditions.

Stormwater Financing Kit Module 2: Financing/Fee Structure

Methods to finance stormwater management can be wide-ranging. Traditionally in Massachusetts municipalities have had to rely on appropriations from the General Fund and/or securing grants and bonds to pay for their stormwater management program and projects. Lesser known mechanisms that some municipalities have utilized are in-lieu of construction fees and latecomer fees, all of which will be described in this Section, as municipalities may require more than one way to finance stormwater management and may want to find a combination of financing options to best suit their needs. However, with regard to developing a secure, long-term funding source for stormwater management, the drainage service fee approach is recommended as the fundamental financing mechanism. This section provides an overview of the different financing options municipalities have used to pay for their stormwater systems, with a primary focus on describing the drainage service fee and the utilization of an Enterprise Fund to account for revenues generated from the fee.

Difference between Tax and a Fee: A Critical Policy Distinction

In general the purpose of a tax is simply to raise revenue, and there need not be any single, pre-determined use of the revenue. A tax is defined by the federal government as a financial charge or other levy imposed on an individual or legal entity by a state or a functional equivalent of a state, such as a tribe. On the other hand, a fee is the price one pays as remuneration for services, such as fees paid for by new or expanded users for use of a municipal utility.

The shift of stormwater financing from tax-based to fee-based structures over the last thirty years has been challenged in a number of states, and the courts have consequently identified three substantial criteria that differentiate a utility fee from a municipal tax. Under these criteria the following three conditions must exist to distinguish a fee from a tax-- 1) the fee must be adopted by ordinance, 2) there must be a direct and transparent relationship between the fee paid and the services provided and 3) there must be a voluntary provision to the fee, i.e. the fees can be reduced by reducing the use of the stormwater system or program. In Massachusetts, Each of these criterion indicates the critical need for a robust internal and public education process as a fee is explored.

As mentioned briefly in Module 1, a Stormwater Utility Analysis Worksheet was developed as a parametric tool designed to help municipalities analyze existing and anticipated budgets and design appropriate billing and revenue structures for stormwater utility programs. The Worksheet can be found on the MAPC Stormwater Kit website.

Drainage Fees

A Drainage Fee (also known as drainage service or drainage user fee) is simply a charge for the generation of stormwater and the management of that stormwater by a municipality. The drainage fee provides a stable, equitable, and sufficient revenue stream to pay for stormwater service

demands. For these reasons, it is often used as the "umbrella" funding source for stormwater utilities. The user service fee is based on the principal understanding that all property owners are responsible for the generation of stormwater: anyone that owns property on which the natural landscape has been altered with the addition of impervious surfaces contributes to water quality/quantity issues. Addressing those issues becomes a municipal responsibility under the MS4 permit, which imposes a cost on the community for which there is no dedicated revenue stream. A drainage fee is bound by the notion that stormwater services are like any other municipal service, for example wastewater or water supply systems.

Drainage user fees are the preferred financing option for stormwater management programming for several reasons. First, the fees are equitable – the amount each resident or business is charged is based on a clear, transparent calculation of stormwater costs, which vary by property type and size. Second, a stormwater user service fee is also stable. The user pays on a regular basis for ongoing stormwater services, and the utility receives a predictable, stable revenue stream. Third, the fees are adequate – property calibrated fees are high enough to cover local stormwater needs (as defined by the community) and meet water quality regulations without generating excess revenue.

It is important to note that a drainage service fee is a highly visible cost, thereby making public acceptance critical. Public education and outreach strategies are fully described in Module 3.

After gathering information about resources needed to support elements of a stormwater management program, as described in Module 1, the overall cost of the program can be estimated. The cost can then be evaluated according to how much funding is currently available and what future funding the program will require. Typically, it is the unfunded slice needed to support the stormwater management program that is the focus of the fee. There are three types of drainage fees that can be established, as follows:

- Flat Fee System: This fee is developed as a specific surcharge to each property in a municipality. The cost is spread across properties based on an existing standard, such as the Massachusetts Land Use Classifications[2] for properties, or just generally across all properties at the same rate. If using the land use classification method, the flat fee could be assigned based on whether a property is a residential use or a non-residential use, or could be further broken down into other categories, such as single family residential, multi-family residential, commercial and industrial, instead of just non-residential. The fee would reflect a charge on each property in the city or town and would only vary based on the category used to delineate properties.
- **Graduated Fee System:** In this system, the fact that certain properties among different land use classifications are likely to send greater quantities of stormwater to a municipal storm sewer system is recognized. This recognition does require more work under a stormwater management program. An example of this fact is the difference between the impervious surfaces from the amount of parking on parcels with single family homes, versus the impervious surface from the amount of parking on parcels with shopping centers. An example of where this type of fee system is used is the City of Newton, MA. The calculation of a fee that reflects the differences in the amount of impervious surfaces, which results in different quantities of stormwater runoff, is considered to be a more equitable method for assessing a drainage fee. ***Therefore, this is the approach MAPC recommends, as further explained in the following sections.***

[2] Available as a Massachusetts Geographic Information System (GIS) Datalayer; digital dataset of land cover/land use based on 0.5 meter resolution digital ortho imagery captured in April 2005; created by The Sanborn Map Company, Inc.

- Customized Fee System: Drainage fees can be even more individualized at a parcel basis by developing specific measures of impervious surface. A customized fee system would not use an average measure of impervious area across land use classifications but would create an estimate for individual properties. This individual estimate would serve as the basis for the fee. Additionally, with a customized fee system, the fee can be even more comprehensive and take into account the stormwater runoff generated by both the impervious and pervious areas on a property. MAPC recognizes that the majority of cities and towns may not have the resources to implement this approach. However, some municipalities may choose to pursue this methodical system. Therefore, information regarding the two approaches in designing a customized fee system: Intensity of Development, and the Equivalent Hydraulic Area approaches, is described below.

Intensity of Development Approach

This Customized Fee approach calculates a fee based on the proportion of impervious surface to the entire size of a specific parcel. This approach is applied to all parcels, including vacant and undeveloped properties, and uses a sliding scale to assess the fees. For developed parcels, fees are based on their intensity of development, which is defined as the percentage of impervious area of the parcel. Vacant or undeveloped parcels contribute to runoff and are assigned a lower fee. Rates are calculated for several ID categories, as shown in the example below.

Table 2.1. Sliding Scale Example

Category (Impervious Percentage Range)	Rate (Per mo. per 1,000 sq. ft. of Total Served Area)
Vacant/Undeveloped (0%)	$0.08
Light development (1% to 20%)	$0.12
Moderate development (21% to 40%)	$0.16
Heavy development (41% to 70%)	$0.24
Very heavy development (71% to 100%)	$0.32

Source: Funding Stormwater Programs Fact Sheet - U.S. EPA

The benefit of this approach is that it also accounts for stormwater from the pervious portion of parcels. However, this method can be more difficult to implement than the graduated fee because the development intensity categories are broad and parcel pervious and impervious areas need to be reviewed.

Equivalent Hydraulic Area Approach

This version of the Customized Fee approach calculates a drainage fee based on the estimated runoff from both impervious and pervious surfaces on a site. It is different from the Intensity of Development approach since it uses a calculation that treats impervious surface areas and pervious surface areas as separate elements rather than along a sliding scale of development intensity. An example of this the calculation used by the City of Moline (Illinois) where residential properties greater than 2 acres in size and all non-residential properties are charged a fee based on a equivalent hydraulic area (EHA) calculation.

The formula calculating the EHA = (Impervious Acreage x 0.95) + (Pervious Acreage x 0.15).

The EHA is then multiplied by a set rate to determine the charge for the individual properties.

The primary benefit of this approach over a graduated fee system is that in addition to impervious surfaces, it accounts for the potential effect of stormwater runoff from the pervious area of a parcel. However, it includes a more in-depth level of analysis.

Developing a Graduated Fee System

The most common method of setting the fee using a graduated system is the Equivalent Residential Unit (ERU). According to the U.S. EPA, the ERU method is used by more than 80 percent of all stormwater utilities in the nation. The ERU is developed using a process that investigates the amount of impervious surface on properties in different land use categories and charging fees based on the average amount of impervious surfaces on properties in those categories. The primary advantage to this fee system is that the relationship (or nexus) between impervious area and stormwater impact is relatively easy to explain to the public: i.e., "you pave, you pay." In addition, the number of billable ERUs can be determined by limiting the parcel area review to impervious area only, making the analysis easier than other customized fees.

In most instances, the average amount of impervious surface on lots with a typical single-family home (e.g., driveways, sidewalks, roofs, etc) is determined to serve as the basis of the ERU and then the ERU is used as a basis for a sliding scale to assess properties with other land uses. On this scale, single family homes are typically charged a fee equivalent to 1 ERU and other properties are charged based on the amount of impervious surface relative to the ERU (e.g., commercial properties = 2 ERU's, industrial properties = 3 ERU's, etc). Examples of municipalities within Massachusetts, and outside of the state, using this type of fee system are shown in Table 2.2.

Table 2.2. Example Municipalities Using ERU Rates

City/Town	State	Population	Pop. Density (persons/sq mi.)	ERU (sq ft)	Basis	Annual Fees	Notes
Newark	DE	28,547	3,200	1,000	Imp. Surface	$5.00	
Normal	IL	52,799	3,688	3,200	Imp. Surface	$55.20	
Bloomington	IL	74,184	3,297	12,000	Gross Lot Area	$87.00	"Large" Parcel
Bloomington	IL	74,184	3,297	7,000	Gross Lot Area	$34.80	"Small" Parcel
Reading	MA	23,708	3,709	2,552	Imp. Surface	$39.84	
Newton	MA	83,829	7,220	2,300	Imp. Surface	$25.00	
Lewiston	ME	36,460	1,072	2,900	Imp. Surface	$50.00	
New Brighton	MN	22,200	3,344	43,560	Gross Lot Area	$215.00	Townhouses

** Gross Lot Area = total lot size.*

A step by step process for developing a graduated drainage fee system based on the ERU method is provided below.

1. Gather Data
2. Perform Analysis of Impervious Surface for Land Use Types
3. Weigh Critical Variables

4. Develop Standard for ERU and Determine ERU Fee Scale
5. Establish Credits

1. Gather Data:

Data for the municipality and the stormwater management program form the foundation for establishing the drainage fee. In particular, mapping data is a key element in this information gathering process; it is recommended that this data is accessible via a Geographic Information System (GIS). The recommended mapping data to be collected are shown in Table 2.3.

Table 2.3. GIS Mapping Needs

Name	Source	Notes
Parcel data	Municipality, Regional Planning Agency or MassGIS	Need to determine if parcels do or do not include right-of-way.
Assessors Data	Municipality	Must be linked to parcel data - if not already
Impervious Cover Data	MassGIS EPA	Data is based on analysis of digital ortho imagery captured. Data is based on an additional analysis that used MassGIS 2005 Land Use data to calculate impervious area (IA) and directly connected impervious area (DCIA).
Orthophotos	Municipality, MassGIS	Based on U.S. Geological Survey or better if available (e.g., municipal data or online map viewer like Bing or Google)

2. Perform Analysis of Impervious Surfaces to Determine ERU

This analysis is likely to involve two processes, each with a set of associated actions, and requires using GIS. The analysis is described using a detached single family residential property in a municipality to determine the ERU. However, the single family home could be replaced by another predominant residential land use type in a municipality (e.g., two- or three-family housing units).

Parcel Analysis

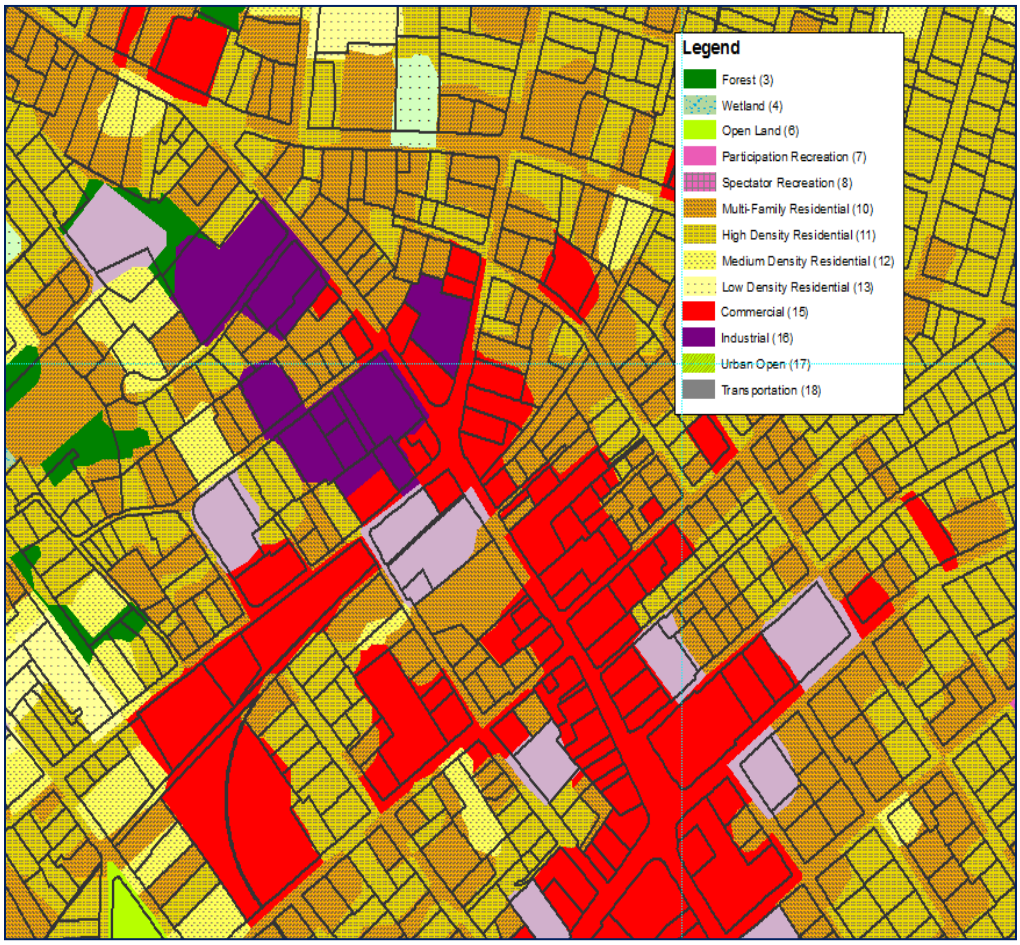
The first of the two processes assumes that parcel data does not include public rights of way (e.g., roadways – Figures 2.1 & 2) so that parcels only include structures and private improvements to the land. With this assumption in mind, the first process is aimed at linking the parcels with other necessary pieces of data as follows.

- ✓ Associate parcel data with property land use classifications that will be used for the fee categories (e.g., single family, multi-family parcel, industrial parcel),
- ✓ Associate parcel data with assessor's data (e.g., ownership, land area, address, etc.), and
- ✓ Link contiguous parcels that have the same property classification, share a structure or structures, and have joint ownership (e.g., shopping center that is under common ownership (but that is comprised of multiple contiguous parcels).

Figure 2.1. Parcel Mapping Example 1

Example of parcel data that does not include public rights of way.

Figure 2.2. Parcel Mapping Example 2



Land Use Map based on MA DEP GIS data.

By linking this information, the parcels contain the data that will be needed to determine impervious surface based on property classifications, property ownership and the drainage fee categories.

Analyzing for Impervious Cover

The second process is aimed at analyzing the parcels for impervious cover and then extrapolating that information in order to develop the ERU. This includes:

- ✓ Performing a Zonal Analysis: the creation of an output that is computed by including the cell values that intersect or fall within each zone of a specified input dataset. For example, the percent of impervious coverage (e.g., land covered by buildings, parking, and driveways) is calculated on each parcel within the municipality (see Figure 2.3).

Figure 2.3. Zonal Analysis Examples

Orthophoto (aerial photo) of a neighborhood

MassGIS impervious surface cover for the same neighborhood

- ✓ Use the resulting percent impervious for each parcel to calculate the land area (e.g., square footage, acreage, etc.) that is impervious.
- ✓ After calculating the area of impervious coverage for each parcel, develop a subset of parcels that includes the single family residential parcels based on the land use classifications.
- ✓ Determine the average impervious surface area for the subset of single family residential parcels. The result is the impervious coverage for the ERU.

3. Weigh Critical Variables

As a city or town moves forward in determining the fee, there are additional considerations that are part of this process. These considerations involve elements such as preferences in addressing pervious as well as impervious surfaces, the differences within specific land use classifications, and properties that may not currently be required to pay property taxes.

As has been discussed in this Kit, impervious surfaces are a major contributor relative to amount of stormwater runoff generated. These surfaces, especially surfaces that are part of the built environment, do not allow stormwater to percolate into the ground and naturally contribute to the watershed's water balance. Pervious surfaces allow stormwater to permeate the ground, but this is not always 100% of the rain that falls. Some of the stormwater is shed and runs off as it does on impervious surfaces. Given this fact, some municipalities and counties with stormwater utilities will add in some proportional cost for pervious surfaces on a property. This is the approach that would be used in a customized fee system. An example of where a model that uses both impervious and pervious considerations may apply is a town where natural waterways (e.g., creeks, streams, etc.) play a significant role in conveying stormwater. If annual work to clear debris and reduce flooding

from the waterways is supported by municipal staff, inclusion of pervious surface may be needed to account for runoff from yards, fields and other large open spaces on private properties.

There can be much variability among land use classifications in a city or a town. Older single family homes may sit on smaller lots as compared to lots for newer single family home developments, and this could be similar for older and newer commercial developments. If these variations occur in a municipality, it can be worth exploring the average impervious among the distinct sets of patterns within land use types. Examples are provided in the images below showing the variety in lots sizes for single family homes in one town.

Figure 2.4. Variations Example 1

Single Family Homes on 1/8 acre lots (approx.)

Figure 2.5. Variations Example 2

Single Family Homes on 1 acre lots (approx.)

Although they are not subject to local property taxes, lands that are publicly-owned or owned by non-profits are assessed as part of developing a drainage service fee. These properties are contributors of runoff to municipal systems and as a result, have a fee associated with them. Within city or town government discussions will need to take place about how these fees will be addressed and who will be responsible for paying them, which could mean specific divisions are responsible or possibly just under a municipal facilities director. For example, the local or region school district would also fall in this category and be responsible for paying a drainage fee for properties with schools, administration buildings and other facilities.

For properties owned by non-profit organizations, they would see a bill that is similar to other private property owners and that would be based on their land use and amount of impervious coverage. They would be billed for stormwater services just as they are already billed for water supply or sewer services if those are provided by the city or town.

4. Develop Standard for ERU and Determine ERU Fee Scale

An Equivalent Residential Unit (ERU) standard, appropriate to the municipality, is determined by undertaking the following steps:

1. Determining the ERU, which is the average impervious surface area per single family residential parcel.
2. Calculating "ERU equivalents" for the remaining parcels in the area of focus. Again, this is the multiplying factor to determine these parcel's impervious surface area relevant to the base ERU. This calculation will include:

a. Using the results of the zonal analysis to total the square footage of impervious surfaces on non-single family parcels. This includes residential and non-residential uses,
b. Calculating the average impervious surface area per parcel in each land use classification, and
c. Dividing the average impervious square footage by the value of the ERU to calculate the ERU equivalent.

3. Calculating the "stormwater unit" – the ERU / ERU equivalent multiplied by the number of parcels – for each land classification.
4. Adding the single family stormwater unit (i.e. the number of these parcels – since its multiplier is 1) to the other residential and commercial/industrial stormwater units to find the grand total.
5. Dividing the projected stormwater management annual budget need by the total number stormwater units to determine an ERU value per parcel, per year.

It should be noted that the budget could be the cost of the entire stormwater management program or the difference between what is currently covered and what funding will be need for required future program work.

A fictional town called "Littlemarsh" was used to illustrate this analysis, starting with the calculation of potential expenditures, as shown in Table. 2.4, and ending with the ERU calculation shown in Table 2.5.

Table 2.4 Example Expenditure Plan – Town of "Littlemarsh"

Stormwater Expenditures	Description	Estimated Costs
General Maintenance & Operations, (DPW)	Routine cleaning, general maintenance and day to day service operations	$600,000
Stormwater Cleaning & Treatment, (Contractual)	Costs of privately contracted facility to treat stormwater runoff.	$200,000
NPDES Compliance	Includes annual reporting and private consulting services.	$20,000
Service Requests	Reporting and Responding to notices, complaints and reported damage	$8,000
Master Planning for Stormwater	Develop a CIP based on Phosphorous Control Plan and Infrastructure Needs.	$55,000
MS4 Stormwater Permit Administration	Review of permits annually by consultants paid for by the developer(s)	$10,000
Illicit Discharge Detection and Elimination	Assume 10% of outfalls have illicit discharge. Estimate cost to identify source at appx. $1200 per hit. Removal costs should be the owner's responsibility.	$50,000
Erosion/Sediment Control Inspections	Estimate a 50% increase in workload due to additional maintenance and construction	$35,000
Catchbasin Inventory Plan	Field crews to inspect, record and clean catchbasins on a regular schedule. Two to Four times per year is recommended.	$12,400
Septic, Inflow and Infiltration Program	Cost of coordination between board of health and stormwater program.	$3,000
Pesticide, Herbicide and Fertilizer Program	Implement fertilizer optimization program. Assume coordination with multiple depts.	$5,300

Stormwater Expenditures	Description	Estimated Costs
Spill Cleanup Program	Develop a priority response program based on high accident areas, significant pollutant potential and proximity to receiving waters.	$16,000
Groundwater and Drinking Water Program	Technical review memo of drinking water quantity and quality in priority areas. Conclusions of reports to be considered in the improvement of the system.	$0
Drainage Monitoring & Mapping	Schematic mapping of water drainage system with field verification of performance	$125,000
Sewer Monitoring & Mapping	Sewer Infrastructure mapping. Assume coordination with multiple departments.	$100,000
Code Development and Zoning Support Services	Review and update ESC, SW, IDDE as needed, report on local regulations affecting impervious areas and report on feasibility of green practices.	$14,500
Hazard Mitigation and Flood Insurance Updates	Allowance for high hazard analysis by private consultant for specific areas of concern identified during the permitting process.	$34,000
Waterfowl & Pet Waste Management Programs	Install waterfowl education signs at congregation areas and implement waterfowl deterrents. Install pet waste stations in strategic locations.	$12,000
Street Cleaning	Increase effort, fuel, supplies, & disposal to Sweep streets.	$180,000
Stream Restoration/Stabilization	Complete at least one stream restoration project every set number of years.	$35,000
Ditch and Channel Maintenance	Assume cost of removal is borne by owner or sewer dept., cost of IDDE removal infrastructure improvements.	$35,000
Utility Fee Implementation Costs	Capital expenses associated with establishing HR to manage the new program.	$20,000
Billing Costs	Costs associated with preparing and distributing invoices.	$3,000
Administrative Fees	General office operations and overhead.	$3,000
Utility Fee Credits	Costs for administering expenses for properties that meet set compliance standards to reduce runoff.	$3,000
Collection Fees, Delinquencies	Costs for processing receivables with contingencies for late or non-payments.	$3,000
Legal Support Services	Legal Review of Regulatory changes - set number of years	$3,000
Inter-Municipal & Agency Coordination	Adjacent municipalities to meet every set number of years to review and coordinate programs	$12,000
Emergency Coordination	Meet twice a year to review and coordinate programs.	$3,000
NPDES Public Education Programs	Distribute at least two messages to residents, commercial, industrial, and construction constituencies and measure and report message effectiveness.	$15,000
NPDES Public Engagement Programs	Host public forums, regularly update websites and host regular workshops	$15,000
Certified Phosphorous Program	Recordkeeping, data tracking and correspondence with regulated entities for updating program progress under "Water Quality."	$10,400

Stormwater Expenditures	Description	Estimated Costs
Grants Program	(Staff efforts to apply for/administer grants received for stormwater programs; assume one grant every two years.)	$10,300
Subtotal:		$1,613,900
Existing Expenditure:		$900,000
Funding to be Covered Under Fee:		$713,900

Currently, most of the stormwater expenditures listed above are funded by sales and property taxes in most towns. If these activities are funded in the future by a stormwater fee, then sales and property taxes currently funding these activities would be available to fund other needs. This difference is indexed above in red.

The instructions listed above were employed, using our Stormwater Utility Workbook, to determine an appropriate ERU for "Littlemarsh". After determining the ERU equivalent for a single-family residential property, the ERU equivalent is then calculated for other residential and commercial / industrial properties. The "stormwater units" are the total number of parcels – per classification – multiplied by its ERU Equivalent (i.e. the multiplier based on the "base" equivalent of 1). This provides an accurate representation of other properties of varying size, relative to a single-family parcel. In other words, it is a way to measure their size in relation to a static figure.

Table 2.5 Calculating an ERU – Town of "Littlemarsh"

Land Use Classification	Number of Parcels	Total Impervious Surface (sf)	Aver. Impervious Surface (sf)	ERU Equivalent	Stormwater Units
Residential					
Detached Single Family	3,753	35,301,672	9,406.25	1	3,753.00
Other Res. & Non-Res.					
Detached Multi-Family, (e.g. Duplex, Triplex etc.)	314	2,893,579	9,215.22	0.98	307.62
Multi-Family	828	7,523,307	9,086.12	0.97	799.82
Commercial	159	1,736,147	10,919.16	1.16	184.57
Industrial	116	1,157,431	9,977.85	1.06	123.05
IMPERVIOUS TOTALS:					
Total Impervious Area:		48,612,136			
Total Stormwater Units:		5,168.07			
ERU Value p/parcel/p/yr:		$138.14			

The ERU value per parcel per year was calculated by dividing the additional budget needs (new expenditures that must be covered under a fee – see Table 2.4) by the total stormwater units. This provides a manager with the total annual revenue that will be drawn from every property. This is the value used to calculate fees for each property type. It should be noted that this calculation is conservative due to the fact that current expenditures that will continue are not included within this calculation. This example assumes that current expenditures will continue to be funded through the municipality's capital budget plan. However, this is not often the case.

The next determination to make is what ERU fee scale to employ. As stated previously, a municipality can develop a flat fee system, a graduated fee, or a customized fee (e.g., Intensity of Development,

or Equivalent Hydraulic Area approach). Again, we have chosen the graduated fee system as our primary example as it is proven to be the most popular and efficient method of assigning fees. Table 2.6 illustrates the calculation for the graduated fees.

Table 2.6 Calculating Graduated Fees – Town of "Littlemarsh"

Property Classification	Number of Parcels in Town	ERU Equivalent	Annual Drainage Fee per parcel	Annual Total Revenue
Residential				
Detached Single Family	3753	1.00	$134.00	$502,902.00
Detached Multi-Family, (e.g. Duplex, Triplex etc.)	314	0.98	$136.73	$515,216.33
Multi-Family	828	0.97	$138.14	$1,372,602.06
Non-Residential				
Commercial	159	1.16	$115.52	$220,406.90
Industrial	116	1.06	$126.42	$175,969.81
Total Revenue Raised:				$2,787,097.10

The base annual drainage fee of $134.00 is divided by each ERU Equivalent per property classification to calculate the annual drainage fee per classification. The annual revenues generated for each classification are also calculated by multiplying the number of parcels by the annual drainage fee. As shown in the table above, significant total revenues (close to $3 million annually) can be realized from the implementation of this basic fee structure.

5. Credits

An important incentive for proper stormwater management on properties is the inclusion of a credit system that rewards property owners for on-site and environmentally sustainable management of stormwater. Credits are linked to a reduction in the drainage fee which serves as an incentive to their installation. This includes techniques that minimize impacts to an area's natural hydrology and allows for groundwater recharge such as rainwater harvesting, Low Impact Development (LID) techniques, green roofs, permeable pavement, and other green infrastructure applications as shown in Figures 2.6 through 2.9.

Figure 2.6. Bioretention – Urban and Suburban Setting

Source: Horsley Witten Group

Figure 2.7. Rain Garden

Raingardens slightly differ from Bioretention facilities because they typically do not involve amended soils, complex sizing calculations, or sophisticated conveyance devices (flow splitters, underdrains, overflow inlets, etc.) Rather, they usually a shallow depression in native soils, or modestly amended soils.

Figure 2.8. Permeable and Grass "Paving"

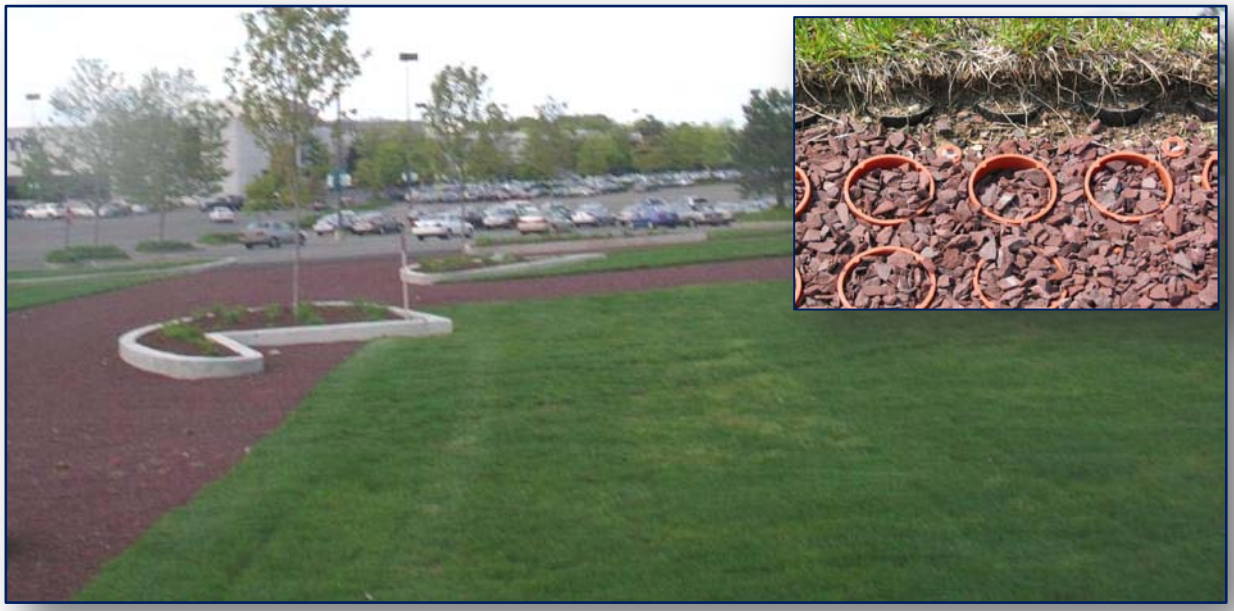


Figure 2.9 Rainwater Harvesting and Green Roofs

These on-site management features can address stormwater quantity and quality, and begin to reduce demands for municipal stormwater management. More information about these and other techniques, including the integration of recharge into an entire site's design, can be found in MAPC's Low Impact Development Toolkit.

In continuing our example analysis, the following provides a scenario for "Littlemarsh" in which a number of properties have either retrofitted or developed new, innovative stormwater management facilities that qualify for credits. Table 2.7 shows the credit calculations for hypothetical credits offered to property owners that implement these facilities.

Table 2.7 Credit Calculations – Town of "Littlemarsh"

Credit/Incentive Item	Residential			Non-Residential Properties			Totals
	Unit Cost	Quantity	Total	Unit Cost	Quantity	Total	
Rate Reduction (Swale/Constr. Wetland)	$500	10	$5,000	$1,000	15	$15,000	$20,000
Rainwater Harvesting (Rainbarrel/Cistern)	$50	100	$5,000	$200	50	$10,000	$15,000
Vol. Reduction (Green Roof, PermeablePave.)	$10,000	0	$0	$20,000	5	$100,000	$100,000
Water Quality (Raingarden/Bioretention)	$5,000	10	$50,000	$10,000	20	$200,000	$250,000
NPDES Costs/Private Maintenance	$1,000	120	$120,000	$3,000	90	$270,000	$390,000
			$180,000			$595,000	$775,000

Credits can also be provided for specific populations or organizations in a municipality. Some towns have considered offering credits, and even exemptions, for senior, low-income and disabled households. Additionally, similar credit systems have been considered for non-profits and municipal property. However, impervious areas on properties owned by these populations or organizations still contribute runoff that places a burden on the stormwater system. If the city or town does want to grant credits or exemptions, it should keep in mind that such a policy could impact the equitable nature of the drainage fee, the amount that others have to pay (in order to cover the deferred revenue) and efforts to reduce runoff through on-site management.

Lastly, if credits are to be offered, their expected effect on the funding for the overall program should be explored and take into account how best to offset reduced revenue to the program. This may mean adjusting how much credit can be claimed or the amount of the drainage fee in order to have sufficient income for management activities.

The final calculation to be made, in order to connect these separate analyses, is to determine the net operating income (NOI). The NOI is simply the credits provided (in dollars) subtracted from the total fee revenue generated from the graduated fee. This figure represents the amount of operating budget needed when you factor out properties that have reduced the need for engineered, municipal stormwater management on their properties, as shown in Table 2.8.

Table 2.8 Net Operating Income (NOI) – Town of "Littlemarsh"

Property Classification	Annual Revenue	Credits	NOI	New Prog. Budget	Excess
Residential	$2,390,720	$180,000	$2,210,720	$713,900	$1,298,197
Non-Residential	$396,377	$595,000	-$198,623		
	$2,787,097	$775,000	$2,012,097		

Enterprise Funds

An Enterprise Fund is essentially an accounting system for financial activities associated with a municipal service, in this case, stormwater management. The enterprise fund statute, M.G.L. Chapter 44, Section 53F½, was first enacted in 1986 as a way to allow Massachusetts municipalities to account for a range of financial activities associated with municipal services. Only Massachusetts cities and towns may adopt an enterprise fund pursuant to the law. Special purpose districts may not adopt an enterprise fund, unless permitted by special legislation.

Initially, the funds were most commonly used for water, gas and electric utility companies to account for annual operating costs, not the indirect costs, capital improvements or fixed assets of the service. Over the past decade, Massachusetts municipalities have looked to their sister/brother entities across the U.S. that have been utilizing Enterprise Funds to account for and manage stormwater drainage and other associated service fees.

Why Use an Enterprise Fund?

This accounting mechanism is quite beneficial because it allows the community to see the portion of the stormwater utility's cost that is paid for by user charges; and it helps to make clear what property owners are paying for and what they are getting in return. Under enterprise accounting, the revenues and expenditures for services are separated into separate funds with their own financial statements, rather than commingled with the revenues and expenses of all other government activities. The community decides which stormwater utility costs will be paid for through user fees (e.g. services versus capital costs). Additional advantages of using an enterprise fund include:

Useful Management Information - With the consolidation of revenues and the cost of services and information on the operating performance of the fund, municipalities will have useful information to make decisions on user charges and other budgetary items. They will be able to analyze how much the user fees and charges support the services and to what extent, if any, tax levy or other available revenues are needed to supplement the enterprise fund.

Investment Income and Surplus - Unlike services operating in the general fund, all investment earnings and any other operating surplus is retained in the enterprise fund rather than returned to the general fund at year-end. Once a surplus is certified as available it may be used to fund operating, capital or debt service costs.

Implement Capital Improvements - The enterprise fund will allow the entity (e.g. department or utility) providing the service to better plan for and implement capital improvements because these needs can be forecasted and integrated into the long-term financial management plans (expenditure, revenue and credit planning).

Adopting an Enterprise Fund

A city or town may adopt an enterprise fund by vote of its legislative body, subject to the local charter. Each enterprise fund must be adopted separately with its own vote. The *Enterprise Funds: G.L. c. 44, § 53F½* manual by the Massachusetts Department of Revenue provides the following sample language for a vote to adopt an enterprise fund:

"To see if the (city or town) will accept the provisions of Chapter 44, § 53F½ of the Massachusetts General Laws establishing (the service) as an enterprise fund effective fiscal year (year)."

Once adopted, the community begins the process of establishing the separate fund on its accounting records and identifying the assets, liabilities and equity in other funds if voted by the legislative body to be transferred to the enterprise fund. The community must operate the enterprise fund for a minimum of three years before the provisions may be rescinded like any local adoption law.

Budget

Under the enterprise fund statute, the entity responsible for operating the fund must submit a proposed line item budget to the local executive authority "no later than one hundred and twenty days prior to the beginning of each fiscal year" (March 1). The budget is then submitted to the community's executive authority like any other departmental request for review and appropriation. When preparing the budget, enterprise-related costs already included for appropriation in the General Fund operating budget must not be included for appropriation in the enterprise fund budget.

The budget is subject to the appropriation process. Any transfers among the enterprise fund's line-item appropriations require additional legislative action during the last two months of any fiscal year.

Expenses

All operating costs of the enterprise must be identified in the budget. Any surplus resulting from unspent appropriations as of June 30 is kept by the enterprise fund. At a minimum, common items to be broken out in enterprise fund budgets should include, salaries and wages, expenses, capital outlays, indirect costs, and a contingency for unforeseen events.

Revenues

Revenues may be appropriated by the town's legislative body until the tax rate is certified by the Bureau of Accounts. An estimated increase in revenues above the prior fiscal year's actual revenues must be supported in writing to the Bureau of Accounts using rate analysis, usage data, new rate implementation dates, etc., for tax rate certification purposes. Any surplus is kept by the enterprise fund at fiscal year-end.

As described in the Case Studies (see Appendices), the Towns of Newton and Reading have utilized an Enterprise Fund for their stormwater fees. For detailed descriptions of adoption and appropriations procedures of enterprise funds please review the *2008 Enterprise Funds Manual, G.L. c. 44, § 53F½* here, http://www.mass.gov/dor/docs/dls/publ/misc/enterprisefundmanual.pdf.

Other Financing Options

While the drainage service fee is the most effective way to implement a successful, long-term stormwater management program or utility, municipalities have a range of other financing options to consider when planning their stormwater system requirements and objectives. With the exception of general fund appropriations, however, most of these additional options are project specific; they are not dedicated or guaranteed, they vary from year to year, and are therefore far less predictable than

user fees. For these reasons, they limit a municipality's ability to pay for ongoing service delivery expenses, such as administration and operations.

Still, due to the range of stormwater system needs and expense types, many communities draw from a range of financing options, combining enterprise-based, user-fee revenues with other funding sources. This has been referred to as "blended funding." When setting up a management plan, municipalities could consider the following types of financing options.

General Fund Appropriation

General fund appropriations are a familiar, frequently used method to pay for stormwater management expenses. In most communities, they are used as the primary funding source for stormwater needs. The disadvantages of using general funds to pay for stormwater system expenses is that stormwater needs then compete against other municipal service needs and must be re-evaluated and re-appropriated each year, which does not provide for a stable funding source with which to make long-term plans. Additionally, there is no clear nexus between the source of the funds (which are primarily tax levies) and the uses. Finally, tax-exempt properties do not contribute to the general fund, though they impose costs on the stormwater/drainage system.

Bonds/Loans

A bond is a written promise to repay borrowed money on a definite schedule, and usually at a fixed rate of interest, for the life of the bond. Some types of bonds are tax exempt. Bonds represent a large source of capital, but can be a complex and more expensive way to borrow. The high expense results from the legal and administrative time required for issuing bonds. In some cases voter approval is required for issuing bonds.

A well-known municipal funding source, capital improvement bonds are especially appropriate for covering large capital expenses associated with stormwater management. Capital improvement typically is defined as a non-recurring expenditure or any expenditure for physical improvements, including costs for: acquisition of existing buildings, land, or interests in land; construction of streets and highways or utility lines; acquisition of fixed equipment; landscaping; and similar expenditures. There are two main types of capital improvement bonds for a municipality to consider: General Obligation Bonds and Revenue Bonds. General Obligation Bonds are backed by the "full faith and credit" of a municipality are not secured by a particular source of revenue. The municipality pledges to use legally available resources, including tax revenues, to repay bond holders. Revenue bonds are a municipal bond supported by the revenue from a specific project, such as a toll bridge, highway, or local stadium. A primary benefit for using revenue bonds versus GO Bonds is that they allow the municipality to avoid reaching legislated debt limits. It should be noted that if a municipality decided to use a revenue bond to pay for stormwater infrastructure capital expenses, it would need to keep user fees distinguishable as a revenue source.

Another bond option is a "Double-Barrel Bond": a municipal revenue bond secured by a pledge of two or more sources of payments, typically a user fee and the credit of the issuing government (generally taxes). State and local governments use double-barrel bonds to finance environmental improvements, including stormwater management and utility set-up, and/or the creation of stormwater management districts. The revenue stream pledge may be in the form of multiple taxes,

such as the real estate transfer tax or special assessment taxes. For further information on the use of this type of bond see *The Fundamentals of Municipal Bonds*; "General Obligation Bonds"[3] (http://www.amazon.com/Fundamentals-Municipal-Bonds-Wiley-Finance/dp/0471393657).

The State Revolving Fund (SRF) Water Pollution Control Program was implemented by the 1987 Clean Water Amendments to provide long-term, low-interest loans for capital improvement projects designed to abate point and nonpoint sources of water pollution. The SRF program is administered by states using federal grant money, matching state funds, and loan repayments to fund eligible projects. Massachusetts DEP and the Massachusetts Water Pollution Abatement Trust jointly administers the Massachusetts Clean Water State Revolving Fund (CWSRF), which provides a low-cost funding mechanism to assist municipalities in complying with federal and state water quality requirements. Financial assistance is available for planning and construction of projects, including CSO mitigation and nonpoint source pollution abatement projects (pollution prevention, and stormwater remediation). While the SRF is a viable funding source for many stormwater capital improvement projects, these loans are only available for projects that offer a solution for stormwater quality issues. Many municipalities also have important capital improvement projects that are intended to improve drainage and flooding issues. For further information on this loan program see the DEP State Revolving Fund Program webpage: http://www.mass.gov/dep/water/wastewater/srfinfo.htm.

Grants

Although an attractive source of funding by municipalities in years past, grants for water pollution from the federal government are far smaller than in earlier years with more stringent requirements. In addition, since grants are designed by the awarding agency or organization to meet certain, often specific, goals, they may carry additional mandates and those mandates may be costly to meet. A few notable grant programs still available to supplement a municipal stormwater management fee/utility include:

- *Clean Water Act Section 319 Nonpoint Source Competitive Grants Program*. This grant program is intended to provide supplemental funding for meeting the provisions of section 319 of the Clean Water Act: "implementation of projects that address the prevention, control, and abatement of nonpoint source (NPS) pollution." Grants can be used to finance the development of a stormwater utility and are often used for CIP projects even if the rest of the stormwater management system is funded through another source. Projects must address activities that are identified in the Massachusetts NPS Management Plan and a 40% non-federal match is required from the grantee. Further information regarding this program can be found on the Massachusetts Department of Environmental Protection (DEP) webpage: http://www.mass.gov/dep/water/grants.htm#319. When the Request for Responses (RFR) is issued, it is posted on the Commonwealth of Massachusetts Procurement Access & Solicitation System, at www.comm-pass.com.
- *Coastal Pollutant Remediation (CPR) Grant Program*. The CPR grant program was established in 1996 by the Massachusetts Legislature to compliment the 319 program to help coastal communities abate water contamination problems from nonpoint source pollutants. The CPR program offers funding to Massachusetts municipalities within the designated Massachusetts Coastal Zone to assess and remediate stormwater pollution from paved

[3] Temel, Judy W.; The Bond Market Association; *The Fundamentals of Municipal Bonds*; "General Obligation Bonds;" 5th ed., John Wiley & Sons, Inc.; 2001.

surfaces and to build boat waste pump-out facilities. Projects may not exceed one year in duration and must be completed by June 30 of each year. Further information regarding this program can be found on the Massachusetts Office of Coastal Zone Management (CZM) webpage: http://www.mass.gov/czm/cprgp.htm. When the RFR is issued, it is posted on the Commonwealth of Massachusetts Procurement Access & Solicitation System, at www.comm-pass.com.

- *Transportation Equity Act for the 21st Century* (TEA-21). TEA 21 authorizes over $200 billion to improve the Nation's transportation infrastructure, enhance economic growth and protect the environment. Municipalities can access this source of funding via submitting project proposals to the Boston Region Metropolitan Planning Organization for inclusion in the Transportation Improvement Program (TIP). TEA-21 allows up to 20% of the cost of a transportation facility reconstruction, rehabilitation, resurfacing or restoration project to be used for environmental mitigation, pollution abatement or construction of stormwater treatment systems.

Betterments

Betterments are a well-known way of funding improved or expanded infrastructure through a discrete charge on properties that benefit from the improvements. Each property benefitting from improved infrastructure is charged an additional special property tax. The cost may be paid in full or apportioned over a period of 20 years. In Massachusetts, municipalities may assess a betterments tax through legislative action such as a city council or town meeting vote. The betterments charge does not have to be for the entire cost of the improved or expanded infrastructure, but if it is less than the full cost, a city or town must decide what other funding sources will be used to pay the expense.

Because betterment fees must be tied to the direct benefit of each assessed property within a set timeframe, such a fee is more suited to a smaller area with discrete improvements rather than a generalized area. Often, if betterment fees are used to finance development of larger areas, it can pose severe administrative burdens on the town, and will require both a clear billing system and an efficient management team.

Plan Review, Development Inspection, and Other Review Fees

Municipal development review processes frequently attach fees to various permits to pay for improvements to public infrastructure. The rationale is that new private development often requires new or upgraded infrastructure, including stormwater infrastructure, and that these costs should be borne, at least in part, by the developer. Such fees are integrated into Planning Board Rules and Regulations that specify the requirements and process for development review.

Using development review fees to help finance stormwater systems or stormwater utilities is attractive because the costs are borne by a special user group – the developer. For this reason, using such fees to pay for stormwater upgrades is politically attractive – the public does not need to be charged for the improvements. The disadvantages of this option are that as with many financing tools, developer fees produce a relatively small amount of revenue that is project-specific. Also, in weaker market cities and towns, additional development fees may act as a deterrent to development.

A primary example of communities applying development review fees (also known as impact fees) can be found on Cape Cod. Towns within Barnstable County have been authorized to assess impact

fees by the Cape Cod Commission Act (Chapter 716 of the Acts of 1989 and Chapter 2 of the Acts of 1990) upon certification of their local comprehensive plans by the Commission. This type of fee is a one-time payment made by an applicant to the municipality as a condition of approval on a proposed development. The premise is that the impact fees offset the municipal capital costs of infrastructure necessary to service the proposed development. These funds must be used for governmental services or infrastructure improvements that are affected by the proposed development. Therefore, management of stormwater created by impervious surfaces on a proposed development are an appropriate use of these funds.

There is a significant challenge in relying upon these fees to make real progress in compliant municipal stormwater management, primarily due to the sporadic nature of their receipt. There are only so many development proposals that come before the Planning board per year, thereby providing a fixed, and rather minute, amount of revenue that can be generated by these fees.

Capitalization Recovery Fees

This financing option seeks to recapture public investment for properties undeveloped at the time a major stormwater system improvement was made. Later developers pay a charge to the municipality to help repay the investment. Capitalization recovery fees are appropriate and complementary for municipalities with a stormwater user service fee that does *not* apply to undeveloped properties.

Massachusetts municipalities could structure a capitalization recovery fee as a betterment that is charged to incoming property owners. However, the administration of such an arrangement would be complex: a municipality would first need to bond for the capital improvements (requiring a vote of the legislature), and then assess the betterment on incoming property owners (again requiring a vote of the legislature). For these reasons, advancing this type of financing option is more suited to more centralized forms of local government (e.g., city councils) and less to decentralized forms (e.g., town meeting).

Summary

Although there are several alternative financing methods that may be used in certain circumstances, only a drainage fee structure provides a long-term, sustainable, dedicated revenue source for stormwater management. These funding sources could be considered to supplement a drainage fee, yet it is unadvisable to a municipality to rely upon these sources to solely fund town-wide stormwater management needs.

As with any new fee or revenue source, public understanding and acceptance is one of the most critical aspects for success. The following section provides guidance and recommendations on public outreach and education to support the implementation of a drainage service fee and/or stormwater utility.

Stormwater Financing Module 3: Outreach and Education Program

Q: Hey man, why should we have to pay a rain tax?

A: It's not a rain tax, it's a pollution fee!

This hypothetical exchange underlines the importance of properly framing the conversation. It is practically impossible to defend a "rain tax" as a worthwhile initiative. A "pollution fee" on the other hand is intuitive and understandable. Pollution after all is a bad thing with real economic, environmental and social costs. Language, message, and education are extremely important components in establishing and implementing a stormwater drainage fee or utility.

Overview

It is critical to secure both public (residents, property owners) and internal (municipal boards and staff) support for creating a drainage fee. The general public will be directly affected by the implementation of a fee, so they need to fully understand the need for it and accept the concept. In terms of internal support, ultimately a municipality's legislative body will need to approve the utility (via Town Meeting or City Council vote). This means that politics are an essential piece of the puzzle. Municipal boards have stated that in establishing utilities there are "rarely infeasible technical and legal constraints that cannot be overcome.[4]" However, there are numerous political hurdles to jump over.

There are numerous methods for developing an outreach campaign that endorses a drainage fee/stormwater utility. Each method carries with it its own risks and potential liabilities (e.g. lack of support from the Board of Selectmen, persuasive and influential citizen opponents, or unsympathetic newspaper articles). For this reason, a well thought-out and targeted internal and external outreach and education program is critical to ensuring the successful implementation of a drainage fee and stormwater utility.

This module focuses on both internal and external outreach strategies that municipalities can employ, with a major emphasis on effective messaging. This is especially important in these difficult economic times when municipal and household budgets are under significant strain.

[4] National Association of Flood and Stormwater Management Agencies. Guidance for Municipal Stormwater Funding. January 2006.

Internal Outreach: Building Support

In the early stages of developing a fee system, most of the details are not yet worked out. Therefore, it is critically important to identify municipal stakeholders that will support the concept, and ultimately the final proposal.

In addition to seeking these "concept champions," all involved officials need to understand the basic principles of pollution generated by stormwater, and the critical need for securing long term funding for stormwater management. In addition, these officials also need to understand the development of, and use of a drainage fee (and utility, if applicable), generally. There are a variety of town boards and departments that should be involved, as they ultimately will have some level of responsibility in implementing the fee, including, but not limited to: Public Works, Planning, Conservation, Open Space, and Health Boards/Commissions. In addition, receiving general support by the Board of Selectmen and Town Manager (or Mayor and City Council) is essential as they ultimately make the final decision regarding the approval of a fee.

The following suggested groups and consultants are often found to be very useful in securing widespread support of a drainage fee or utility. The primary advantage of creating these relationships is that one person or department will not have to bear the entire burden of advocating for this funding source from its concept to full implementation, which can be time consuming. It is important to note, again, that all property owners and residents are responsible for the generation of stormwater, therefore there should be a collective sponsorship established from the start of the process.

Stormwater Management Committee

The primary function of a committee or task force is to coordinate the establishment of a drainage fee and to become the primary educators regarding the importance of establishing this long-term funding source. A Stormwater Management Task Force or Committee, whether its ad-hoc or formalized, can make great strides on an issue since all perspectives are brought together where collective decisions can be made. In such as group, resources can be shared and the burden of facilitating such a large process by one person or department is lifted. In addition, these types of committees have been proven to be very effective time and again in breaking down silos that are prominent in Massachusetts, based on our "home rule" and structured departmental organization.

Establishing a committee that is composed of local government officials, AND community and watershed-based stakeholders is important to ensure diverse perspectives and knowledge is brought to the process. Influential organizations and individuals will need to be brought into the process early as they generally have established relationships with critical businesses and property owners that need to be in support of stormwater financing. For example, Chambers of Commerce, business organizations, and active environmental organizations are often important allies in this campaign. Community representatives know what has worked, or not worked, in the past and often know how best to best engage potential opponents in conversation.

One external task that the advisory committee can help with is determining how extensive the need for public education is. As discussed below, the public education component can range from narrowly tailored to very extensive depending on need, budget, and other resources available. Some communities begin the education campaign with very broad and general information on stormwater; in some ways an extension of the public outreach required under the NPDES permit. Other

communities condense the outreach into a focused phase during the development of the stormwater fund concept. With this approach, details of how the stormwater utility could be structured and how the rate structure could work, are added to the more general topics, particularly the benefits of a sustainable and long term funding source for stormwater problems.

Often times a Town Manager, or other municipal official, makes a formal request for staff to establish an advisory or steering committee to develop options for financing. This entity should be called upon to help establish, and participate in, both the internal and external outreach processes. It is recommended that a work plan is established for the committee, to help guide its work in establishing stormwater financing. In addition, committee leader(s) or executors should be selected in order to most effectively manage and coordinate the group.

There are a number of successful examples of Stormwater groups and committees across the Commonwealth whom have come together for the purpose of working collectively on stormwater management issues, as follows:

- Town of Ipswich, MA Stormwater Advisory Committee: Is one of the first stormwater management committees within the MAPC Region. Formed prior to the first NPDES Massachusetts General Permit, the Committee developed their own Coastal Stormwater Remediation Plan to proactively address water quality and quantity issues adversely affecting the Ipswich River. Their current mission is to develop a comprehensive approach to the implementation of the Town's Stormwater Management Bylaw.
- Watertown, MA Stormwater Advisory Committee: This seven Member committee comprised of four citizens at large, three Town Manager appointees one Town Council President appointee, meets regularly – similar to other town boards – to perform the following duties:
  - Identify and advocate for stormwater funding through grants and other sources.
  - Develop educational programs to increase public awareness of stormwater management.
  - Perform tasks relevant to assisting the Superintendent of Public Works with the implementation of best practices for stormwater management.
- City Of Northampton Storm Water Ad-Hoc Advisory Taskforce: this ad-hoc taskforce was formed in 2013 with a specific focus: to recommend "a fair and equitable method to fund stormwater and flood control mandates." Members were appointed by the Joint Committee of the Department of Public Works and the City Council. Once their recommendations for stormwater funding were accepted by the Council, they did not continue meeting.
- Town of Orleans, MA Stormwater Task Force: This group came together in 2013 following a Preliminary Town-wide Stormwater Assessment project to identify and rank outfalls with the highest potential pollutant discharges. The Task Force consists of the Highway Manager, Town Planner, Health Agent, Conservation Officer and the Chairperson of the Marine and Freshwater Quality Task Force. It appears that this ad-hoc group will continue to meet to collaborate on stormwater management programs and projects.

Soliciting Expertise

A content specialist could be solicited to assist in the development of an outreach message or campaign for a fee and/or utility. The content specialist could be a consultant or a municipal staff member to support the local official who is responsible for the overall leadership of program development.

Outside experts can be effective in helping to frame outreach messages and critical discussions. There are quite a few issues that need to be explored, and ultimately understood, by municipal officials such as identifying local nonpoint source issues, stormwater management issues and solutions, and the function and structure of a drainage fee and/or utility. In order to plan effectively for the implementation of a fee structure, it is during this stage that key issues must be surfaced, and critical education regarding stormwater and the importance of a drainage fee be provided. An outside party can ensure equitable group discussions and provide a neutral perspective on contentious issues that may arise between represented departments.

Another form of consultation that may be required is with respect to addressing local politics. A political leader could provide liaison services between those developing the fee system and those whom are to approve it. It is likely that personalities and approaches of people that take on each of these roles will vary due to the difference in mission and perspective. The political liaison could be someone within the municipality (e.g. Town Manager or a Select Board member), a community leader, a political consultant (e.g. from a nonprofit advocacy organization) or even a state Representative or Senator that is involved in local initiatives. This consultant would be brought into the conversation early to understand the pros and cons of adopting a drainage fee and/or utility, in order to best equip them to think strategically about local politics and how to generate support for a stormwater financing system.

External Outreach: Selling the Concept

Once the stormwater committee/task force is assembled and internal support has been established, the development of an external public education campaign can begin. When designing an external or public outreach campaign, it is important to determine precisely what extent of outreach and level of education that is needed within a community.

Just as the makeup of key stakeholders will vary from town to town, the reasons for establishing a drainage fee or utility will likewise vary. In some communities, flooding and transportation impacts may be the most important problem to address with collected fees. In others, degraded water quality or quantity issues may be the primary motivation for addressing stormwater. Often it will be a combination of factors, but there is generally one or two critical issues that will particularly resonate within a community. The advisory committee can help hone in on the most critical issues and goals for a financing system for a particular municipality. Once goals and objectives have been identified, the committee can begin identifying the primary outreach and education audience, and crafting a message that is tailored towards addressing these particular community needs.

Messaging is one of the most important factors when developing a drainage fee or utility. A helpful public outreach and marketing concept to keep in mind is the “social diffusion theory,” which states that once 15% of a community has adopted a new idea or product, it has the critical mass to spread by its own momentum. This theory reiterates the concept that outreach strategies shouldn’t be aimed at too broad of an audience, but rather carefully targeted to audiences that would then perpetuate outreach and education messages.

In terms of crafting n effective message, it is important to keep in mind that, generally, stormwater is poorly understood or not often thought about by the general public due to its “covert” nature. Water quality issues are not typically visible to the naked, untrained eye (e.g., you can’t normally tell a river is polluted by looking at it). In addition, stormwater runoff itself is typically not visible, particularly after it enters an underground system of engineered pipes. Therefore, the stormwater discussions

typically occur after a significant, and often catastrophic, precipitation event in which there were human impacts such as beach or shellfish closures from polluted runoff or flooding events due to inadequate stormwater management and lack of green infrastructure. Adding to this, asking the public to pay for something that hasn't been paid for in the past – and taken for granted - is a steep task. For these reasons, a well planned education program with the right message is a necessary precondition for public acceptance of a fee.

Self-interest and its antagonist altruism are each strong motivators in society. Two of the most effective approaches are heralding the economic and health benefits of fixing stormwater problems. Shaping the message with an eye towards these motivators by explaining issues of importance to the municipality is critical. For example, if your community is currently motivated by economic development and flooding is a persistent problem, the real costs of property destruction and values lost are effective messages. Finding data that shows costs associated with property loss from flooding can make a compelling case for a stormwater fund or utility to solve these flooding problems. Health and safety for families and children are also hard to argue against. For example, the Erase the Waste campaign (see Appendices for templates) focuses on the health problems of stormwater pollution as the primary message in a very successful national campaign. The long-standing pollution issues within our watersheds (Merrimack, Ipswich, Sudbury/Concord, Charles, Saugus, Boston Harbor, and Neponset) are finally understood to be direct contributors to adverse health problems of local residents such as increased molds and particulates causing lung diseases, skin rashes and diseases from contact with polluted water, and flood waters causing public safety concerns.

Three Critical Tasks

There are three broad tasks that need to be completed early on in any public outreach campaign:

1. Identify the make-up of audience and general behaviors,
2. Craft an appropriate message that will resonate with that audience, and
3. Determine the most effective media for communication and interacting with that audience.

Each of these critical steps are outlined in the following sections.

1. Identify the Make-up and Behaviors of Your Audience

Communities are made up of a variety of diverse constituencies with varying and often conflicting interests. Any successful public outreach campaign will need to acknowledge this gradation and work to identify the most significant impacts that will resonate with different stakeholders. This type of analytical work early on in the campaign will allow a municipality to customize the public education and outreach activities as needed, to meet situation-specific needs.

Community groups and demographics will vary from town to town, but will generally include several types of groups that include students, business owners, young families, church groups, single adults, elderly and retired individuals. Each of these groups is characterized by different lifestyles, income and education levels, and different ideas and expectations about what their most desired home life and community character should be. Being able to speak cogently and respectfully to each of these

groups without marginalizing the positions of others is a delicate and important skill that can determine the ultimate success of the campaign.

Once your target audiences and their potential roles have been identified, outreach programs should be expanded to utilize social diffusion principles described previously. Perhaps once 15% or more of a community has accepted a specific message, enough interest may have been generated for the message to become self-perpetuating. This is a critical point in time to include these community leaders in education and outreach programs and solicit their assistance in spreading the word through other avenues. For example, it is possible that these champions may be willing to host a community meeting or dinner at the community or senior center, resulting in additional stewardship.

2. Craft a Message that will Resonate with the Audience

By understanding what issues are most important to these groups and what information they respond to will help you develop a program that maximizes effectiveness while minimizing unnecessary efforts and costs. The following list provides some example questions to ask when developing your public education program:

- What different age groups are prominent in the community that should be identified as target audiences (e.g., schoolchildren, high school students or elderly)?
- Where does most of the community's runoff come from and what are the primary pollutants? For Example: 1) Are dog parks and walks not cleaned appropriately causing high bacteria levels in surface waters? 2) Are residents using inappropriate or excessive amounts of lawn care products creating excess nutrients in waterways? Identifying these issues and causes will help identify the types of community behaviors that must be addressed.
- What associated environmental issues are stakeholder groups most concerned about? (E.g. surface or groundwater pollution, green/open space conservation, water recycling and reuse, etc.).
- To what extent are community members already familiar with stormwater runoff and problems associated with it?
- What types of media are utilized by different groups in the community? (I.e., Elderly residents might get their news from local papers while young adults and students prefer the internet and mobile devices.)
- Are community members interested and typically motivated to participate in informational events such as workshops, community dinners and other events?
- Are there groups within the community that are interested in actively participating in public education efforts? For example, would high school teachers and students be willing to develop a project or public presentation about stormwater runoff?

In addition to addressing important, resonating community issues, it is important to keep in mind there are three basic messages that must be conveyed in order to build support for a drainage fee/utility:

1. ***Stormwater is a problem that all property owners contribute to.*** This is a crucial introductory message that can help identify consensus across constituencies and build solidarity around a common problem. It is important in any public outreach campaign to identify common interests and shared problems that presuppose any demographic or socio-economic differences. In this regard, it will be incumbent upon campaign leads not to single out any one particular group or

marginalize any of its audiences, but rather make it clear that all groups are responsible for producing runoff and consequently share the responsibility for fixing the problems. It is important to understand and to demonstrate this concept for residents in a tangible and credible way with hard data and relatable anecdotal evidence to help residents understand that this "shared burden" is not merely rhetoric in the service of a marketing gimmick. Common and effective strategies for building this type of consensus can be seen in other public health and environmental campaigns that focus on the cumulative costs of the ongoing problems to tax payers and the comparative ease with which it can be mitigated.

2. ***Efficient and successful stormwater management is critical to the community.*** Building off of the solidarity established in the first step, painting a detailed picture of the risks and dangers associated with the status quo is a crucial next step (e.g. increased flooding, river/stream bank and coastal erosion, polluted surface and groundwater). The use of photographs of deteriorating conditions within the community, and the detailed explanations of the causes and processes responsible, is a very powerful starting point. Successful public health campaigns like anti-smoking efforts and energy conservation campaigns that illustrate the dangerous impact on our health and environments if nothing is done to curb the detrimental behavior responsible for it are helpful precedents to look to for guidance.

3. ***Existing funding and management are not remedying these issues or meeting permit requirements***. Often, convincing people that there is an imminent problem can be a formidable task, however many times people can be surprisingly receptive to the agenda. Convincing people that a problem exists is only half of the battle, however; convincing people that they will need to make sacrifices and actively contribute to a solution is an entirely different problem. It will be crucial to carefully and clearly explain how much a proposed stormwater utility will cost and where the costs come from. Additionally, explaining where the money will go and allowing residents to easily see the impact of their contributions will be vital. For this phase it is recommended that residents see clear and simple data on the existing expenses for stormwater programs and the existing shortcomings is an important starting point. Properly walking residents through the subsequent needs and costs of the new program is the most immediate and helpful way to conclude any outreach initiative.

3. Determine the Most Effective Methods of Communication

There are many outreach techniques ranging from formal public hearings or workshops to television ads and articles in community newspapers. Different populations get their information in different ways. Therefore, it is important to learn about what the most effective and impactful media is for communicating with a town's different audiences.

For some populations, the only way to include them in the process is by going to them directly. Whether it's at a church, temple, or community center, getting out into the community is likely to reach a different group of constituents than those that typically attends local government hearings and meetings. For example, building support by holding general information meetings and personal meetings with key business and the Chamber of Commerce organizations is helpful in gaining critical business-sector support for a fee.

According to a recent study conducted by Vanasse Hangen Brustlin, Inc., video and television adds, as well as local newspaper and community letter ads, are the most helpful and preferred media by the general public. Therefore, three primary templates have been provided, as well as other varying templates for municipal use (see Appendices). There are additional education and outreach

templates developed by both the U.S. Environmental Protection Agency, as well as the Water Environment Federation that have proven to be quite effective.

A series of proposed general communications steps are provided below. These steps are offered in an order in which would provide the most effective and least controversial approach to engaging the general public.

a. Workshops

First providing the general public with an outline of the issues and critical need for a long-term fund, generally, is an important step in getting community attention for the issue, and gaining support. It is up to community leaders and/or the stormwater committee whether a large workshop or symposium or smaller, targeted workshops is most effective in their community. Leaders can judge this on past attendance and participation levels in local campaigns or planning efforts, as well as Town Meetings. Regardless of the meeting approach, it is important that each of the above steps have been taken to determine community behaviors about, and perspectives on, the issue to best create effective materials with clear messages to be presented at the workshops. Also, workshops should be planned with an eye towards allowing attendees to interact and provide feedback – in charette format – in order to best create stewardship regarding the importance of funding stormwater management. Again, at this early stage, it is not necessary to have determined and convey the full details of the fee, rather to start out slowly to gain support of stormwater management, generally, and introduce the need and concept of a fee or utility.

Preparation:

- ✓ Advance and Equitable Notification. It is critical to notify community members using various media types (web postings, email notifications via Board/Department lists, mailing, flyers hung at community centers and shopping areas, local paper announcement, etc.), in a manner compliant with Massachusetts Open Meeting Law (if applicable), and accounting for minority languages used in the community (e.g. translated flyers and/or web postings).
- ✓ Americans with Disabilities Act Requirements. Event planners should check with their legal councils or other advisors to ensure they are complying with ADA meeting requirements (e.g. handicapped accessible meeting location, voice-activated online materials for sight-impaired citizens, sign-language and/or translation services at meetings, if needed). Data available within a municipality's Council on Aging, Town Clerk, or sometimes the Planning Department would inform event planners about these needs. The ADA Title II Technical Assistance Manual provides guidance to local officials regarding requirements, including communications and accessibility.
- ✓ Prepared Agenda. It is often advisable to distribute or at least post and advertize an agenda prior to the meeting, if possible so that attendees are prepared for what's to come.
- ✓ Refreshments! If budget allows, it is always important to provide attendees with some refreshments. Sharing food or a meal typically breaks down social barriers and lightens inhibitions people may have came with.
- ✓ Workshop Ground Rules. Reminding attendees to be respectful of others opinions and ideas, to allow others to talk, and to not behave insolently, to name a few, will be important too ensuring effective communication occurs.
- ✓ Limited "Lecturing" / More Participation. As mentioned, in order to ensure public support and interest, it will be important for audience members to not feel "lectured." Providing community members with the space to air concerns and make their voices heard regarding the issue at hand is just as important as providing education on the subject. MAPC's Civic Engagement Guide provide further explanation of this critical concept of ***cultivating***

stakeholders and provides guidance about determining what level of engagement to include in your workshop and outreach program.

b. Press Articles

Assistance from the press can be a critical factor in building support for a stormwater drainage fee/utility. A strong, singular voice is important in ensuring the success of any campaign and a skilled spokesperson should be identified to be the primary point person to the media. Typically a town employee plays this role. Favorable editorials and even letters to the editor from well respected community leaders can play a big role in publicizing the issue of stormwater and building support for addressing it. It should be noted that, on the other hand, negative stories and headlines can greatly undermine an initiative like this. The spokesperson's job is to provide factual and timely information. Therefore, it is important for the municipal stormwater lead or committee to take a proactive role with the press in the very early stages of the development of a fee or utility. A series or articles or editorials outlining the issue, prior to providing any details regarding what is proposed for the fund, will go a long way in both building a rapport with the reporter and publication, as well as "prime" readers about the issue.

c. Follow-up Events

It will be important to schedule events or hold standard meetings (possibly during a scheduled planning or conservation meeting) to follow-up on the initial outreach provided, as described in sub-section a. It is important for the coordinator of these events to seek assistance from the Planning department to determine the most effective meeting strategies. For example, the Planning Department can offer guidance regarding what times of the month and day work best for varying audiences. They may also have an example to offer regarding the set-up of one of their most successful or widely attended meeting or event. In the absence of planning assistance, MAPC staff is available to help in planning an event and often times could include a presentation on the subject within a Subregional or Regional event already planned. A city or town's recreation or conservation committee members should be consulted to see if there may be opportunities to piggy-back on an upcoming event. It is important to think strategically regarding what type of meeting or event would motivate the public to attend. Again, refreshments always help!

In terms of focusing the information presented in this follow-up event, it will be important to provide a refresher regarding the need (water quality/quantity issues and how they are related to stormwater), the lack of long-term funding and management available to address these issues, brief background on the town's efforts in establishing a drainage fee and the rationale, a concise explanation of the proposed approach in laymen's terms, and then time for discussion or a group consultation on particular items. Attendees will want to feel empowered that they are being asked for their feedback rather than preached to about the problems at hand and their responsibility to fixing them. Again, creating ownership of the issue is nearly as critical an outcome as receiving support for the fee.

d. Final Messages

After some consensus has been reached regarding the establishment of a fee, it is important to provide the public with final information regarding proposed rates and administrative structure. It is critical to provide clear information regarding what has been decided and who to contact with questions. Materials developed for public consumption should provide a positive spin on the issue; explaining how the proposed drainage fee will finally provide the town with the funds required to make water quality improvements (thereby ensuring beaches are not closed and rivers are clean for

recreation and fishing), implement recharge systems that replenish stream flow and – in some cases – drinking water sources, and reduce flooding. As noted above, the most effective community media include video and local newspaper articles (web and print). Therefore, these final messages should utilize these media types. Local cable stations can be helpful in providing a media outlet for cable television announcements. This information should occur far in advance of a council/board hearing or town meeting vote on the proposal. Once the City Council, Board of Selectmen or Town Meeting hearing is scheduled, it should be widely publicized, with outreach targeted towards supporting entities. Soliciting supporting testimony from individuals or organizations that may be willing to speak at a hearing, would be highly advantageous.

e. Fee / Utility Notification

Once the drainage fee and/or utility has been approved, the general public should be notified in advance of implementation. Notification within local newspapers and inserted flyers into town/city-wide bills or other mailings (e.g. water bill). There should also information uploaded to the city/town's website regarding the passage of a drainage fee.

f. Fee "Test Run"

Once the details of the drainage fee or utility have been approved and the billing system is ready to be implemented, it's advisable to conduct a test run. Approximately 6 months before the first bills is issued, it is suggested that a new utility or stormwater department issue sample bills comprised of addresses from the advisory committee. This way any glitches can be uncovered internally, prior to public receipt, preventing surprise. The utility's staff will need to be trained in how to answer questions and complaints about the new fee prior to the first real bills being issued. On the day the first bills are mailed, a well-publicized ground-breaking should be considered to explain the issues and need for the fee. It's this type of action that helps people connect the fee to what it will accomplish in the real world such as a capital construction project to reduce flooding.

g. Ongoing Education and Reporting

After the fee has been implemented successfully (typically after the first billing cycle) and/or the utility is up and running, there is still a need for ongoing education and transparent reporting on the program's activities. Ongoing education is needed to maintain support for the utility and there will always be a need to remind people about the connections between their yards and streets and their lakes, rivers, and ocean. It is helpful and encouraging to update residents on the success and impact the new utility has had and is having throughout the year as well. Reminders on best practices for pet waste disposal, impervious surfaces, car washing, and the proper disposal of litter and hazardous waste will be needed over the long term. Bill inserts, school curricula, and newsletters are some techniques that can help get the word out. Additionally, many towns around the country have recently begun creating pages on their websites that have regularly updated information and data on the performance and progress of certain programs and services. This information is often linked to and syndicated through towns' social media presence as well to broaden its reach and impact. Many towns have always published information online and in papers on the performance of schools and state of the municipality's budget, but the increased reliance on internet services has induced a demand by residents and managers to have access to "real-time" and instant information that is easily accessible. Regular updates on the status of utility program and notable projects should be routinely published on a diverse range of digital media for residents to easily find and comment on.

Publicizing successful projects and making sure rate-payers understand what their fees are being used for will reduce the prospect of attempts at pulling the plug on the utility. This communication

can occur in a variety of ways, such as through regular updates to the Town website, through newsletters, bill inserts, or newspaper articles.

Key Examples to Consider

The examples provided illustrate two successful education campaigns that are offered as models to emulate. Both examples highlight key points of success for their campaigns. Their successful outreach templates have been included in the Appendices to be altered (if needed) and utilized in Massachusetts campaigns to support a drainage fee and utility.

Templates from other broad, mass media campaigns regarding stormwater pollution that will be useful in designing a public education campaign have also been provided in the Appendices, as follows:

- "Think Again, Think Blue": a campaign that the Massachusetts Bays National Estuary Program created, barrowing from San Diego's Think Blue mass media campaign, which is now managed by the Pioneer Valley Planning Commission.
- EPA's Public Education and Outreach Toolbox.
- Massachusetts Stormwater Matters campaign: provides various outreach products for members, managed by the SuAsCo Watershed Community Council.

Newton, MA

During the development of Newton's stormwater fund, the City took proactive steps to educate the public on stormwater, and the concept of a fund to address water quality issues and properly manage stormwater on impervious surfaces. This greatly helped to facilitate public acceptance of the utility. First, their outreach program began with the publicizing of informative articles in their local newspaper, *Newton Tab* (see Appendices).

In addition, a local college student prepared a five-minute video segment, which aired on the City's local cable television program, about local stormwater issues in relation to the proposed fee (Newton News). Last, prior to the first stormwater bill, the City sent out an insert in water bills announcing the fund, outlining costs and providing an explanation of the funds need and use.

A critical "selling" point was the support shown by the local watershed association: Charles River Watershed Association (CRWA) and EPA Region 1. These organizations undertook the following important efforts to show their support for Newton's fund, which truly assisted in its City-wide acceptance:

- EPA and CRWA sent letters to Newton's DPW director in support of the stormwater fee; describing critical water quality issues within the Charles River and the significant mitigation measures that the fee would finance.
- CRWA sent out an action alert to Newton resident members, which included basic information about the proposed stormwater fee including rates and billing structure. It also encouraged residents to support the fee, as they did, by contacting their board of aldermen, and offered talking points that described how the proposed fee was fair.

Charlottesville, VA

Although Charlottesville, Virginia is not a New England case study, we have found it to be a very successful model of a larger campaign; inclusive of robust partnerships, varying media messages, and a transparent process. Similar to Newton, MA, Charlottesville also engaged their local clean water NGO partnership; Choose Clean Water Coalition, to help define the issue's, program goals, and identify opposition and supporters. The Coalition understood that the message needed to appeal to the City Council's primary concerns, as well as to generate visible support for the fee/utility from their constituents. Therefore, partners worked with a communications firm to identify the issues that the Council cared about: public health, flooding, aging infrastructure and civic pride. The primary campaign message was:

> *"Stormwater management is a must for Charlottesville citizens because continuing to ignore the problem will put property values and public health at risk. It's a straightforward issue with a simple solution."*

This message was boiled-down to the following campaign slogan and logo: "*What Happens Below Matters Above: Keep Charlottesville Clean."* This slogan was applied to all campaign outreach materials, including:

- Two-full page ads placed in local papers, co-signed by a coalition of diverse local and regional supporters.
- A concise one-page fact sheet distributed to coalition members' networks, at meetings and outreach events, and shared with the City for its official outreach.
- Campaign stickers worn by supporters attending the public comment meetings. This is an important and easy way to show broad support for your issue. Despite a few opponents who spoke out against the proposal, council members were able to discern that the vast majority present were there to support the utility proposal.

Stormwater Financing Module 4: Administration/Management

The purpose of this section is to identify and examine various organizational structures to manage a community's stormwater management program. As described in Module 1, there are multiple benefits to establishing a stormwater utility, which is the concept that is of primary focus in this Starter Kit. Municipal and regional governments across the U.S. have embraced the notion that water quality is not merely a governmental concern, rather something contributed by all property owners, and that therefore stormwater management is a service that all benefit from, quite similar to the provision of drinking water services. However, there are specific interests and constraints that municipalities may face that would not make this approach possible. Therefore, this Module also describes other varying administration and management approaches.

Administration Options

There are varying options to administering and managing a stormwater utility, many of which are currently utilized in other areas of the United States. Administrative options include a single municipality, sharing services among multiple municipalities, a watershed-based approach, and a regional entity (4 or more municipalities). Each option is outlined in Table 4.1 below.

Table 4.1. Administration Options – Single Municipality

Options	Included Entities	Comments	Issues
Existing Department or Municipal Utility	Public Works, or Water Dept. for example	Good option if stormwater is a well established program	Capacity for new work?
Committee/Task Force	Public works, planning, conservation, finance department, etc.	Specific responsibilities would have to be documented for each department and their respective budgets increased	Designated Manager Needed
New Utility	New "Stormwater Department"	This would be directly funded by the fee.	Start-up costs
Multi-Municipality	Two or three adjacent communities	An option where other services, like a regional high school, are shared. Communities are accustomed to working with one another	Determining "Lead" Community & responsibilities
Watershed-Based or Regional Utility	Several Municipalities	Administration based on geographic scale.	Determining a Lead entity, finance management across communities.

As noted, there are varying approaches for establishing administration. However, essentially, there are two primary administrative categories for establishing a stormwater management program within a single municipal entity, as listed below.

- Utilizing Existing Resources:
  - Existing Municipal Department
  - Stormwater Management Committee/Task Force
- Establishing a New Entity:
  - New Stormwater Management Department
  - Stormwater Utility
  - Watershed or Regional Utility

Each of these options will be described in detail within the following sections.

Utilizing Existing Resources

This option entails utilizing an existing municipal department and/or set of staff to come together to administer the stormwater management program and fee system.

Existing Municipal Department

Every community has traditionally delivered some degree of stormwater service, and since 2003 that service has been increasingly regulated by the federal EPA General Permits required for MS4 systems. The Department of Public Works (or Highway Department) is the usual municipal department responsible for meeting the general operational requirements such as street sweeping, cleaning catch basins, etc. Assisting with enforcement and regulation may be the Town Engineer, Building Commissioner/Inspector, and Conservation Commission/Agent. With the establishment of a stormwater utility fee, a community may decide to keep the program within the existing department. This may be the case particularly if the existing work program is extensive and is being carried out efficiently and effectively. The stormwater department may share some of its staff with other programs, but it would have dedicated primary staff and budget.

One variation of the existing department model is an existing municipal water department or wastewater/sewer department. One benefit is the existing billing process that could be used by the stormwater utility. This may be useful because tax exempt properties do not typically receive tax bills, but every property that receives water or wastewater service has an account.

Multiple-Department Task Force

Acknowledging the variety and amount of work to be accomplished under the proposed MS 4 Permits, a community may determine that the most efficient approach is to form a multi-department stormwater task force. Stormwater-related activities include not just the usual operational duties of street cleaning and catch basin cleaning. There are requirements for an updated Stormwater Management Program (SWMP), system mapping, public education and outreach, public participation and involvement, outfall monitoring, revising and updating local regulations and managing construction activities. Capital construction, including design and construction, is another major activity center.

Some municipalities may decide to administer this work through a multi-disciplinary task force comprised of representatives from various municipal departments. Specific responsibilities would be assigned based on area of expertise. A program or task force manager would have to be appointed to coordinate the work. Participating departments could include: Public Works/Highway Department, Engineering, Planning, Conservation Commission, Board of Health, Information Technology/GIS, and possibly someone from the School Department or Library who might assist with outreach and/or public education. Depending on the work program, the composition of the task force could be adjusted.

A major challenge would be to ensure that the participating personnel have the time to carry out the assigned specific stormwater tasks. Administrative time to determine tasks and budget and follow-through might require additional resources. Individual department budgets would also need to be adjusted to account for increased workload.

The benefit of this option is that it helps to integrate the stormwater work program across the entire municipal workforce, helping at least initially to raise the profile of the work and to signal the importance of the stormwater utility. It also provides the opportunity to perhaps fully fund a half-time position (such as Conservation Agent) if sufficient additional work is identified. It also allows for staff to participate in an "as needed" basis. A GIS staff person may be required only a few hours a month to maintain the system map, once developed.

Establishing a New Entity

This option includes a commitment on the part of a municipality, or multiple municipalities in the case of a regional entity, to establish a new department or utility to collect fees and administer the stormwater management program. This new entity could also be in charge of complying with MS4 permit requirements such as administering a water quality monitoring program and managing components of a water quality/quality improvement program, to accompany traditional stormwater management responsibilities.

New Stormwater Department

Depending on the results of the capacity assessment, a community may determine it is more straightforward and efficient to create an entirely new Stormwater Department. This department would receive most of the drainage fee funds, and would manage all stormwater activities. The benefit of this administrative option is that it would establish stormwater as a department level priority, on par with public works or the highway department. Disadvantages include establishing an additional administrative entity (additional bureaucracy) and possibly duplicating equipment purchasing, staff and training.

Municipal Stormwater Utility

Establishing a single, municipal stormwater utility is the most efficient type of administrative option for stormwater utilities in Massachusetts. In this case, a single municipality provides stormwater services and establishes and manages the utility fee solely for the single community.

As described in Module 1, a Stormwater Utility is a special entity set up to manage a drainage fee, or other sources of funding, which is used specifically for stormwater management. It is a dedicated service unit within the municipal government.

Local examples include Reading and Newton, Massachusetts (provided as case studies in Appendices). The advantages to a single municipal approach are outlined in the table below.

Table 4.2. Administering a Stormwater Utility by a Single Municipality

Stormwater Utility – Single Municipality	
Advantage	Comments
Funding	Funds raised in the community stay in the community
Control/Political Issues	Community maintains control to ensure compliance with permit conditions Local control for all decisions Local control on setting project priorities Avoids political problem of creating a new entity-"more bureaucracy"
Administrative Costs	Depending on the specific organizational structure, may be minimal because it takes advantage of existing administrative resources

For Massachusetts communities without much experience in regional services (such as a regional school system), forming a single municipal utility will be, at least initially, very attractive. The concept of Home Rule is deeply ingrained in many communities, and the single municipal model supports this by maintaining control for all aspects of the stormwater program within the community boundaries.

Multi- Municipal Option

Smaller than a regional stormwater utility, this model anticipates cooperation between two or three neighboring communities. These municipalities may be accustomed to coordinating services, such as a regional school or water services.

Table 4.3. Administering a Stormwater Utility by a Multi Municipality

Stormwater Utility - Multi-Municipality (2-3 Communities)	
Advantage	Comments
Funding	The majority of funds raised in the community would stay in the community
Control/Political Issues	The community would determine which stormwater services it would share or contract Politically, may be easier to adopt than a regional utility
Administrative Costs	Not a separate organizational structure; would use existing municipal department

The benefit of a multi-municipal stormwater utility administrative option is that the individual municipalities can continue with the operations currently in place, while sharing staff/equipment and the costs for new services, or contracting with another municipality in a vendor-like arrangement for additional services. This could provide the opportunity for efficient delivery of services, less duplication, and the opportunity for one or another community to "specialize" in particular aspects of the stormwater program. An example is hiring an additional GIS person for mapping services to be shared by the 2 or 3 municipalities if one community already has GIS in-house. Politically, it also may be easier to gain support for because there is still local control over the majority of the funds and the overall stormwater program.

There are also required elements that lend themselves to a multi-municipal approach. One example is the public outreach and education tasks. One of the municipalities could develop a public education program and provide it to the others, either through a shared-cost arrangement, or fee for service. Another service that could be shared is water quality monitoring.

Each municipality is responsible for meeting the NPDES MS 4 requirements, so there must be written agreements outlining the specific details. These will need legal review and approval as required by each municipality (Board of Selectmen, City/Town Council, Town Meeting as applicable). The issues to be addressed in development of the agreement include:

- What is the service to be provided?
- What is the remedy if the service is not provided satisfactorily? Who determines this?
- Can a member municipality leave the program? Following what process/procedures?
- Would outside contracts (third party) be allowed, and who would do this?
- How would the agreement be amended?
- Would other municipalities be permitted to join? What is the process for this?

Watershed or Regional Option

Although stormwater utilities in the US are often administered at a municipal level, there are examples in states like Florida, Texas and Washington where the utility has been established at a larger geographic or political level, such as around a watershed or county system. These utilities take a multi-jurisdictional approach to stormwater management and the funding to support their work. Additionally, in some cases these "regional" stormwater entities have been created from as an entirely new structure while in others they have developed overtime as separate municipalities and/or counties have come together both for cost efficiencies and program effectiveness. As such, the term region can be quite dynamic and is used broadly to define a situation where three or more separate organizations join together to address the issues of addressing stormwater quality and quantity.

Purpose/Goal

The motivation to develop a regional approach to stormwater management is similar to other current initiatives looking at regionalization. These include:

- *Cost Efficiency* that results from the ability to reduce costs by eliminating or sharing services, and through the opportunity to create more competitive bids for services, capital improvements or materials.
- *Program Effectiveness* due to the ability to leverage or employ more specialized or professional levels of service that support similar work across several partnering organizations.
- *Shared Goals and Challenges* that face cities and towns, and that can be addressed in a more effectively in a cooperative fashion rather than at an individual level. These may be existing responsibilities as well as new requirements.

Stormwater itself also lends itself to a broader context since stormwater is part of a hydrological cycle that does not adhere to political boundaries. Its context is likely to be both larger and smaller than a municipal or city boundary. This is most typical in the case of a watershed. The watershed for a particular water source reflects a drainage area the results from the topology and geologic function of a surrounding landscape. The watershed boundaries typically meander and do not align with municipal boundaries. Cities and towns can be located in or multiple watersheds.

Regionalization Framework

There exist several avenues in Massachusetts that could be used to implement a regional approach to stormwater management. The existing mechanisms are available to a group of municipalities either through a form of direct agreement or through state statutes. The primary approaches are:

- *Mutual Aid Agreement*: These agreements involve cities and towns lending service to one another without the requirement of payment. Also known as service exchange arrangements, mutual aid agreements typically involve sets of municipalities agreeing the sharing of equipment or services relative to the occurrence of a special event or circumstances (e.g., fire or police emergency).
- *Shared Service Agreements*: The Shared Service Agreement is a formalized contractual association between municipalities where a materials or services are shared for an agreed price. These agreements can be structured as a one-way purchase, as a ongoing relationship where transfers occur on as needed basis or as a mechanism for the joint procurement by the involved cities and towns for materials and services that would be a benefit to all. Although costs and other associated factors (e.g., liability) is shared by each municipality, under a shared service structure, one municipality (or host agency) ultimately bears responsibility for the transaction.
- *Regional Districts*: Another approach is the creation of a new entity or organization, rather than relying on existing municipalities or organizations. This new entity, which would be a regional district, can be created under state law, however, they do require specific approvals at the municipal level and are directed by the law regarding governance and any assessment mechanisms. A new district also would likely mean a reduction or an elimination of municipal control over the services to be provided by the district.
- *Consolidation*: Special legislation may be used as a way to create a new regional organization between several municipalities. This is likely an avenue when looking to regionalize a service not addressed by state law. Although the power of cities and towns to create a new governmental organization is not explicitly prohibited, most municipalities look to special legislation if services are to be consolidated under a new structure.

Given these approaches, the framework for a regional stormwater management approach could take one of many forms. On one end, a new regional organization could be formed to administer and manage the utility as well as be responsible for capital and maintenance work. On the other end, the group of interested cities and towns could partner around shared obligations, like public education or development and adoption of consistent stormwater-related bylaws. Broadly, however the regional structure could be grouped into two main categories: Shared Program(s) and Fully Regional Program.

Shared Stormwater Management Program(s)

A shared program structure would include municipalities looking at specific categories under a stormwater management program and cooperating around one or multiple categories. For example, a group of municipalities may each be contracting for catch basin cleaning services, a practice will could be required to occur more frequently under a new MS4 permit. These municipalities could band together and instead of contracting for the more frequent services individually, they could release a joint procurement and share a specific contractor through the use of Shared Service Agreement. Similar examples could be created around water quality testing, public education and training for staff in charge of stormwater management.

A shared program could also take advantage of shared service agreement to create a more formal arrangement around categories under a stormwater management program. For example in-house engineering may be stronger in one municipality or another and the agreement could create the opportunity to share this engineering expertise on an on-call basis.

Some examples where this approach is being used currently, although not directly related to stormwater management, are:

- *Braintree, Quincy Weymouth Joint Procurement for Solid Waste and Recycling:* The Towns of Braintree and Weymouth and the City of Quincy joined together to procure a single contract for curbside pickup of solid waste and recyclables in the three municipalities. In June 2008, they signed a contract with Capitol Waste and have enjoyed savings from the use of their buying power. It also assisted the three municipalities in moving to a Single Stream Recycling program.
- *Regional Housing Services Office (RHSO):* The RHSO serving the Towns of Bedford, Concord, Lexington, Lincoln, Weston and Sudbury receive administrative housing services for annual fee per Inter-Municipal Agreement including: monitoring, HOME program, local support, regional efforts and resident selection. The Town of Sudbury provides the housing services through the RHSO and the work is supported through a related revolving fund.
- *The Cape Cod Commission Project STORM (Stormwater Outreach for Regional Municipalities):* Project STORM is a collaborative effort among towns on Cape Cod for the sharing of resources, ideas, and solutions for their stormwater management programs and is a central source of information on effective means to control impacts of stormwater pollution. The project provides assistance to towns that must comply with EPA Phase II stormwater regulations, and is partnered with AmeriCorps Cape Cod members, who have supported the effort by assisting towns with stormwater mapping and the identification of catch basin and outfall locations.

Fully Regional Stormwater Management Program

A fully regional stormwater program would be one where the entire set of services under a stormwater management program would be consolidated under a central organization. This could be vesting responsibility to a specific municipality that then provides the services across a set of municipalities. It could also include the creation of new organization that would be separate from the cities and towns involved using either a regional district approach or the creation a special district.

A fully regional stormwater program would likely require more to initiate and coordinate than would be a shared programs. A key piece here would be defining the geography or district that the organization would serve. The outer boundary formed by a set of municipalities could define the district, or if a watershed approach is being advanced, the district could be defined by a watershed's limits. Additionally, if a stormwater system (e.g., drains, pipes, outfalls) serves only a portion of the cities and towns involved, the district may just include these areas.

Examples of Fully Regional Programs of municipal services and stormwater utilities include:

- *South Shore Regional Emergency Communications Center:* The South Shore Regional Emergency Communications Center combined the 911 emergency call centers for the towns of Cohasset, Hingham, Hull and Norwell into a single regional dispatch location. The center was formed through special state legislation and an intermunicipal agreement.
- *The Brevard County Stormwater Program (BCSP)* in Florida was created in 1990 and accompanied by the establishment of a stormwater utility to fund program activities. In 1999, the county program was joined by the City of West Melbourne and the Town of Malabar to create a regional coordinated stormwater program. The program uses an ERU approach based on the typical impervious square footage of a single family home and is administered by the County. The program also features a credit program that provides a reduction in stormwater assessments for various levels of stormwater treatment implemented and maintained by property owners.

- *Yakima County, WA,* serves the Regional Stormwater Lead on behalf of the cities of Yakima, and Union Gap and urban Yakima County. The county is vested responsibility through an Intergovernmental Agreement to administer the stormwater program in compliance with the state's NPDES Phase II permit. Through this role, the county development a stormwater management plan, mapping resources, educational materials, and developed procedures for construction and post-construction water management practices among others.

Legal Authority

The legal authority to advance a Shared Program(s) or a Fully Regional Program is enabled by the following set of state laws and statutes:

- *Intermunicipal Agreement:* Housed in MGL, Chapter 40, Section 4A, the intermunicipal agreement (IMA) allows two or more cities and towns to act in unison and in line with what a single municipality is permitted to do. Upon approval by the "chief executive officer of a city or town, or a board, committee or officer authorized by law to execute a contract in the name of a governmental unit", the group of municipalities may enter into mutual aid or shared service agreements, with guidelines such as maximum terms (i.e. 25 years) and financial liabilities for those involved. One limitation under the existing IMA legislation is that municipalities do have the explicit power ("joint powers") to form new entities.
- *Special Legislation:* It is within the powers of cities and towns to petition for special legislation that would enable the creation of regional entities. If a set of municipalities was to draft special legislation such as a home rule petition, it would have to be approved by the municipal legislative body and then submitted to the state legislature for approval. In the case of stormwater, it would be important to coordinate with the Executive Office of Energy and Environmental Affairs (EOEEA) and the Department of Environmental Protection (DEP) as both would comment, and potentially lend support, to the petition for special legislation.
- *Special Districts:* There are statutes in the state's general laws that authorize municipalities to create districts that can serve a regional function. These currently include such districts as Regional School Districts, Regional Water and Wastewater Districts and Veterans Districts. However, the regional management of a stormwater program is not included in this category, but it presents itself as an option for more consistent creation of such districts. For example, there may be the potential for stormwater to be addressed under the Regional Water and Wastewater District.

Authorization: Bylaw/Ordinance

In order for a municipality to establish a drainage fee and/or stormwater utility, it must be authorized in their stormwater bylaw/ordinance or other law that specifies stormwater management procedures. For example, some municipalities may not have a separate stormwater bylaw or ordinance, however stormwater management may be prescribed in its General Bylaw or Zoning Code.

For example, the Town of Brookline does not have a separate stormwater bylaw, rather, stormwater management is included as an article in the Town's General Bylaws, introduced as follows:

> *The purpose of Section 8.26.1 is to eliminate nonstormwater discharges to the Town of Brookline's Municipal Storm Drain System (storm drain).*

Interestingly, Brookline defines the term "non-stormwater discharge" as: "Discharge to the storm drain not comprised entirely of stormwater." Stormwater is defines as "runoff from precipitation or snowmelt." Therefore, Brookline makes a distinction regarding stormwater – as a natural occurance that should only contain rainwater or snow in its natural form, and what is often classified as stormwater pollution in other municipalities as "non-stormwater discharge." This nuanced difference is important to note, as a campaign for a drainage fee in this community may only include "non-stormwater drainage." Most importantly, the bylaw does not authorize a drainage fee or utility.

The City of Newton amended its Zoning Code in 2006 to ensure that the proposed stormwater fee was authorized. The following language was instated into the Code:

> Sec. 29-80. Sewer /Stormwater use charge.
>
> "(a) Every estate whose building sewers discharge directly or indirectly into public sewers of the city, shall pay a charge for the use of main drains, stormwater facilities and sewage works."

In the absence of both, a municipality must develop a new bylaw/ordinance that is specific to stormwater management, in order to include language regarding the authorization of a drainage fee/utility. Example language regarding this authorization may look something like the following:

> ADMINISTRATION
>
> Stormwater Utility. The *[Stormwater Authority]* may adopt, through the Regulations authorized by this Stormwater Management Bylaw, a Stormwater Utility pursuant to M.G.L. Chapter 83 Section 16 and Chapter 40 Section 1A. The *[Stormwater Authority]* shall administer, implement and enforce this Utility. Failure by the *[Stormwater Authority]* to promulgate such a Stormwater Utility through its Regulations or a legal declaration of its invalidity by a court shall not act to suspend or invalidate the effect of this Bylaw.

Examples of these, and other relevant bylaws/ordinances, can be found in the Appendices.

Stormwater Financing Kit: Appendices

STRUCTURING A STORMWATER UTILITY

Town of Reading, MA

April 30, 2009

Discussion Topics

- Joe Delaney – Development of the Storm Water Utility
- Kim Honetschlager – GIS use in program development/implementation
- Ted McIntire – Program implementation and lessons learned

Establishing the Storm Water Utility

- What to Expect
- Planning for the Storm Water Program
- Developing Storm Water Utility Parameters
- Getting Program Approval
- What Can Go Wrong

What to Expect

- Plenty of time
- Local opposition
- Delays
- Money

Planning for the Storm Water Program

- Establish a Storm Water Committee
- Review universe of funding options
  - General fund
  - Existing enterprise fund
  - New enterprise fund
- Make recommendation
- Get early buy-in from decision makers

Developing Storm Water Utility Parameters

- Determine program costs
  - Labor
  - Expenses
  - Equipment
  - Capital
  - Other

Developing Storm Water Utility Parameters

- Establish rate setting criteria
  - Simple to implement
  - Equitable to ratepayers
  - Defensible
- Determine fee structure
  - Exemptions
  - Flat fee vs. variable fee
  - Abatements
- Document and obtain buy-in

Getting Program Approval

- Public Education
- Town Meeting/City Council approval establishing an Enterprise Fund
- Major issues
  - Tax vs. fee
  - Tax deductibility
  - Applicability to non-profits/Town properties
  - Unfunded mandate
  - Legality

What Can Go Wrong

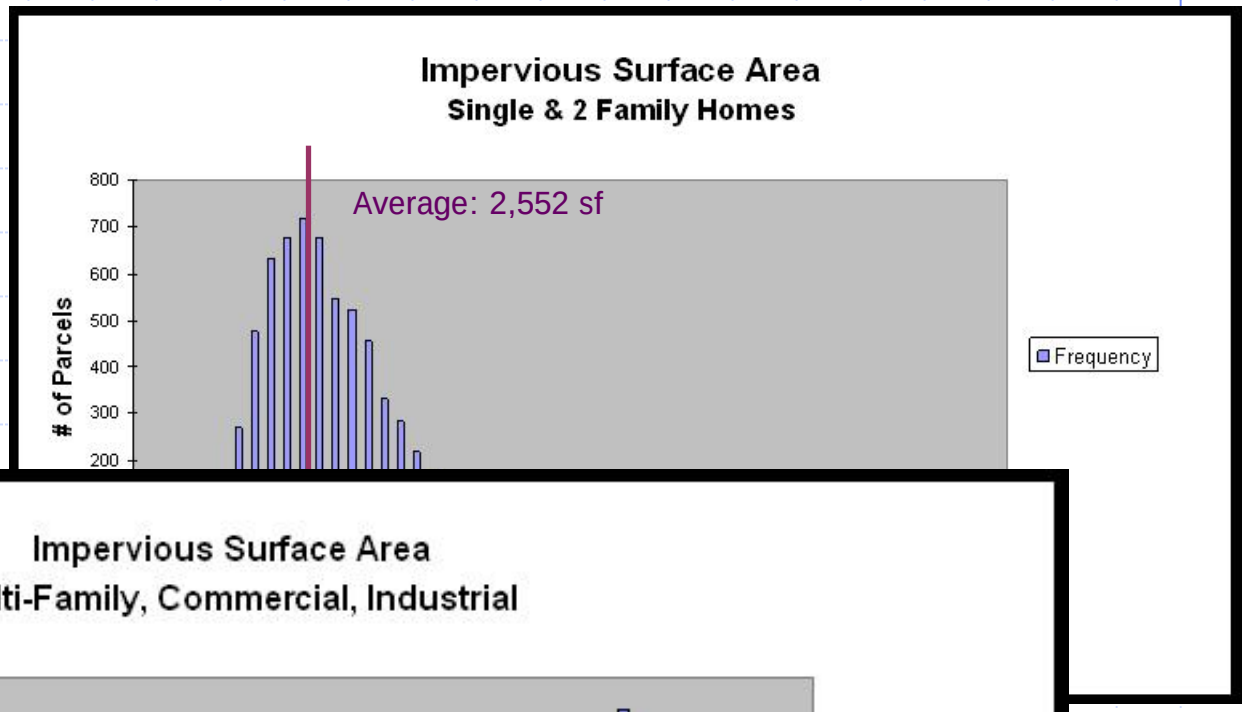
- Not doing your homework
- Non-defensible program costs and rate structure
- Program opposition
- Lawsuits

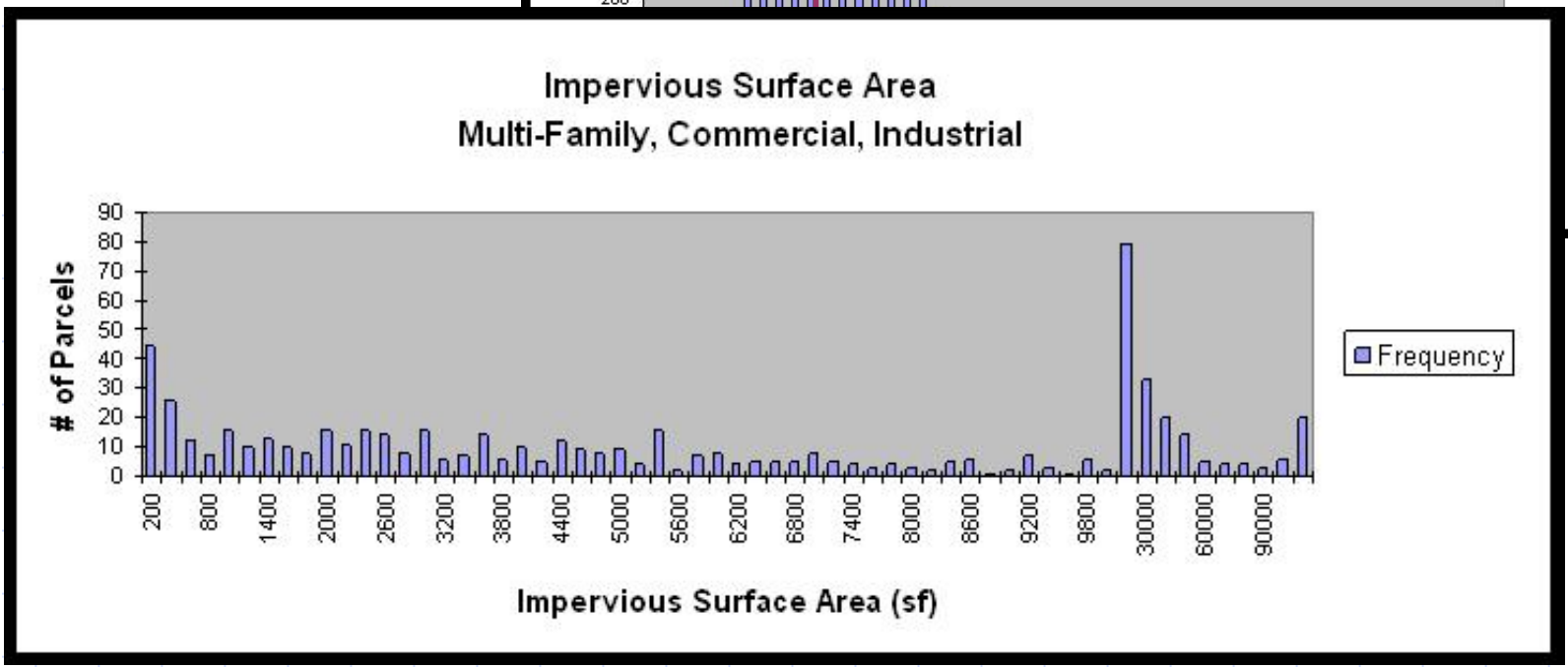
Why Base Fee on Impervious Surface?

- Difficult to “meter” stormwater
- More impervious surface = the more runoff = more pollutants going into water bodies
- Well established nationally. Over 400 stormwater utilities nationwide. Few in New England.

So Where does GIS Come In?

- **GIS used for preliminary calculations to develop methodology**





- **GIS used to calculate and apply fee**

Fee Calculation Steps

1. **Calculate average impervious surface area for residential parcels = “storm water unit” (2,552 sf in Reading)**

2. **Determine total # of storm water units on all parcels in town**

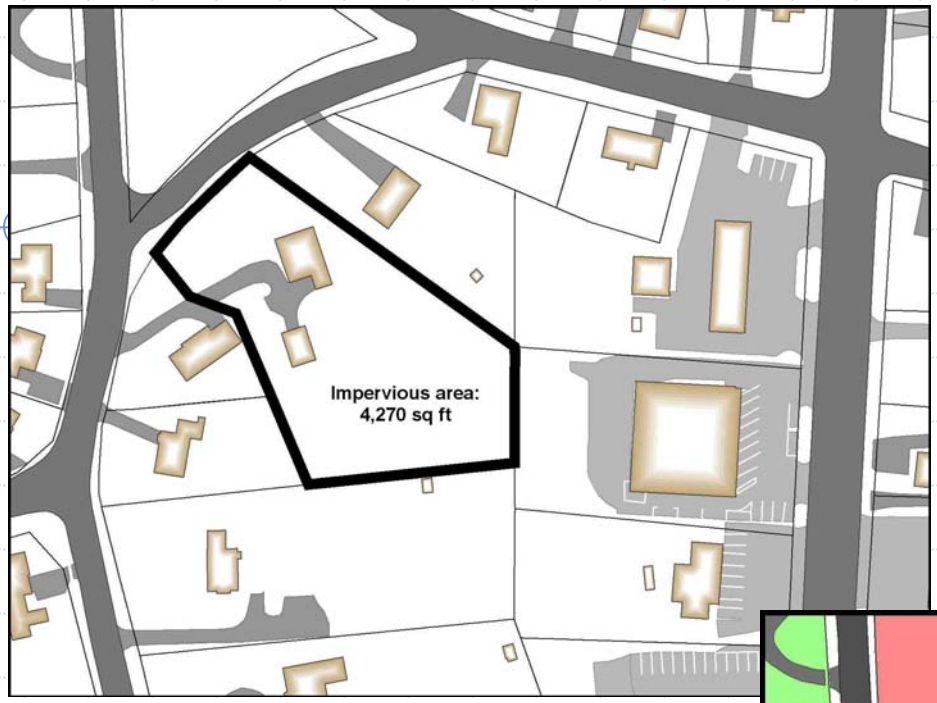
3. **Divide the total revenue to be generated by the total number of storm water units to determine the required fee per storm water unit**

4. **Increase the fee to cover abatements & non-payments & to build reserve fund**

Step 1: Orthophoto features captured as GIS layers

- GIS layers developed by tracing features visible in orthophoto.
- Impervious surfaces = building footprints, private roads, driveways, parking areas

* Analysis was done using 1998 orthophotos.

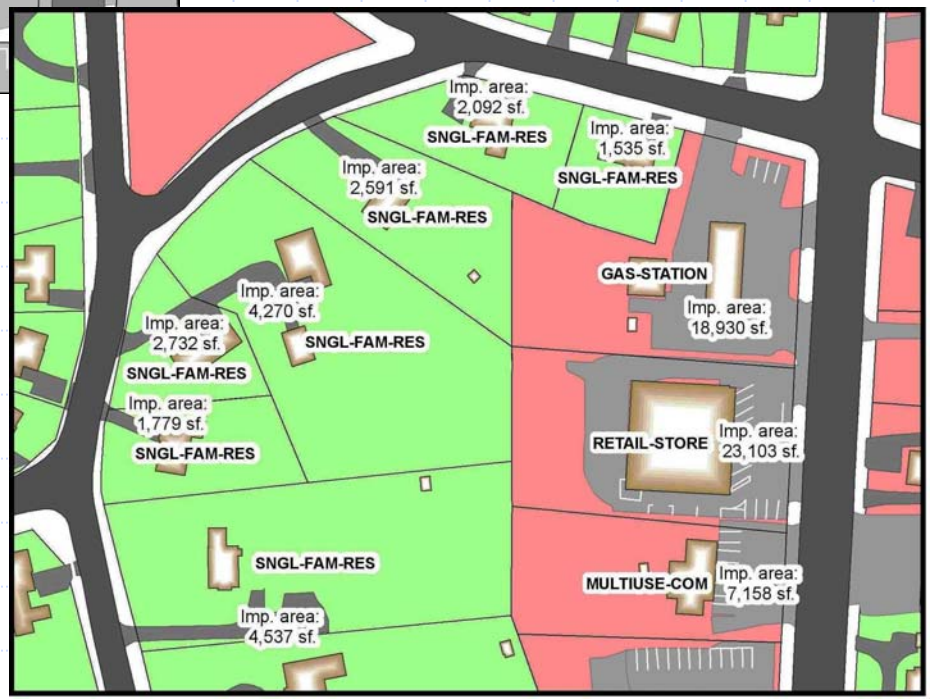


Step 2: Calculate Impervious Surface Area

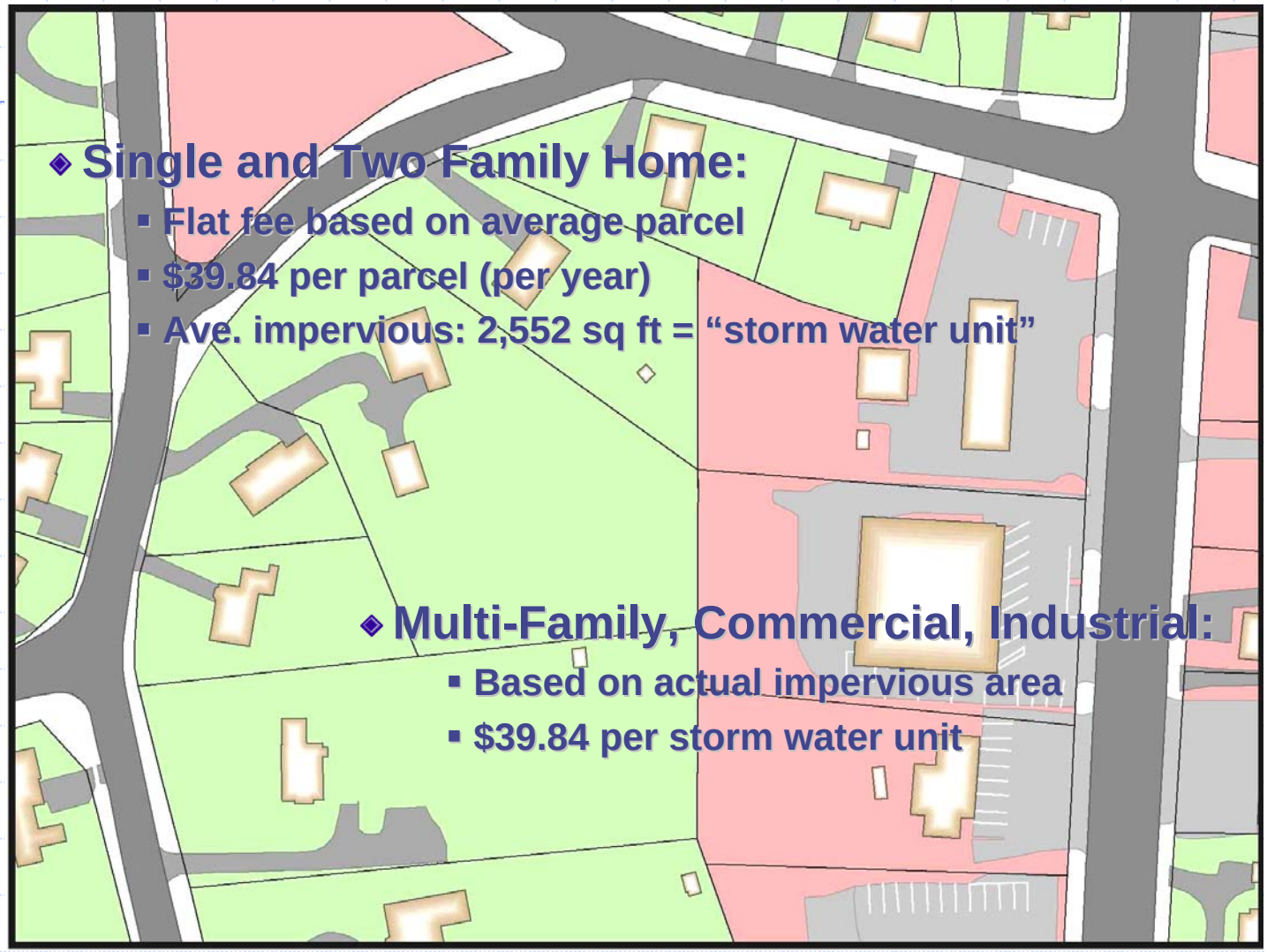
- Use parcel layer as “cookie cutter” & sum impervious surface area for each parcel.

Step 3: Join Assessing Data

- Join assessing database to GIS parcel layer by parcel ID.
  - Land use code
  - Owner name & address

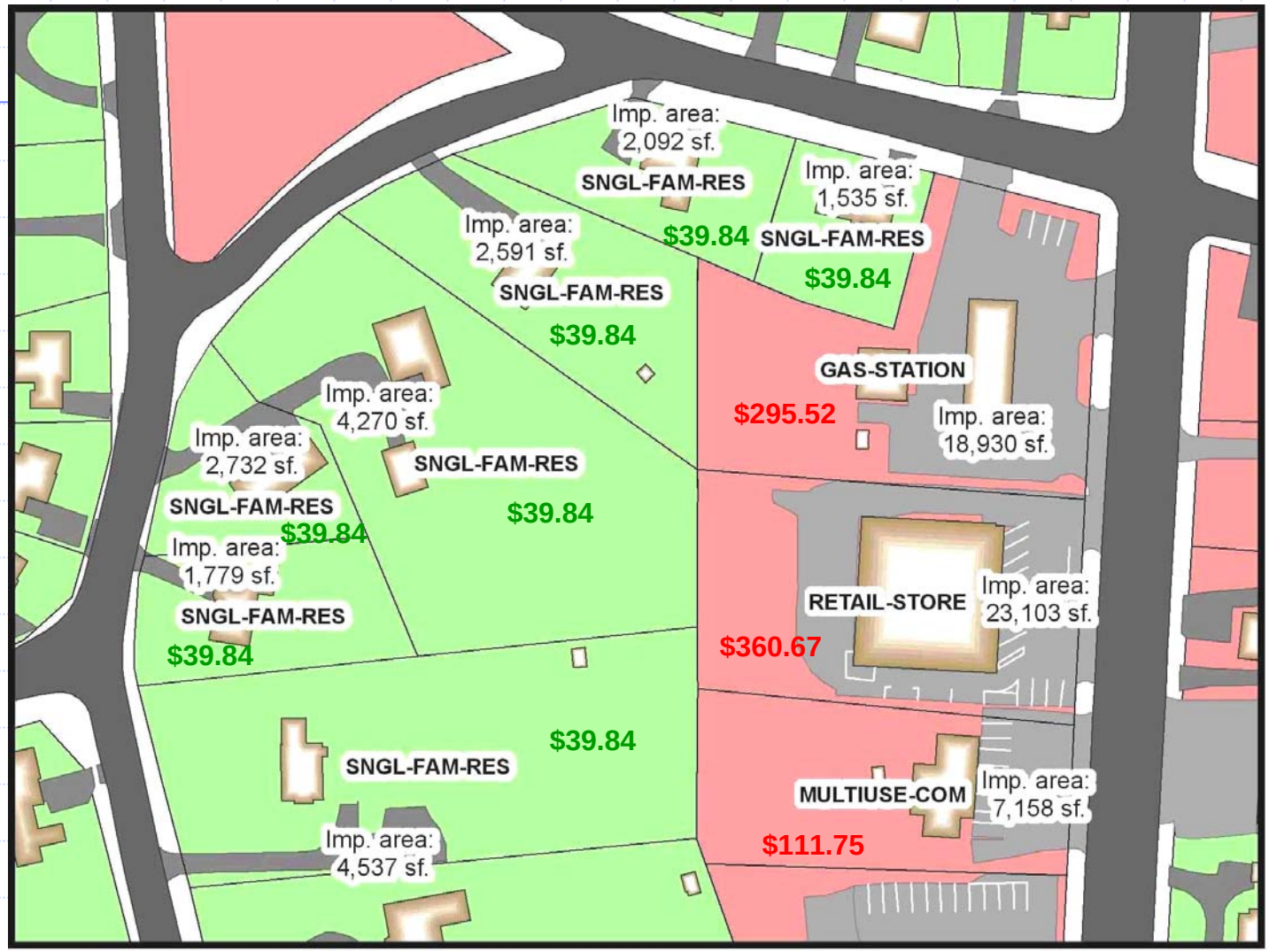


Step 4: Calculate Fee Based on Land Use



- **Single and Two Family Home:**
  - Flat fee based on average parcel
  - $39.84 per parcel (per year)
  - Ave. impervious: 2,552 sq ft = “storm water unit”
- **Multi-Family, Commercial, Industrial:**
  - Based on actual impervious area
  - $39.84 per storm water unit

Step 4: Calculate Fee Based on Land Use



Will this approach work in your community?

- If you have good GIS data, yes
- If not – look for other sources
  - Sample data, i.e. a subset of parcels in town
  - Assessing data only, e.g. lot size, zoning, and land use
  - Other impervious surface data sources, e.g. MassGIS

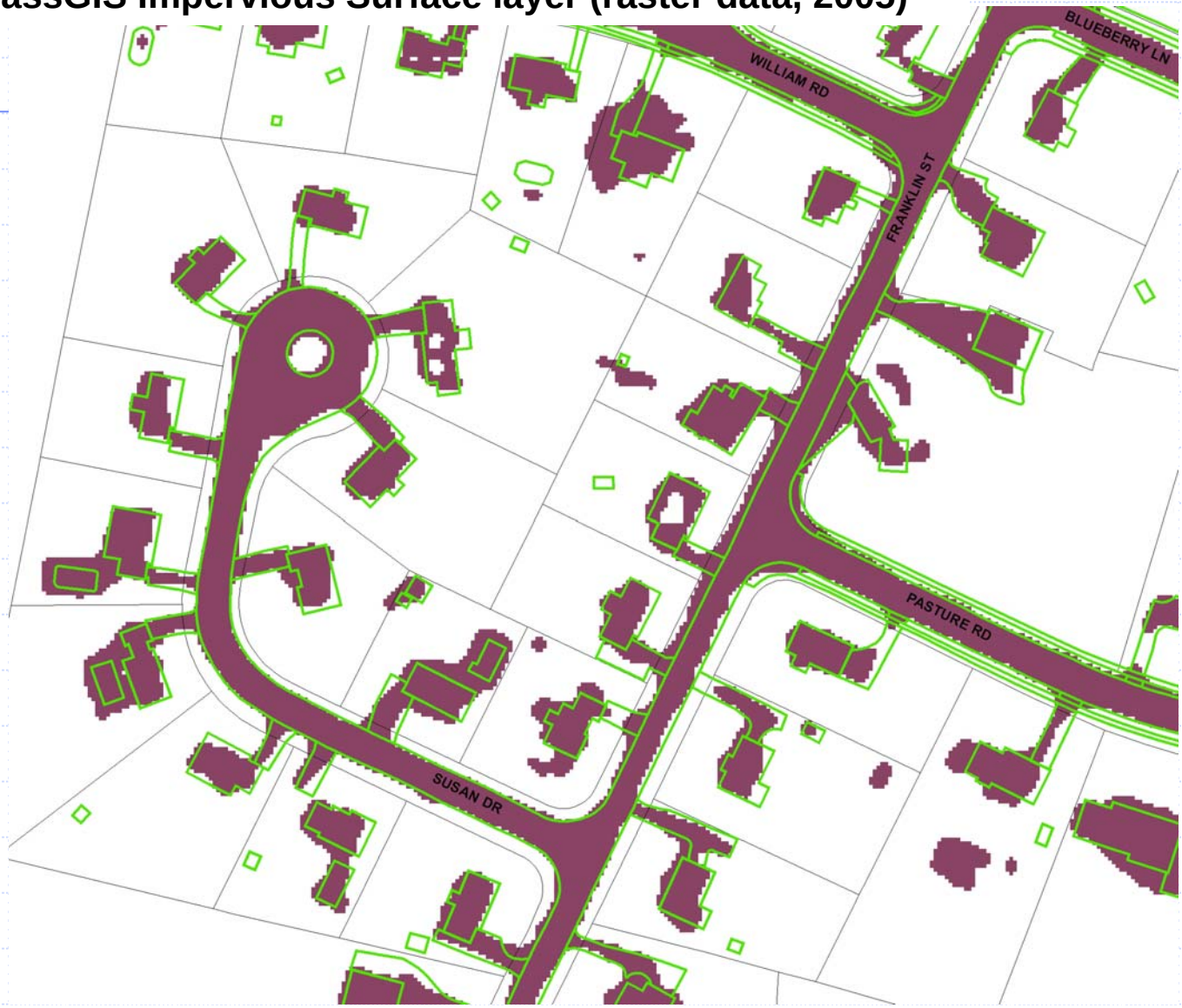
MassGIS Data

MassGIS Orthophoto 2005

MassGIS Impervious Surface layer -

automatically extracted from aerial photos.

Reading planimetrics (vector data, 1998) over MassGIS Impervious Surface layer (raster data, 2005)



Program Implementation and Lessons Learned

- Choose billing method carefully
- Determine which department(s) pay for town-owned land
- Decide how to handle non-profit properties
- Educate property owners prior to billing
- Prepare staff to answer property owner questions
- Have procedure in place for abatements
- Adjust fees annually

Storm Water Enterprise Fund Frequently Asked Questions

FAQs

1. What is storm water?
Storm water is rain water that runs off impervious surfaces such as streets, driveways, parki rooftops, or other tightly packed surfaces. Impervious surfaces reduce the ability of storm w absorbed or infiltrate into the ground.

2. Why did Town Meeting and the Board of Selectmen vote to establish a storm wate enterprise fund (SWEF)?
The Town of Reading is required by the United States Environmental Protection Agency (E develop a storm water management plan that reduces the discharge of pollutants to our storm drain system and water ways. The Town is required to be in full compliance with the terms National Pollutant Discharge Elimination System (NPDES) Phase II permit by 2008 to mee and state mandates. The Town established a SWEF to provide a dedicated and adequate sou funding for our storm water management program.

3. Why is storm water management necessary?
Storm water often contains surface pollutants including petroleum products, soaps, detergen lawn fertilizer which eventually empty into the Aberjona, Ipswich, and Saugus rivers. Effec storm water management also helps reduce flooding and the erosion of river banks.

4. How is the SWEF fee calculated?
Single and Two-Family properties will be billed at a flat rate. All other properties will be as annual storm water fee based on the total amount of impervious surface area on the lot, whic billed quarterly. Condominium properties will be billed based on the total amount of imper surface, at a maximum of the single and two-family rate, for each condominium unit. The a will appear as a separate charge on your quarterly water and sewer bill. The fee will be calc follows for the following different types of property:

Property Type	Storm Water Fee
Undeveloped	No fee
Single & Two-Family Residences	Flat fee of $9.96/ quarter or ($39.84 annually)
Multi-Family, Commercial/ Industrial	Fee is based on Total Impervious Surface Area.

5. How is total impervious surface area determined?
Impervious surface areas were measured using the Town's mapping system (GIS). Building driveways, and parking areas, were delineated from aerial photos. The surface area of these was calculated and will be assessed at a rate of $39.84/ 2,552 sq. ft. (annually) for multi-fam commercial, and industrial properties.

6. For what purposes will SWEF fee revenue be used?
Storm water fee revenue will be used to hire two laborers that will perform stream and deter maintenance activities. The SWEF will allow the Department of Public Works to address a of stream and drainage maintenance issues that have not been completed due to staffing and limitations. Storm water fees will also fund capital expenditures for drainage system mappi layer), illicit discharge detection, and general drainage system infrastructure improvements.

5. Will residents be assessed a SWEF fee if their property is located on a private way or on a town accepted street that does not have catch basins or storm drains?
Yes, although a property may be located on a private way or on a town accepted street that does not have catch basins or storm drains, the owner will be assessed a storm water fee since the property still produces runoff into the Town's storm water system.

6. Are there certain types of properties that are exempt from the storm water fee?
The Board of Selectmen approved a rate structure as recommended by the Water, Sewer, and Storm Water Management Advisory Committee that does not provide any exemptions for municipal properties, schools, or properties owned by religious or registered non-profit organizations. Undeveloped property (without impervious surfaces) is the only category of property that will not be assessed a storm water fee.

7. Has the Town made any provisions for storm water abatements?
Yes, to encourage property owners to minimize the amount of runoff from properties and to reduce the amount of pollutants entering Town waterways, the Town has instituted the following storm water abatement program:

Single & Two-Family Residences
Single and two-family residential properties that install and maintain infiltration systems or other means to reduce runoff will be eligible for an abatement of up to 50% of their total assessment.

Commercial/ Industrial/ Multi-Family
Commercial/ Industrial/ Multi-Family properties that install and maintain state-of-the-art storm water treatment and infiltration systems will be eligible for an abatement up to 50% of their total assessment.

8. What are some typical storm water devices that qualify for abatements?
- Drywells
- Infiltration Chambers
- Detention Ponds

9. What are some typical devices that do NOT qualify for abatements?
- Drinking water filtration systems
- Rain Barrels
- Sump Pumps

10. Where can I obtain more information or file for an abatement?
Property owners or condominium associations (on behalf of condominium owners) seeking additional information or would like to file for an abatement should contact the Department of Public Works, Engineering Division at (781) 942-9082. The Abatement Application Form may be obtained through the Town of Reading website at www.ci.reading.ma.us, or may be picked up at the Engineering Office at Reading Town Hall, 16 Lowell St.

11. Is the storm water abatement permanent?
The storm water abatement percentage will only change if the impervious surface area changes.

Other New England Municipalities

South Burlington
Stormwater Utility

http://www.sburl.com/stormwater/

- Used QuickBird Satellite data. Pilot study resulted in flat fee for residential, tiered fee for non-residential.

City of Newton, MA
http://www.ci.newton.ma.us/dpw/engin/stormwater.htm/

- Actual measurements of sample parcels. Two flat fees: one for residential parcels, one for non-residential parcels.

Charles River Watershed Association
http://www.crwa.org/projects/stormwater/swutility.html

- Case study of South Burlington, Newton, & Reading stormwater utilities

Resources

- Reading Storm Water Division
  http://www.readingma.gov/Pages/ReadingMA_Water/storm/index
- Charles River Watershed Association
  http://www.crwa.org/projects/stormwater/utilities.html
- New England Water Works Association
  http://www.newwa.org/

Contact info

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Deputy Director
Division of Municipal Services
Commonwealth of MA
617-292-5808
Joseph.Delaney@state.ma.us

Kim Honetschlager, GISP
GIS Coordinator
Town of Reading, MA
781-942-6631
khonetschlager@ci.reading.ma.us

Ted McIntire
DPW Director
Town of Reading, MA
781-942-9077
tmcintire@ci.reading.ma.us

http://www.readingma.gov

Ipswich River, Reading, MA
http://ma.water.usgs.gov/ipswich/IF2.htm

City of Newton
Stormwater Utility / Use Fee

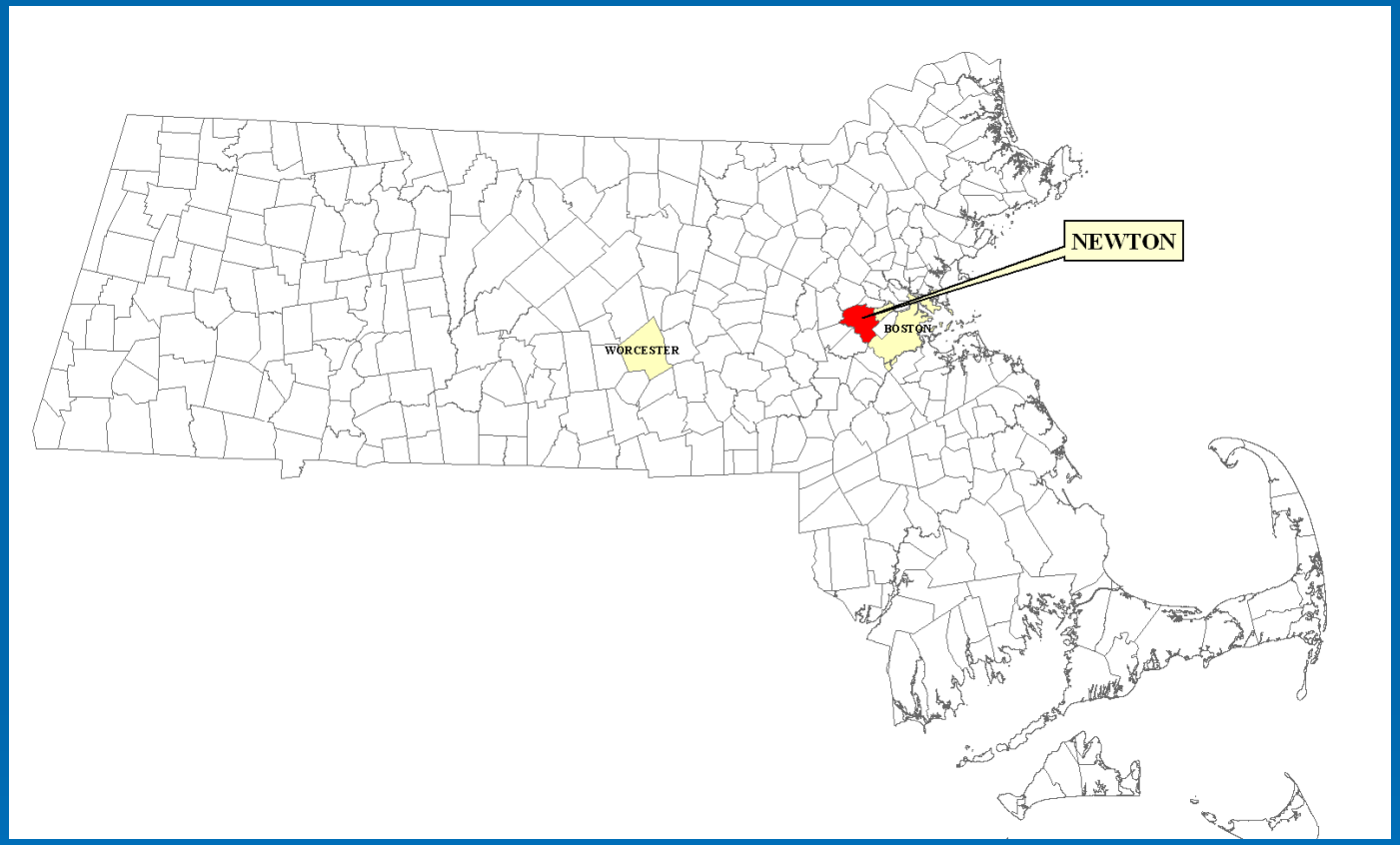
Presented by

Maria Rose, Stormwater / Environmental Engineer

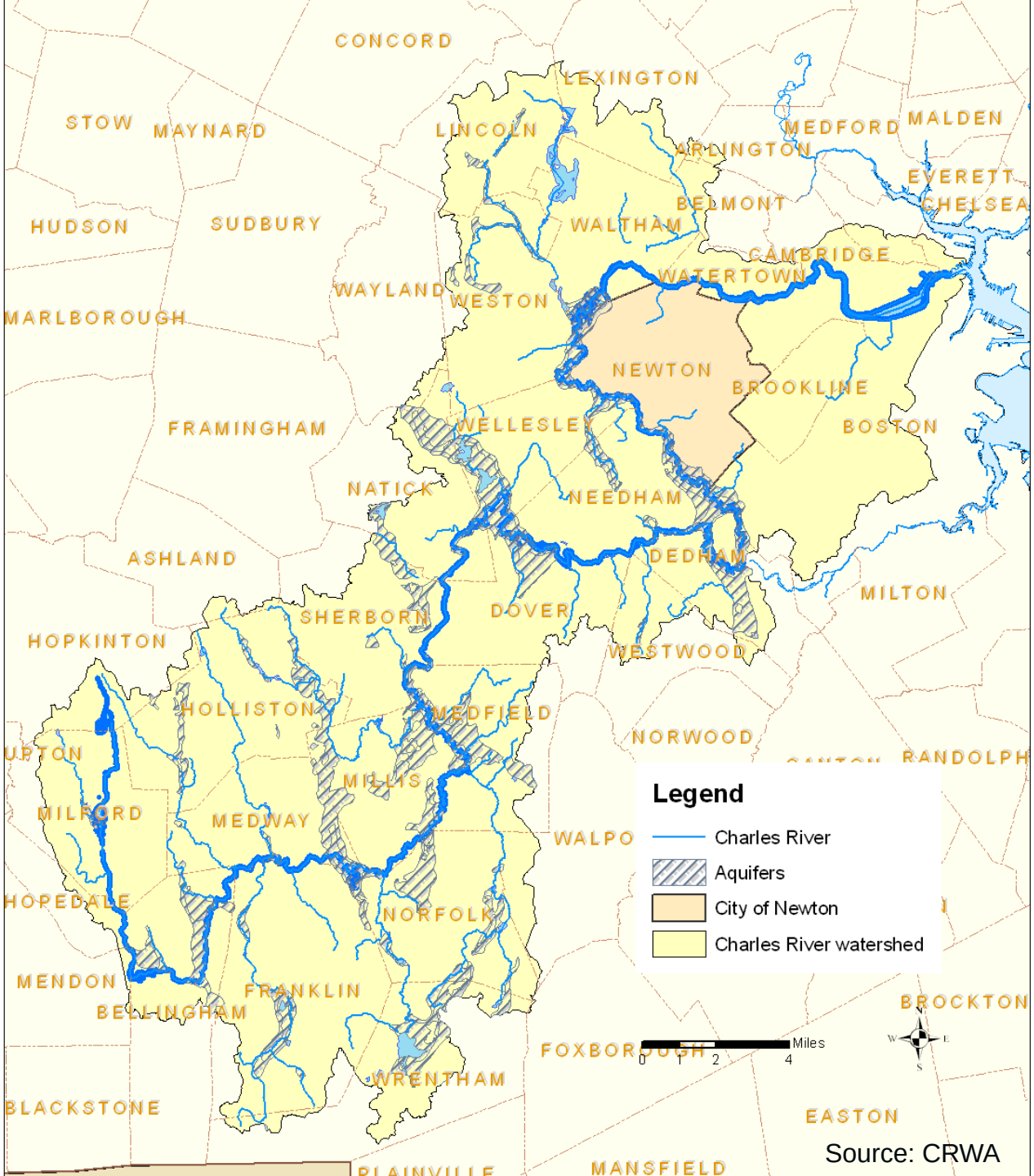
Public Works Dept.

ACEC of MA
February 8, 2011

Newton, MA



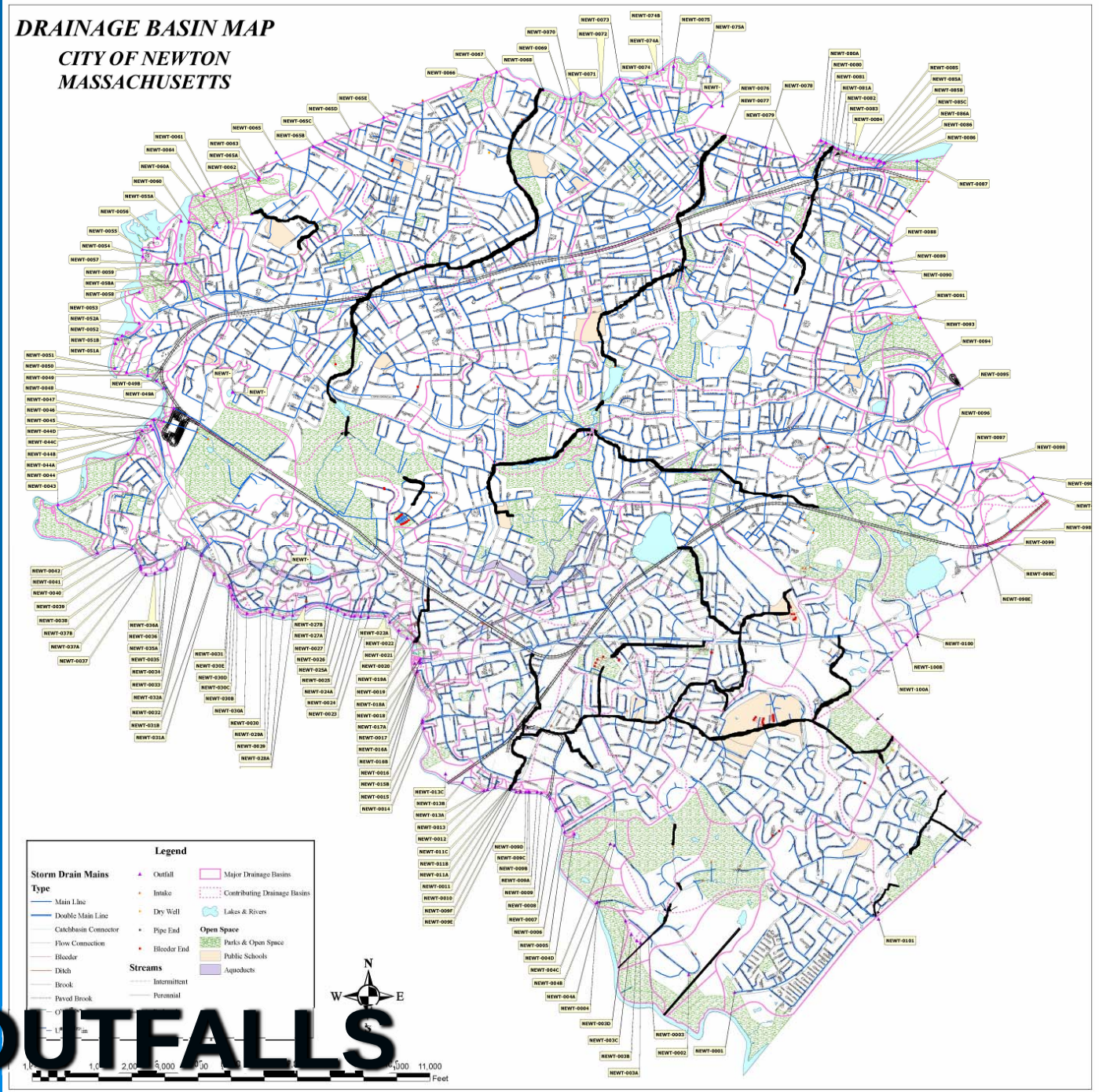
- Population: 82,000
- Size: 18.1 sq miles
- 11.5 miles of riverfront
- High and Medium Density Residential, Commercial & Industrial land uses
- 20% Open Space


CONCORD
LEXINGTON
STOW
MAYNARD
LINCOLN
MEDFORD
MALDEN
ARLINGTON
EVERETT
CHELSEA
BELMONT
HUDSON
SUDBURY
WALTHAM
CAMBRIDGE
WATERTOWN
WAYLAND
WESTON
MARLBOROUGH
NEWTON
BROOKLINE
FRAMINGHAM
WELLESLEY
BOSTON
NATICK
NEEDHAM
DEDHAM
ASHLAND
MILTON
SHERBORN
DOVER
HOPKINTON
WESTWOOD
HOLLISTON
MEDFIELD
NORWOOD
UPTON
MILLIS
MILFORD
MEDWAY
WALPOLE
HOPEDALE
NORFOLK
MENDON
FRANKLIN
BELLINGHAM
BROCKTON
FOXBOROUGH
WRENTHAM
BLACKSTONE
EASTON
MANSFIELD
Legend
Charles River
Aquifers
City of Newton
Charles River watershed
Miles
0
1
2
4
W
E
S

Source: CRWA

Newton's Drainage Infrastructure

- **12,750 catch basins**
- **320 miles** of drainage pipes
- **7 miles of streams**
- **155 outfalls or drainage channels** that flow into the Charles River or conservation land near the river
- Five (5) perennial streams and 17 intermittent streams (most in culverts)



155 OUTFALLS

Historical Perspective

- Significant development post-WWII
- Deferred maintenance on infrastructure
- NPDES Phase II in March 2003
- Further pressure from EPA to address water quality issues in Nov. 2004
- Recent trend: Increased demand for larger homes and big box retail stores
- Additional impervious areas compound flooding issues

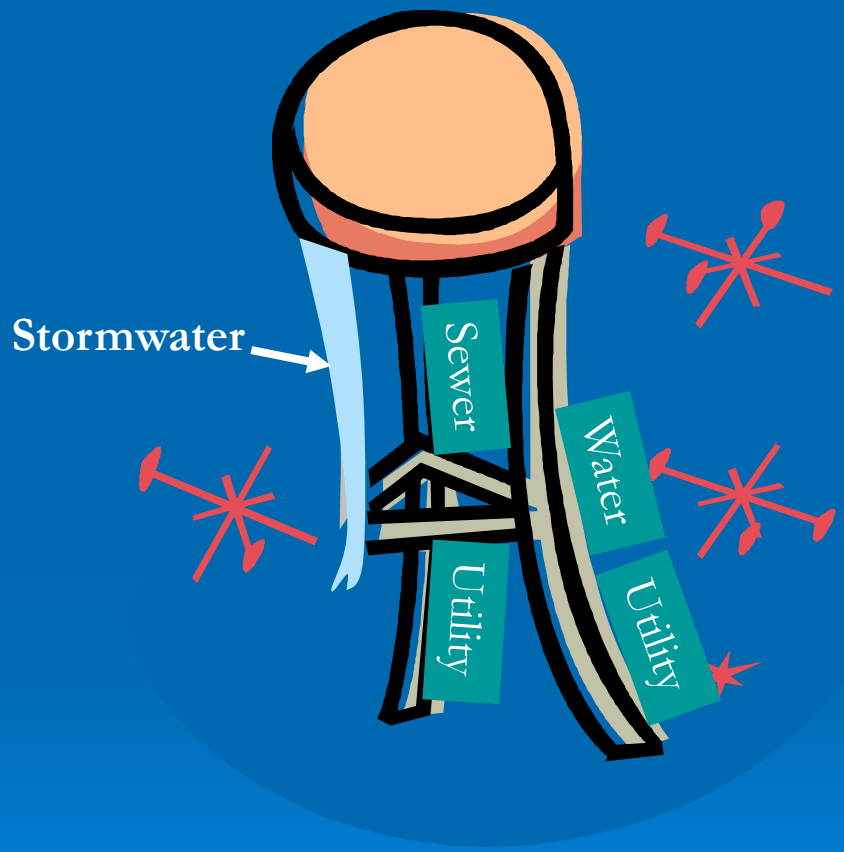
Drivers

- Aging infrastructure needs
- Stream channels and pond maintenance
- Flooding issues
- Water quality issues
- NPDES Permit

How can Newton pay for the mounting needs in stormwater management and water quality improvement?

- Taxes: compete against police, public safety and schools for much needed funds
- Assessments: Direct and special benefit
- Establish a user-fee based Stormwater Utility

Neglected Leg of the Stool



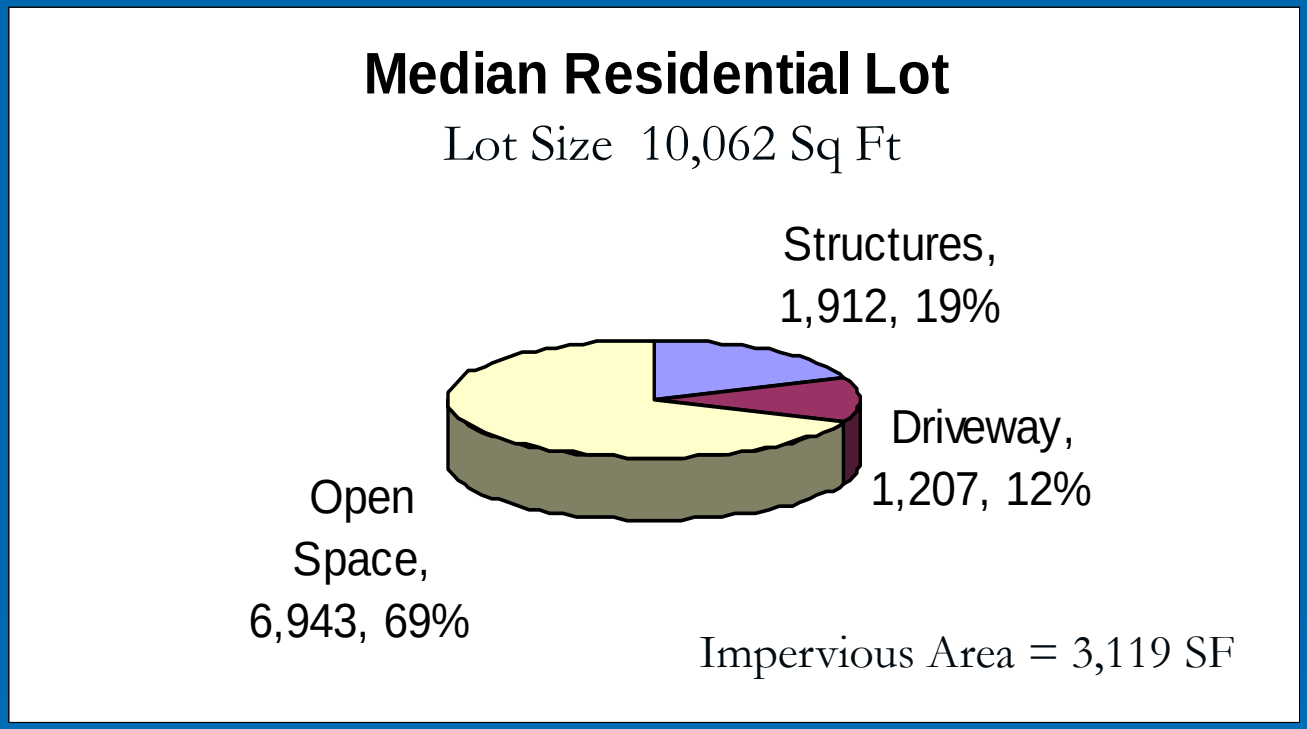
Utility Concept Development

- Technical: develop the rate structure
  - Uniform fee versus Unit-based fee
  - MGL Ch 83 §140
- Regulatory: bylaw or ordinance
- Revenue Allocation Plan
- Administrative:
  - Implement transparent billing and credit procedures
  - Develop FAQs and Supplemental documents
  - Manage Program

Modest Start - Build Trust First

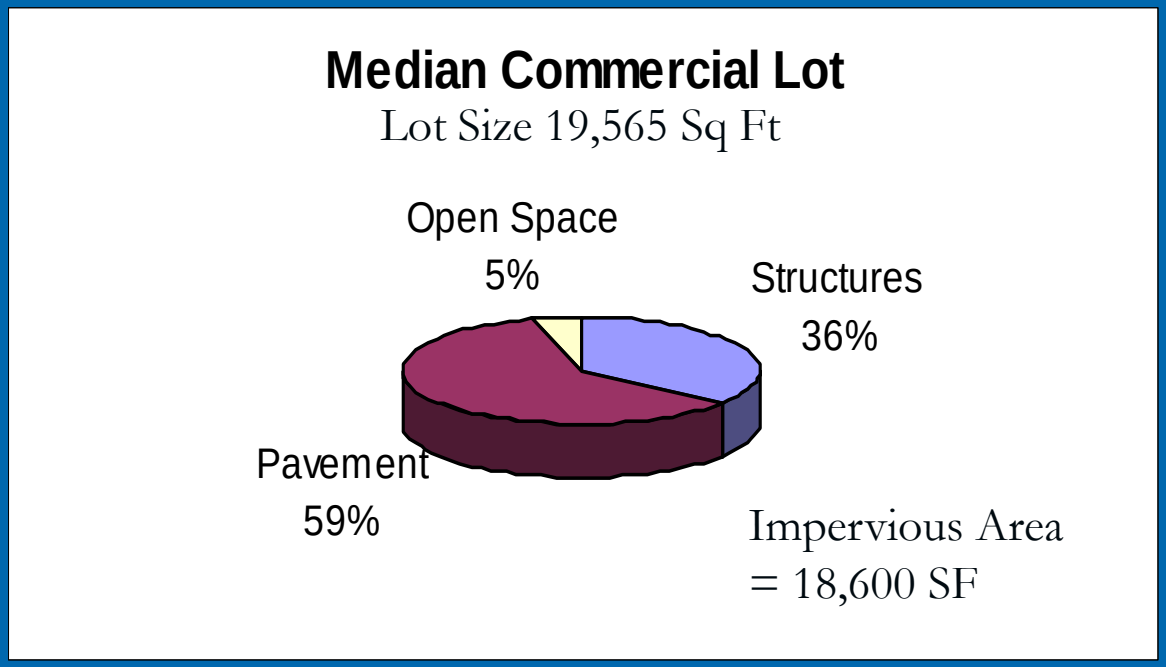
- Simplified Rate Structure and Billing
- Newton's Initial Fee Structure based on "bare bones" program need of $700,000
- Residential accounts: 23,762
- Commercial, Institutional & Industrial: 848

Stormwater Rate Structure



Based upon a composite analysis of various sized residential lots from the 14 villages in Newton.

Current Stormwater Rate Structure



For commercial properties analyzed: there was on average 6 times more impervious surfaces than residential.

$700,000 =23,762(x) + 848(6x)

“X” or the Equivalent Residential Unit (ERU) **= $25 per yr**

Resource Plan

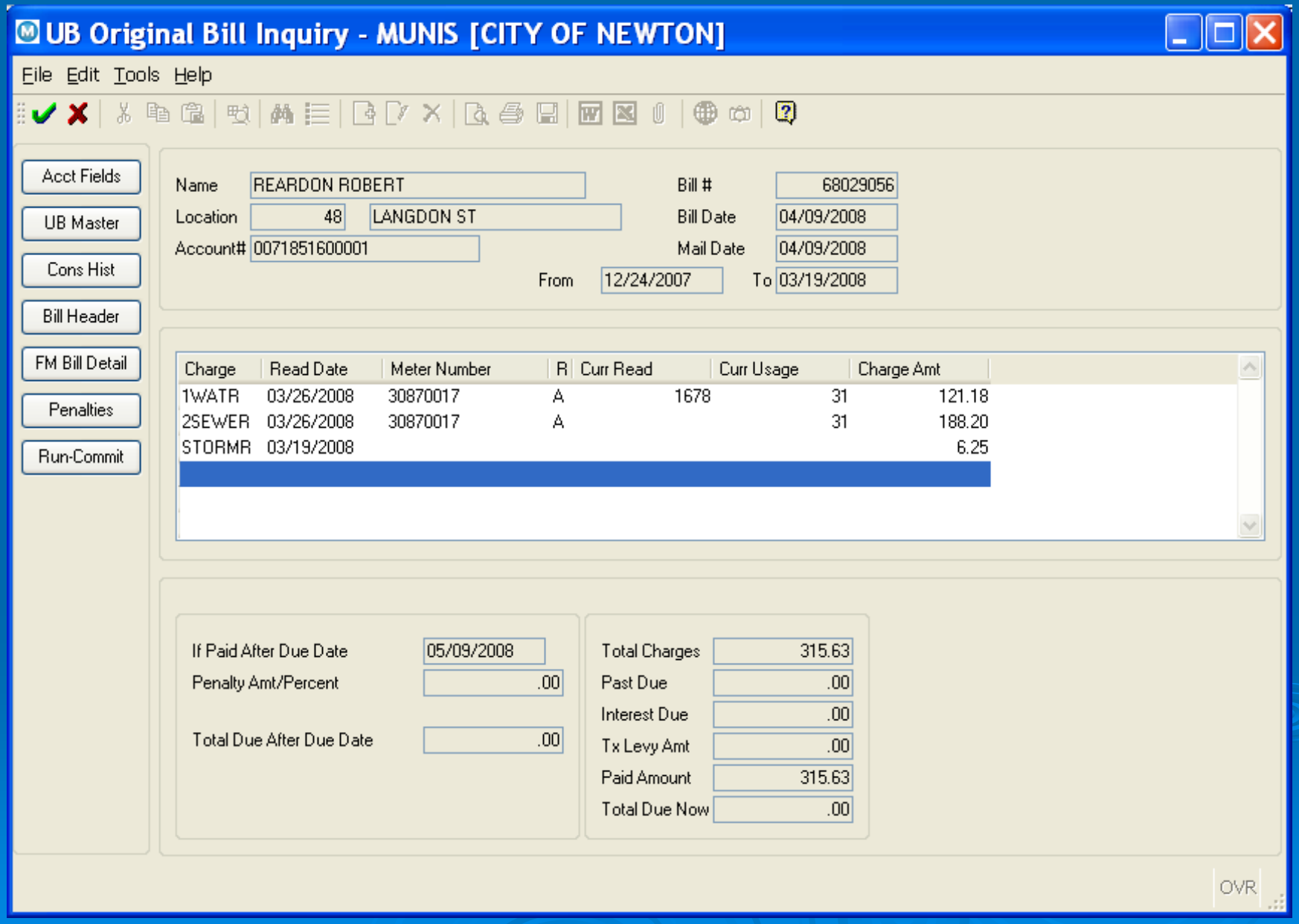
- Stormwater Program Manager
- Dedicated DPW staff for maintenance, special projects and IDDE component of NPDES
- Cross-utilization of Public Works resources
- Generate revenue for capital improvements and infrastructure maintenance

Public Approval Process

- Presented concept to our Sewer / Stormwater Task Force
- Obtained letters of support
- Presentation made to the Public Facilities Com.
- Charles River Watershed sent out an Action Alert in support of the user fee and encouraged members to contact their Alderman to approve it
- Presentations made to the full Board of Alderman
- BOA approve ordinance on May 24, 2006

User Fee Implementation

- Drain fee included in Water / Sewer bills
- Revenue dedicated for stormwater management
- Elderly Discount Applies
- Credits given for owner maintained stormwater management / recharge systems


UB Original Bill Inquiry - MUNIS [CITY OF NEWTON]
File Edit Tools Help
Acct Fields
UB Master
Cons Hist
Bill Header
FM Bill Detail
Penalties
Run-Commit
Name REARDON ROBERT
Location 48 LANGDON ST
Account# 0071851600001
Bill # 68029056
Bill Date 04/09/2008
Mail Date 04/09/2008
From 12/24/2007
To 03/19/2008
Charge Read Date Meter Number R Curr Read Curr Usage Charge Amt
1WATR 03/26/2008 30870017 A 1678 31 121.18
2SEWER 03/26/2008 30870017 A 31 188.20
STORMR 03/19/2008 6.25
If Paid After Due Date 05/09/2008
Penalty Amt/Percent .00
Total Due After Due Date .00
Total Charges 315.63
Past Due .00
Interest Due .00
Tx Levy Amt .00
Paid Amount 315.63
Total Due Now .00
OVR

Public Education/ Program Roll-out

- News story on local cable TV
- Utility Bill Insert
- Newspaper Articles
- Stormwater Program FAQs
- Web site
  http://www.ci.newton.ma.us/stormwater/

Bioretention Areas – Filters Stormwater before entering Hammond Pond

Pollutant Removal Efficiencies:

- TSS (80 - 90%),
- Phosphorus (10-90%),
- Nitrogen (30 - 50%)
- Metals: Copper, Lead, Zinc (40 to 90%)
- Petroleum Hydro-carbons (40- 60%)
- Bacteria / Pathogens – insufficient data

Sand Filters

Pollutant Removal Efficiencies:

- TSS (80%),
- Phosphorus (10-50%),
- Nitrogen (20 - 40%)
- Metals: Copper, Lead, Zinc (50 to 90%)
- Petroleum Hydrocarbons

Sand Filters in Use

Replace Drain Pipes & Increase Flood Capacity

Ashmont Ave Drainage Project, 2009

Water quality sampling

Sediment Sampling

Preparations for Sediment Removal

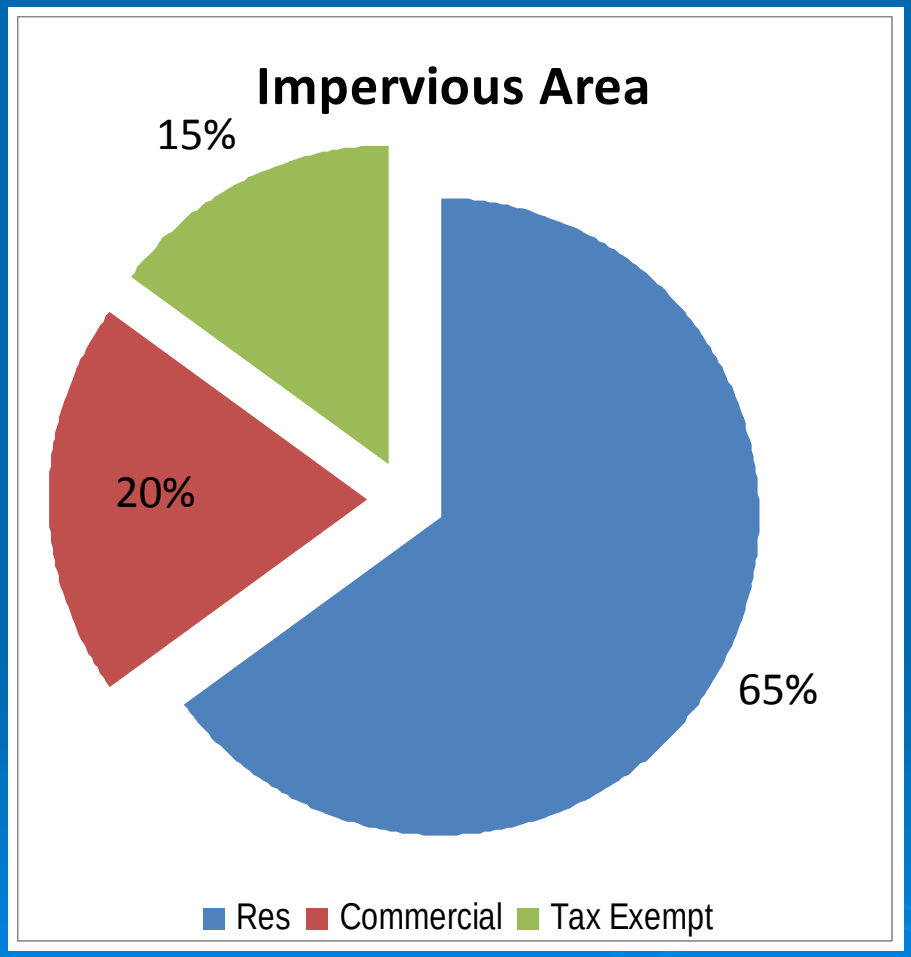
Cheesecake Brook

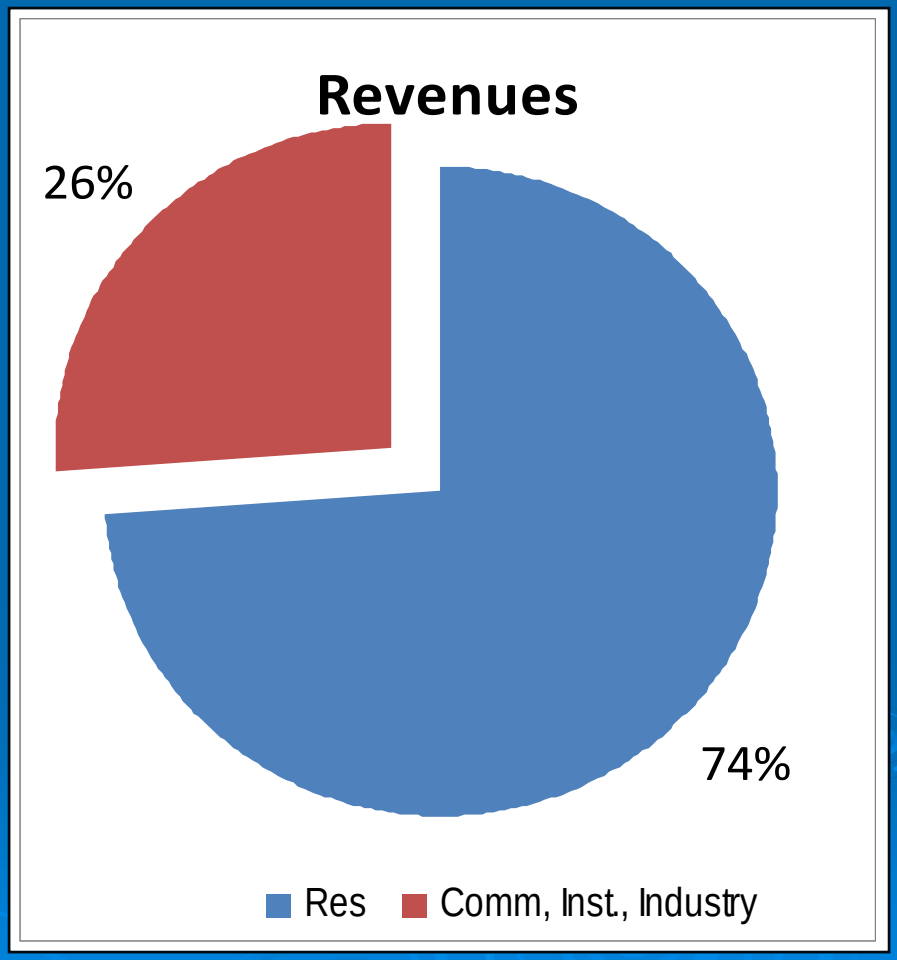
Public Education and Involvement

Where do we stand now?

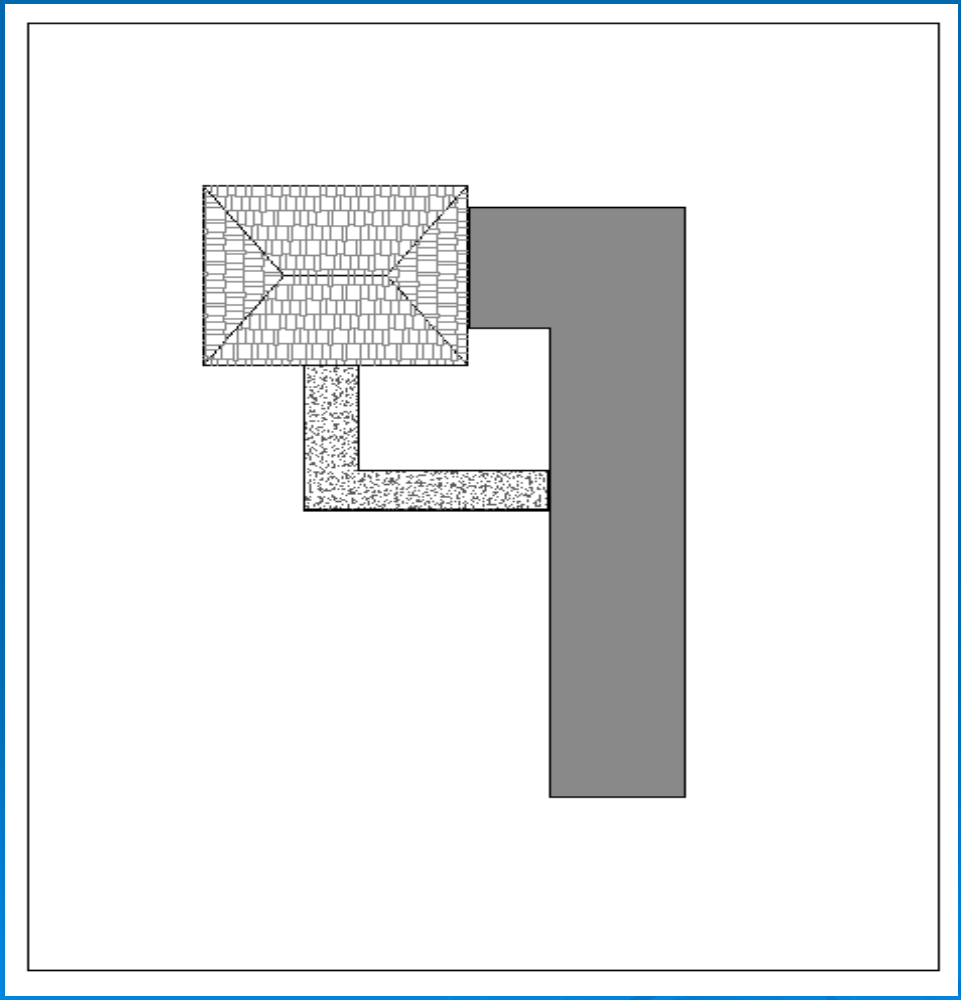
- Revenue generated is inadequate for our SWM needs.
- March 2010 floods strained all available resources and staff.
- Next generation of the NPDES MS4 Permit indicates additional revenue must be allocated for compliance.
- Need to correct inequities in fee structure.
- Consultant retained for rate study analysis and budget planning

Current System





Fee Calculation

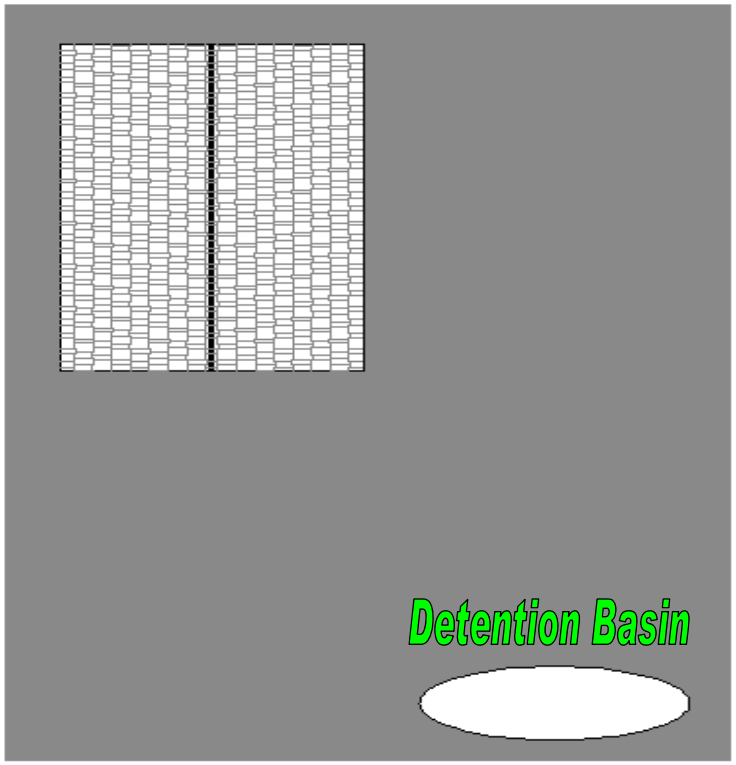


Mean Residential Impervious Area is 2300 sq ft.

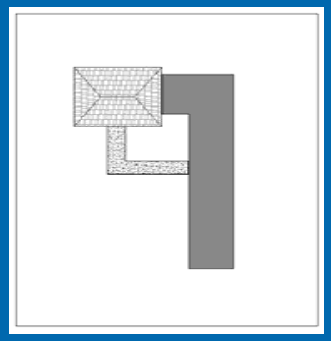
Equals 1.0 ERU

Fee Calculation

Commercial Property



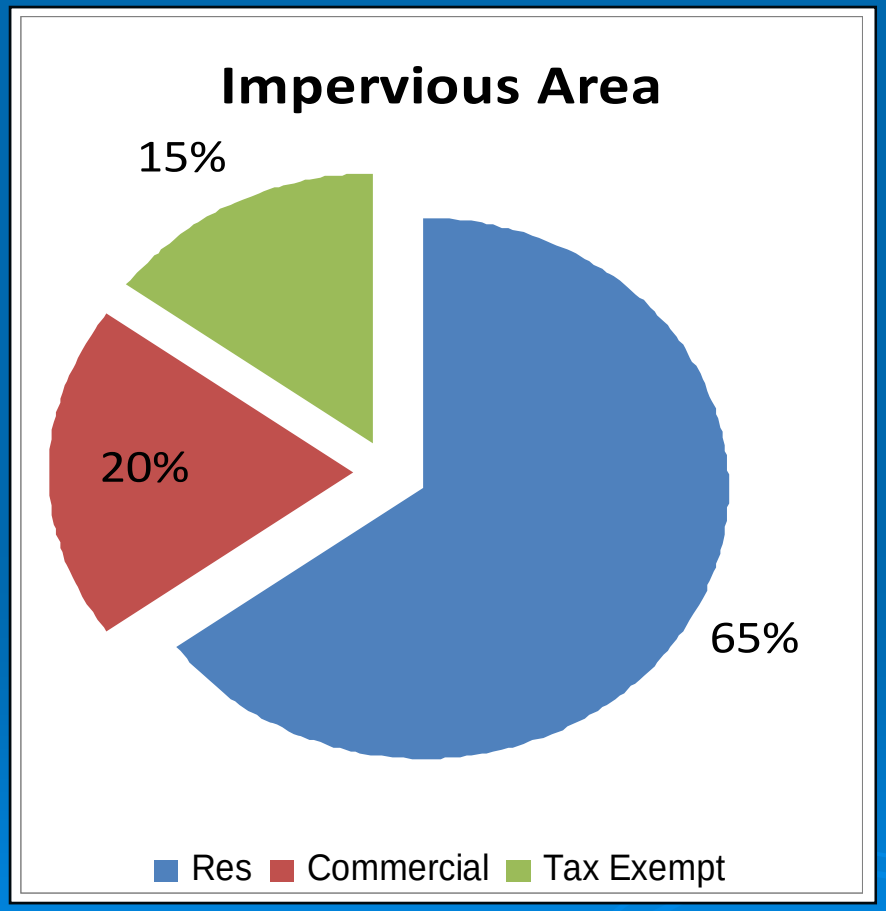
1.1 ac Lot with 46,000 sq ft impervious

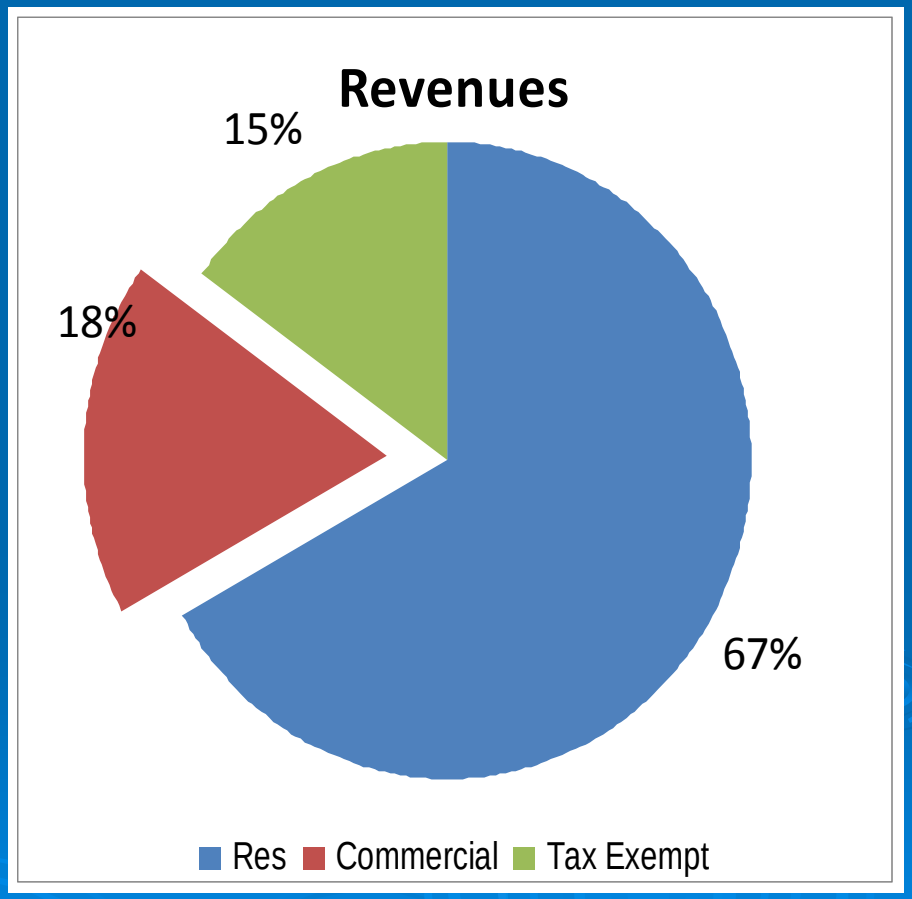


= 1 ERU

= 20 ERUs less credit

Distribution Under Revised Rate Structure





Preliminary Proposed Rate Structure

The average impervious area per unit redefined at 2,300 SF, thus this becomes the base unit or Equivalent Residential Unit (ERU)

- Single-family: 1 ERU = $25.00
- 2-Family: 1.5 ERU = $37.50
- 3-Family and 4 or more unit apartments and condominiums: fee derived from impervious area
- Commercial and Tax-Exempt Properties: fee derived from impervious area

New Rate Structure

- Increases our Stormwater Management revenues to 1.1 Million annually
- Eliminates a loop-hole and corrects minor issues in current rate structure
- Reinforces our SW Utility to be “SAFE”:
  - Stable
  - Adequate
  - Flexible
  - Equitable
- We have a planning level budget through 2017 that correlates to modest rate increases.

Lessons Learned

- Simplified initial approach worked for Newton; *however*, there have been some challenges
- Have at least one showcase project
- Document gains made with the fund
- Be responsive to every billing inquiry, maintenance requests and flooding issues
- Build relationships with community & watershed groups
- Be consistent with credits given for stormwater recharge systems

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PART I ADMINISTRATION OF THE GOVERNMENT (Chapters 1 through 182)
TITLE VII CITIES, TOWNS AND DISTRICTS
CHAPTER 44 MUNICIPAL FINANCE
Section 53F1/2 Enterprise funds

Section 53F1/2. Notwithstanding the provisions of section fifty-three or any other provision of law to the contrary, a city or town which accepts the provisions of this section may establish a separate account classified as an “Enterprise Fund”, for a utility, health care, recreational or transportation facility, and its operation, as the city or town may designate, hereinafter referred to as the enterprise. Such account shall be maintained by the treasurer, and all receipts, revenues and funds from any source derived from all activities of the enterprise shall be deposited in such separate account. The treasurer may invest the funds in such separate account in the manner authorized by sections fifty-five and fifty-five A of chapter forty-four. Any interest earned thereon shall be credited to and become part of such separate account. The books and records of the enterprise shall be maintained in accordance with generally accepted accounting principles and in accordance with the requirements of section thirty-eight.

No later than one hundred and twenty days prior to the beginning of each fiscal year, an estimate of the income for the ensuing fiscal year and a proposed line item budget of the enterprise shall be submitted to the mayor, board of selectmen or other executive authority of the city or town by the appropriate local entity responsible for operations of the enterprise. Said board, mayor or other executive authority shall submit its recommendation to the town meeting, town council or city council, as the case may be, which shall act upon the budget in the same manner as all other budgets.

The city or town shall include in its tax levy for the fiscal year the amount appropriated for the total expenses of the enterprise and an estimate of the income to be derived by the operations of the enterprise. If the estimated income is less than the total appropriation, the difference shall be added to the tax levy and raised by taxation. If the estimated income is more than the total appropriation, the excess shall be appropriated to a separate reserve fund and used for capital expenditures of the enterprise, subject to appropriation, or to reduce user charges if authorized by the appropriate entity responsible for operations of the enterprise. If during a fiscal year the enterprise incurs a loss, such loss shall be included in the succeeding fiscal year’s budget.

If during a fiscal year the enterprise produces a surplus, such surplus shall be kept in such separate reserve fund and used for the purposes provided therefor in this section.

For the purposes of this section, acceptance in a city shall be by vote of the city council and approval of the mayor, in a town, by vote of a special or annual town meeting and in any other municipality by vote of the legislative body.

A city or town which has accepted the provisions of this section with respect to a designated enterprise may, in like manner, revoke its acceptance.

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PART I ADMINISTRATION OF THE GOVERNMENT
(Chapters 1 through 182)

TITLE XIV PUBLIC WAYS AND WORKS

CHAPTER 83 SEWERS, DRAINS AND SIDEWALKS

Section 16 Charge for use of sewers

Section 16. The aldermen of any city or the sewer commissioners, selectmen or road commissioners of a town, may from time to time establish just and equitable annual charges for the use of common sewers and main drains and related stormwater facilities, which shall be paid by every person who enters his particular sewer therein. The money so received may be applied to the payment of the cost of maintenance and repairs of such sewers or of any debt contracted for sewer purposes. In establishing quarterly or annual charges for the use of main drains and related stormwater facilities, the city, town, or district may either charge a uniform fee for residential properties and a separate uniform fee for commercial properties or establish an annual charge based upon a uniform unit method; but, the charge shall be assessed in a fair and equitable manner. The annual charge shall be calculated to supplement other available funds as may be necessary to plan, construct, operate and maintain stormwater facilities and to conduct stormwater programs. The city, town or district may grant credits against the amount of the quarterly or annual charge to those property owners who maintain on-site functioning retention/detention basins or other filtration structures as approved by the stormwater utility, conservation commission, or other governmental entity with appropriate authority.

Model Stormwater Management Bylaw

Prepared for the Towns of Duxbury, Marshfield, & Plymouth, MA

Prepared by Horsley Witten Group
December 31, 2004

In collaboration with:

Massachusetts Office of Coastal Zone Management
North and South Rivers Watershed Association
Massachusetts Bays National Estuary Program
Buzzards Bay Project National Estuary Program

Model Stormwater Management Bylaw Components:

- **Model Stormwater Bylaw**
- **Model Stormwater Regulations**
- **Appendix A: Method of Pollutant Load Calculation for Compliance with Water Quality Standards**
- **Appendix B: Example System of Stormwater Management Credits and Incentives**

This project is funded through the Coastal Nonpoint Pollution Grant Program made possible by NOAA and administered by the Massachusetts Office of Coastal Zone Management. Views expressed herein are those of the author(s) do not necessarily reflect the views of EOEA or CZM.

MODEL STORMWATER BYLAW
Duxbury, Marshfield, and Plymouth
December 31, 2004

Introduction

It is hereby determined that:

Land development projects and other land use conversions, and their associated changes to land cover, permanently alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, which in turn increase flooding, stream channel erosion, and sediment transport and deposition, and decrease groundwater recharge;

Land development projects and other land use conversions also contribute to increased nonpoint source pollution and degradation of receiving waters;

The impacts of post-development stormwater runoff quantity and quality can adversely affect public safety, public and private property, surface water drinking water supplies, groundwater resources, drinking water supplies, recreation, aquatic habitats, fish and other aquatic life, property values and other uses of lands and waters;

These adverse impacts can be controlled and minimized through the regulation of stormwater runoff quantity and quality from new development and redevelopment, by the use of both structural and nonstructural Best Management Practices;

Localities in the Commonwealth of Massachusetts are required to comply with a number of both State and Federal laws, regulations and permits which require a locality to address the impacts of post-development stormwater runoff quality and nonpoint source pollution.

Therefore, the *[Stormwater Authority]* has established this stormwater management bylaw to provide reasonable guidance for the regulation of post-development stormwater runoff for the purpose of protecting local water resources from degradation. This bylaw regulates the post-construction stormwater controls for both new and re-development projects.

It has been determined that it is in the public interest to regulate post-development stormwater runoff discharges in order to control and minimize increases in stormwater runoff rates and volumes, post-construction soil erosion and sedimentation, stream channel erosion, and nonpoint source pollution associated with post-development stormwater runoff.

1.0 PURPOSE

A) The purpose of this Bylaw is to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-development stormwater runoff and nonpoint source pollution associated with new development and redevelopment. It has been determined that proper management of post-development stormwater runoff will minimize damage to public and private property and infrastructure, safeguard the public health, safety, environment and general welfare of the public, protect water and aquatic resources, and promote groundwater recharge to protect surface and groundwater drinking supplies. This Bylaw seeks to meet that purpose through the following objectives:

1. Establish decision-making processes surrounding land development activities that protect the

integrity of the watershed and preserve the health of water resources;

2. Require that new development, redevelopment and all land conversion activities maintain the after-development runoff characteristics as equal to or less than the pre-development runoff characteristics in order to reduce flooding, stream bank erosion, siltation, nonpoint source pollution, property damage, and to maintain the integrity of stream channels and aquatic habitats;

3. Establish minimum post-development stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality; Establish minimum design criteria for the protection of properties and aquatic resources downstream from land development and land conversion activities from damages due to increases in volume, velocity, frequency, duration, and peak flow rate of storm water runoff; Establish minimum design criteria for measures to minimize nonpoint source pollution from stormwater runoff which would otherwise degrade water quality;

4. Establish design and application criteria for the construction and use of structural stormwater control facilities that can be used to meet the minimum post-development stormwater management standards;

5. Encourage the use of nonstructural stormwater management, stormwater better site design practices or "low-impact development practices", such as reducing impervious cover and the preservation of greenspace and other natural areas, to the maximum extent practicable; Coordinate site design plans, which include greenspace, with the Town's greenspace protection plan;

6. Establish provisions for the long-term responsibility for and maintenance of structural stormwater control facilities and nonstructural stormwater management practices to ensure that they continue to function as designed, are maintained, and pose no threat to public safety;

7. Establish provisions to ensure there is an adequate funding mechanism, including surety, for the proper review, inspection and long-term maintenance of stormwater facilities implemented as part of this Bylaw;

8. Establish administrative procedures for the submission, review, approval or disapproval of stormwater management plans, and for the inspection of approved active projects, and long-term follow up; Establish certain administrative procedures and fees for the submission, review, approval, or disapproval of stormwater plans, and the inspection of approved projects.

B) Nothing in this Bylaw is intended to replace the requirements of either, the Town of *[_____]* Flood Plain Zoning Bylaw, the Town of *[_____]* General Wetlands Protection Bylaw, or any other Bylaw that may be adopted by the Town of *[_____]*. Any activity subject to the provisions of the above-cited Bylaws must comply with the specifications of each.

2.0 DEFINITIONS

The following definitions shall apply in the interpretation and implementation of this Bylaw. Additional definitions may be adopted by separate regulation:

ALTER: Any activity, which will measurably change the ability of a ground surface area to absorb water or will change existing surface drainage patterns. Alter may be similarly represented as "alteration of drainage characteristics," and "conducting land disturbance activities."

BEST MANAGEMENT PRACTICE (BMP): Structural, non-structural and managerial techniques that are recognized to be the most effective and practical means to prevent and/or reduce increases in stormwater volumes and flows, reduce point source and nonpoint source pollution, and promote stormwater quality and protection of the environment. "Structural" BMPs are devices that are engineered and constructed to provide temporary storage and treatment of stormwater runoff. "Nonstructural" BMPs use natural measures to reduce pollution levels, do not require extensive construction efforts, and/or promote pollutant reduction by eliminating the pollutant source.

BETTER SITE DESIGN: Site design approaches and techniques that can reduce a site's impact on the watershed through the use of nonstructural stormwater management practices. Better site design includes conserving and protecting natural areas and greenspace, reducing impervious cover, and using natural features for stormwater management.

GENERAL STORMWATER MANAGEMENT PERMIT (GSMP): A permit issued for an application that meets a set of pre-determined standards outlined in the Regulations to be adopted by the *[Stormwater Authority]* under Section 4 of this Bylaw. By meeting these pre-determined standards, the proposed project will be presumed to meet the requirements and intent of this Bylaw.

HOTSPOT: Land uses or activities with higher potential pollutant loadings, such as auto salvage yards, auto fueling facilities, fleet storage yards, commercial parking lots with high intensity use, road salt storage areas, commercial nurseries and landscaping, outdoor storage and loading areas of hazardous substances, or marinas.

MASSACHUSETTS STORMWATER MANAGEMENT POLICY: The Policy issued by the Department of Environmental Protection, and as amended, that coordinates the requirements prescribed by state regulations promulgated under the authority of the Massachusetts Wetlands Protection Act G.L. c. 131 § 40 and Massachusetts Clean Waters Act G.L. c. 21, §. 23-56. The Policy addresses stormwater impacts through implementation of performance standards to reduce or prevent pollutants from reaching water bodies and control the quantity of runoff from a site.

NEW DEVELOPMENT: Any construction or land disturbance of a parcel of land that is currently in a natural vegetated state and does not contain alteration by man-made activities.

NONPOINT SOURCE POLLUTION: Pollution from many diffuse sources caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into water resource areas.

PERSON: Any individual, group of individuals, association, partnership, corporation, company, business organization, trust, estate, the Commonwealth or political subdivision thereof to the extent subject to Town Bylaws, administrative agency, public or quasi-public corporation or body, the Town of *[_____]*, and any other legal entity, its legal representatives, agents, or assigns.

PRE-DEVELOPMENT: The conditions that exist at the time that plans for the land development of a tract of land are submitted to the *[Stormwater Authority].* Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time prior to the first plan submission shall establish pre-development conditions.

POST-DEVELOPMENT: The conditions that reasonably may be expected or anticipated to exist after completion of the land development activity on a specific site or tract of land. Post-

development refers to the phase of a new development or redevelopment project after completion, and does not refer to the construction phase of a project.

RECHARGE: The replenishment of underground water reserves.

REDEVELOPMENT: Any construction, alteration, or improvement exceeding land disturbance of *[5,000]* square feet, where the existing land use is commercial, industrial, institutional, or multi-family residential.

STORMWATER AUTHORITY: the Town *of [_____] [Planning Board, Conservation Commission, Board of Health, or other specifically authorized Dept. or entity the Town decides is appropriate to administer, implement and enforce this bylaw, OR its authorized agent(s)]*. The *[Stormwater Authority]* is responsible for coordinating the review, approval and permit process as defined in this Bylaw. Other Boards and/or departments participate in the review process as defined in the Stormwater Regulations adopted by the *[Boards, Commissions and/or Departments of the Town of _____]*.

STORMWATER CREDITS: A form of incentive for developers to promote conservation of natural and open space areas. Projects that comply with prescribed requirements are allowed reductions in stormwater management requirements when they use techniques to reduce stormwater runoff at the site.

STORMWATER MANAGEMENT PERMIT (SMP): A permit issued by the *[Stormwater Authority]*, after review of an application, plans, calculations, and other supporting documents, which is designed to protect the environment of the Town from the deleterious affects of uncontrolled and untreated stormwater runoff.

STORMWATER UTILITY: A special assessment district set up to generate funding specifically for stormwater management. Users within the district pay a stormwater fee, and the revenue thus generated directly supports maintenance and upgrade of existing storm drain systems; development of drainage plans, flood control measures, and water-quality programs; administrative costs; and sometimes construction of major capital improvements.

3.0 AUTHORITY

This Bylaw is adopted under authority granted by the Home Rule Amendment of the Massachusetts Constitution, the Home Rule statutes, and pursuant to the regulations of the federal Clean Water Act found at 40 CFR 122.34, and as authorized by the residents of the Town of *[_____]* at Town Meeting, dated *[_____]*.

4.0 ADMINISTRATION

A) The *[Stormwater Authority]*, shall administer, implement and enforce this Bylaw. Any powers granted to or duties imposed upon the *[Stormwater Authority]* may be delegated in writing by the *[Stormwater Authority]* to its employees or agents.

B) Stormwater Regulations. The *[Stormwater Authority]* may adopt, and periodically amend, rules and regulations relating to the terms, conditions, definitions, enforcement, fees (including application, inspection, and/or consultant fees), procedures and administration of this Stormwater Management Bylaw by majority vote of the *[Stormwater Authority]*, after conducting a public hearing to receive comments on any proposed revisions. Such hearing dates shall be advertised in a newspaper of general local circulation, at least seven (7) days prior to the hearing date. After public notice and public hearing, the *[Stormwater Authority]* may promulgate rules and regulations

to effectuate the purposes of this Bylaw. Failure by the *[Stormwater Authority]* to promulgate such rules and regulations or a legal declaration of their invalidity by a court shall not act to suspend or invalidate the effect of this Bylaw.

C) Stormwater Management Manual. The *[Stormwater Authority]* will utilize the policy, criteria and information including specifications and standards of the latest edition of the Massachusetts Stormwater Management Policy, *[or approved local equivalent]*, for execution of the provisions of this Bylaw. This Policy includes a list of acceptable stormwater treatment practices, including the specific design criteria for each stormwater practice. The Policy may be updated and expanded periodically, based on improvements in engineering, science, monitoring, and local maintenance experience. Unless specifically altered in the Stormwater Regulations, stormwater management practices that are designed, constructed, and maintained in accordance with these design and sizing criteria will be presumed to be protective of Massachusetts water quality standards.

D) General Permit. The *[Stormwater Authority]* shall have the authority to develop a General Stormwater Management Permit (GSMP) for specific types of projects, such as, without limitation Construction of a *[Deck, Patio, Retaining Wall, Existing Driveway Expansion, Shed, Swimming Pool, Tennis or Basketball Court]*. Any such General Stormwater Management Permit Requirements shall be defined and included as part of any Stormwater Regulations promulgated as a result of this Bylaw.

E) Actions by the *[Stormwater Authority]*. The *[Stormwater Authority]* may take any of the following actions as a result of an application for a Stormwater Management Permit as more specifically defined as part of Stormwater Regulations promulgated as a result of this Bylaw: Approval, Approval with Conditions, Disapproval, or Disapproval without Prejudice.

F) Appeals of Action by the *[Stormwater Authority]*. A decision of the *[Stormwater Authority]* shall be final. Further relief of a decision by the *[Stormwater Authority]* made under this Bylaw shall be reviewable in the Superior Court in and action filed within *[60 days]* thereof, in accordance with M.G.L. Ch 249 § 4.

G) Stormwater Credit System. The *[Stormwater Authority]* may adopt, through the Regulations authorized by this Stormwater Management Bylaw, a Stormwater Credit System. This credit system will allow applicants the option, if approved by the *[Stormwater Authority],* to take credit for the use of stormwater better site design practices to reduce some of the requirements specified in the criteria section of the Regulations. Failure by the *[Stormwater Authority]* to promulgate such a credit system through its Regulations or a legal declaration of its invalidity by a court shall not act to suspend or invalidate the effect of this Bylaw.

H) Stormwater Utility. The *[Stormwater Authority]* may adopt, through the Regulations authorized by this Stormwater Management Bylaw, a Stormwater Utility pursuant to M.G.L. Chapter 83 Section 16 and Chapter 40 Section 1A. The *[Stormwater Authority]* shall administer, implement and enforce this Utility. Failure by the *[Stormwater Authority]* to promulgate such a Stormwater Utility through its Regulations or a legal declaration of its invalidity by a court shall not act to suspend or invalidate the effect of this Bylaw.

5.0 APPLICABILITY

A) This bylaw shall be applicable to all new development and redevelopment, including, but not limited to, site plan applications, subdivision applications, grading applications, land use conversion applications, any activity that will result in an increased amount of stormwater runoff or pollutants flowing from the a parcel of land, or any activity that will alter the drainage characteristics of a parcel of land, unless exempt pursuant to Section 5.B) of this Bylaw. All new development and redevelopment under the jurisdiction of this Bylaw as prescribed in this Bylaw

shall be required to obtain a Stormwater Management Permit.

B) Exemptions

No person shall alter land within the Town of *[_____]* without having obtained a Stormwater Management Permit (SMP) for the property with the following exceptions:

1. Any activity that will disturb an area less than *[5000]* square feet or less than *[25%]* of a contiguous property, whichever is less. This exception may not be applied for contiguous properties held in common ownership at the time of adoption of this Bylaw that may have been previously subdivided and/or are attributed to multiple separate owners;

   Another option could be based on impervious area such as "Any activity that will increase a contiguous impervious area of less than [5000] square feet.

2. Normal maintenance and improvement of land in agricultural use as defined by the Wetlands Protection Act regulation 310 CMR 10.04 and MGL Chapter 40A Section 3.

3. Maintenance of existing landscaping, gardens or lawn areas associated with a single family dwelling;

4. Repair or replacement of an existing roof of a single-family dwelling;

5. The construction of any fence that will not alter existing terrain or drainage patterns;

6. Construction of utilities (gas, water, electric, telephone, etc.) other than drainage, which will not alter terrain, ground cover, or drainage patterns;

7. Emergency repairs to any stormwater management facility or practice that poses a threat to public health or safety, or as deemed necessary by the *[Stormwater Authority]*;

8. Any work or projects for which all necessary approvals and permits have been issued before the effective date of this Bylaw;

9. Redevelopment projects are presumed to meet the specified stormwater management requirements described in the Stormwater Regulations of the Town of *[_____]* if the total impervious cover is reduced by *[40%]* from existing conditions. Where site conditions prevent the reduction in impervious cover, stormwater management practices shall be implemented to provide stormwater controls for at least *[40%]* of the site's impervious area. When a combination of impervious area reduction and stormwater management practice implementation is used for redevelopment projects, the combination of impervious area reduction and the area controlled by a stormwater management practice shall equal or exceed *[40%].*

10. An alteration, redevelopment, or conversion of land use to a hotspot such as, without limitation: auto salvage yards, auto fueling facilities, fleet storage yards, commercial parking lots with high intensity use, road salt storage areas, commercial nurseries and landscaping, outdoor storage and loading areas of hazardous substances, or marinas, shall require a Stormwater Management Permit.

6.0 PROCEDURES

Permit Procedures and Requirements shall be defined and included as part of any rules and regulations promulgated as permitted under Section 4 of this Bylaw.

7.0 ENFORCEMENT

The *[Stormwater Authority],* or an authorized agent of the *[Stormwater Authority]* shall enforce this Bylaw, regulations, orders, violation notices, and enforcement orders, and may pursue all civil and criminal remedies for such violations. Enforcement shall be further defined and included as part of any Stormwater regulations promulgated as permitted under Section 4 of this Bylaw.

8.0 SEVERABILITY

The invalidity of any section, provision, paragraph, sentence, or clause of this Bylaw shall not invalidate any section, provision, paragraph, sentence, or clause thereof, nor shall it invalidate any permit or determination that previously has been issued.

MODEL STORMWATER REGULATIONS

Duxbury, Marshfield, and Plymouth
December 31, 2004

1.0 PURPOSE

The purpose of these Stormwater Regulations is to protect, maintain and enhance the public health, safety, environment, and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-development stormwater runoff, decreased groundwater recharge, and nonpoint source pollution associated with new development and redevelopment, as more specifically addressed in the Stormwater Management Bylaw of the Town of *[_____]*.

2.0 DEFINITIONS

The definitions contained herein apply to issuance of a Stormwater Management Permit (SMP) established by the Town of *[_____]* Stormwater Management Bylaw and implemented through these Stormwater Regulations. Terms not defined in this section shall be construed according to their customary and usual meaning unless the context indicates a special or technical meaning.

ALTER: Any activity, which will measurably change the ability of a ground surface area to absorb water or will change existing surface drainage patterns. Alter may be similarly represented as "alteration of drainage characteristics," and "conducting land disturbance activities."

APPLICANT: A property owner or agent of a property owner who has filed an application for a stormwater management permit.

BEST MANAGEMENT PRACTICE (BMP): Structural, non-structural and managerial techniques that are recognized to be the most effective and practical means to prevent and/or reduce increases in stormwater volumes and flows, reduce point source and nonpoint source pollution, and promote stormwater quality and protection of the environment. "Structural" BMPs are devices that are engineered and constructed to provide temporary storage and treatment of stormwater runoff. "Nonstructural" BMPs use natural measures to reduce pollution levels, do not require extensive construction efforts, and/or promote pollutant reduction by eliminating the pollutant source.

BETTER SITE DESIGN: Site design approaches and techniques that can reduce a site's impact on the watershed through the use of nonstructural stormwater management practices. Better site design includes conserving and protecting natural areas and greenspace, reducing impervious cover, and using natural features for stormwater management.

CERTIFICATE OF COMPLETION (COC): A document issued by the *[Stormwater Authority]* after all construction activities have been completed which states that all conditions of an issued Stormwater Management Permit (SMP) have been met and that a project has been completed in compliance with the conditions set forth in a SMP.

CONVEYANCE: Any structure or device, including pipes, drains, culverts, curb breaks, paved swales or man-made swales of all types designed or utilized to move or direct stormwater runoff or existing water flow.

DEVELOPER: A person who undertakes or proposes to undertake land disturbance activities.

DEVELOPMENT: The modification of land to accommodate a new use or expansion of use, usually involving construction.

DISTURBANCE OF LAND: Any action that causes a change in the position, location, or arrangement of soil, sand, rock, gravel of similar earth material.

DRAINAGE EASEMENT: A legal right granted by a landowner to a grantee allowing the use of private land for stormwater management purposes.

GENERAL STORMWATER MANAGEMENT PERMIT (GSMP): A permit for projects in the categories and meeting the standards and defined herein and as authorized in the Town of *[_____]* Stormwater Management Bylaw. Projects in these categories that meet these generic standards and are properly implemented are assumed to meet the requirements and intent of the Town of *[_____]* Stormwater Management Bylaw.

GRADING: Changing the level or shape of the ground surface.

EROSION CONTROL: The prevention or reduction of the movement of soil particles or rock fragments.

EROSION CONTROL PLAN: A plan that shows the location and construction detail(s) of the erosion and sediment reduction controls to be utilized for a construction site.

FLOOD CONTROL: The prevention or reduction of flooding and flood damage.

FLOODING: A local and temporary inundation or a rise in the surface of a body of water, such that it covers land not usually under water.

GROUNDWATER: All water beneath any land surface including water in the soil and bedrock beneath water bodies.

HOTSPOT: Land uses or activities with higher potential pollutant loadings, such as auto salvage yards, auto fueling facilities, fleet storage yards, commercial parking lots with high intensity use, road salt storage areas, commercial nurseries and landscaping, outdoor storage and loading areas of hazardous substances, or marinas.

IMPERVIOUS SURFACE: Any material or structure on or above the ground that prevents water from infiltrating through the underlying soil. Impervious surface is defined to include, without limitation: paved parking lots, sidewalks, roof tops, driveways, patios, and paved, gravel and compacted dirt surfaced roads.

INFILTRATION: The act of conveying surface water into the ground to permit groundwater recharge and the reduction of stormwater runoff from a project site.

MASSACHUSETTS STORMWATER MANAGEMENT POLICY: The Policy issued by the Department of Environmental Protection, and as amended, that coordinates the requirements prescribed by state regulations promulgated under the authority of the Massachusetts Wetlands Protection Act G.L. c. 131 § 40 and Massachusetts Clean Waters Act G.L. c. 21, §. 23-56. The Policy addresses stormwater impacts through implementation of performance standards to reduce or prevent pollutants from reaching water bodies and control the quantity of runoff from a site.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) or MUNICIPAL STORM DRAIN SYSTEM: The system of conveyances designed or used for collecting or conveying stormwater, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage structure that together comprise the storm drainage system owned or operated by the Town of *[_____].*

NEW DEVELOPMENT: Any construction or land disturbance of a parcel of land that is currently in a natural vegetated state and does not contain alteration by man-made activities.

NONPOINT SOURCE POLLUTION: Pollution from many diffuse sources caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into water resource areas.

OPERATION AND MAINTENANCE PLAN: A plan that defines the functional, financial and organizational mechanisms for the ongoing operation and maintenance of a stormwater management system to insure that it continues to function as designed.

OWNER: A person with a legal or equitable interest in a property.

PERSON: Any individual, group of individuals, association, partnership, corporation, company, business organization, trust, estate, the Commonwealth or political subdivision thereof to the extent subject to Town Bylaws, administrative agency, public or quasi-public corporation or body, the Town of *[_____]*, and any other legal entity, its legal representatives, agents, or assigns.

PRE-DEVELOPMENT: The conditions that exist at the time that plans for the land development of a tract of land are submitted to the *[Stormwater Authority].* Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time prior to the first plan submission shall establish pre-development conditions.

POINT SOURCE: Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants are or may be discharged.

POST-DEVELOPMENT: The conditions that reasonably may be expected or anticipated to exist after completion of the land development activity on a specific site or tract of land. Post-development refers to the phase of a new development or redevelopment project after completion, and does not refer to the construction phase of a project.

RECHARGE: The replenishment of underground water reserves.

REDEVELOPMENT: Any construction, alteration, or improvement exceeding land disturbance of *[5,000]* square feet, where the existing land use is commercial, industrial, institutional, or multi-family residential.

RESOURCE AREA: Any area protected under including without limitation: the Massachusetts Wetlands Protection Act, Massachusetts Rivers Act, or Town of *[_____]* Wetlands Protection Bylaw.

RUNOFF: Rainfall, snowmelt, or irrigation water flowing over the ground surface.

SEDIMENTATION: A process of depositing material that has been suspended and transported in water.

SITE: The parcel of land being developed, or a designated planning area in which the land development project is located.

STORMWATER AUTHORITY: Town of *[_____]* [*Planning Board, Conservation Commission, Board of Health or other duly authorized Town entity that has the authority to administer, implement, and enforce these Stormwater Regulations].* The *[Stormwater Authority]* is responsible for coordinating the review, approval and permit process as defined in this Bylaw. Other Boards and/or departments participate in the review process as defined in Section 5 of these Stormwater Regulations.

STORMWATER MANAGEMENT: The use of structural or non-structural practices that are designed to reduce storm water runoff pollutant loads, discharge volumes, and/or peak flow discharge rates.

STORMWATER MANAGEMENT PERMIT (SMP): A permit issued by the *[Stormwater Authority]*, after review of an application, plans, calculations, and other supporting documents, which is designed to protect the environment of the Town from the deleterious affects of uncontrolled and untreated stormwater runoff.

STOP WORK ORDER: An order issued which requires that all construction activity on a site be stopped.

TSS: Total Suspended Solids**.**

WATER QUALITY VOLUME (WQ_v): The storage needed to capture a specified average annual stormwater runoff volume. Numerically (WQv) will vary as a function of drainage area or impervious area.

3.0 AUTHORITY

A) The Rules and Regulations contained herein have been adopted by the [*applicable town boards, commissions and/or departments]* in accordance with the Town of [*_____]* Stormwater Bylaw.

B) Nothing in these Rules and Regulations is intended to replace or be in derogation of the requirements of the Town of [*Town General Wetlands Protection Bylaw*] or the Town of *[_____] Floodplain Zoning Bylaw*] or any Rules and Regulations adopted thereunder.

C) These Stormwater Regulations may be periodically amended by the *[Stormwater Authority]* in accordance with the procedures outlined in Section 4.0 of the Town of *[_____]* Stormwater Bylaw.

4.0 ADMINISTRATION

A) The *[Stormwater Authority]* shall administer, implement and enforce these Regulations. Town Boards, including, but not limited to *[the Conservation Commission, Planning Board, Zoning Board of Appeals, Department of Public Works, Building Department, Board of Health, and insert any other applicable town board or department]* who have formally adopted these regulations, either directly, or by reference, and who issue permits and/or approvals for projects and/or activities under their specific jurisdiction and in accordance with their specific jurisdictional requirements regarding public notice, hearings and actions shall have approval authority under these Stormwater Regulations. Projects or activities approved by *[insert applicable board and/or department]* shall be deemed in compliance with the intent and provisions of these Stormwater

Regulations. Each approving *[insert board, commission or department]* must forward written documentation of said approval and all conditions of approval to the *[Stormwater Authority]* within *[10 business days]* of said approval. Upon receipt of written approval from *[insert board, commission or department]*, the *[Stormwater Authority]* shall issue a Stormwater Management Permit to the applicant within *[10 business days]*.

Note: The above provision is designed to allow existing Town Boards, Commissions and/or Departments who have current jurisdiction over project approval activities to continue their current review procedures, but to add a provision that would authorize these entities to review and approve stormwater management facilities designed in accordance with this Regulation. In order for this authority to be granted, each applicable Town entity must adopt these regulations either directly, or by reference which would allow applicants to receive stormwater approval for projects without making a separate application to the designative Stormwater Authority. If certain Town Boards, Commissions and/or Departments fail to adopt these Regulations they would not have review authority for stormwater management applications.

5.0 APPLICABILITY

A) These Stormwater Regulations apply to all activities in accordance with the applicability section of the Town of *[_____]* Stormwater Management Bylaw and further described in this section. Projects and/or activities not specifically under the currently regulated jurisdiction of any of the Town of *[_____]* boards, commissions or departments but still within the jurisdiction of the Town of *[_____]* Stormwater Management Bylaw must obtain a Stormwater Management Permit from the *[Stormwater Authority]* in accordance with the permit procedures and requirements defined in Section 6 of these Regulations. For projects and/or activities within the currently regulated jurisdiction of any of the Town of *[_____]* boards, commission or departments, the specific application submission requirements, public notices, and fee requirements of the applicable board, commission and/or department shall govern. Not withstanding these requirements, the Stormwater Management Plan Contents, Operation and Maintenance Plan Contents, and Stormwater Review Fee, under Section 6.0 L) and Section 6.0 M) of these Regulations must also be met.

B) If a portion of a project or activity is within the specific jurisdiction of *[insert applicable town board, commission and department]* then the entire project and all related projects required as a result of the activity proposed by the applicant shall be within the specific jurisdiction of that *[insert applicable town board, commission and department]* and subject to the provisions of these Regulations.

6.0 PERMIT PROCEDURES AND REQUIREMENTS

A) Projects requiring a stormwater management permit shall be required to submit the materials as specified in this section, and are required to meet the stormwater management criteria as specified in Section 7. Applicants filing a stormwater permit application under the currently regulated jurisdiction of the Town of *[_____] [insert applicable town board, commission and department]* need only to comply with Subsections 6.0 L, and 6.0 M of these Regulations.

B) Permit Required

1. No land owner or land operator shall receive any of the building, grading or other land development permits required for land disturbance activities without first meeting the requirements of this Bylaw prior to commencing the proposed activity.

2. Should a land-disturbing activity associated with an approved plan in accordance with this section not begin during the [*180-day]* period following permit issuance, the *[Stormwater Authority]* may evaluate the existing stormwater management plan to determine whether the plan still satisfies local program requirements and to verify that all design factors are still valid. If the authority finds the previously filed plan to be inadequate, a modified plan shall be submitted and approved prior to the commencement of land-disturbing activities.

C) Filing Application

1. The applicant shall file with the *[Stormwater Authority]*, *[three (3)]* copies of a completed application package for a Stormwater Management Permit (SMP). Permit issuance is required prior to any site altering activity. While the applicant can be a representative, the permittee must be the owner of the site. The SMP Application package shall include:

   a) A completed *[Application Form]* with original signatures of all owners;
   b) A list of abutters, certified by the Assessors Office; (abutters at their mailing addresses shown on the most recent applicable tax list of the assessors, including owners of land directly opposite on any public or private street or way, and abutters to the abutters within 300 feet of the property line of the applicant, including any in another municipality or across a body of water);
   c) Stormwater Management Plan and project description;
   d) Operation and Maintenance Plan;
   e) Payment of the application and review fees;
   f) Inspection and Maintenance agreement;
   g) Erosion and Sediment Control Plan;
   h) Surety bond.

D) Entry

Filing an application for a permit grants the *[Stormwater Authority]*, or its agent, permission to enter the site to verify the information in the application and to inspect for compliance with the resulting permit.

E) Fees

The *[Stormwater Authority]* shall obtain with each submission an Application Fee established by the *[Stormwater Authority]* to cover expenses connected with the review of the Stormwater Management Permit and a technical review fee sufficient to cover professional review services for the project. The *[Stormwater Authority]* is authorized to retain a Registered Professional Engineer or other professional consultant to advise the *[Stormwater Authority]* on any or all aspects of these plans. Applicants must pay review fees before the review process may begin.

1. Rules

   a) Application fees are payable at the time of application and are non-refundable.

   b) Application fees shall be calculated by the *[Stormwater Authority]* in accordance with the fee schedule below.

   c) These fees are in addition to any other local or state fees that may be charged under any other law, Bylaw, or local ordinance.

d) The fee schedule may be reduced or increased by the *[Stormwater Authority]*. Any such change shall be made at a posted public hearing of the *[Stormwater Authority]* not less than [30] days prior to the date upon which the change is to be effective.

2. Application Fees

a) A non-refundable application fee of the larger of *[$30.00] or $0.0030]* per square foot of the parcel to which the permit will be issued shall be due and payable to the Town of *[_____]* at the time an application is filed.

Or, the [Stormwater Authority] may adopt reasonable administrative fees and technical review fees for site plan review.

b) Application fees for permits issued under General Stormwater Management Permits (GSMP)s under Section 4 of the Town of *[_____]* Stormwater Bylaw shall be waived when such permits are issued for *[projects associated with existing single-family dwellings]* or *[for those projects that qualify].*

3. Engineering and Consultant Reviews and Fees

a) The *[Stormwater Authority]* is authorized to require an applicant to pay a fee for the reasonable costs and expenses for specific expert engineering and other consultant services deemed necessary by the *[Stormwater Authority]* to come to a final decision on the application. This fee is called the "Engineering and Consultant Review Fee."

b) Payment may be required at any point in the deliberations prior to a final decision.

c) Any application filed with the *[Stormwater Authority]* must be accompanied by a completed [*Engineering Consultant Fee Acknowledgement]* form.

d) Consultant fees shall be determined at the time of project review based on a specific scope of work, and shall be calculated at a rate of [*as the Stormwater Authority may determine].*

e) The services for which a fee may be utilized include, but are not limited to, wetland survey and delineation, hydrologic and drainage analysis, wildlife evaluation, stormwater quality analysis, site inspections, as-built plan review, and analysis of legal issues.

f) The *[Stormwater Authority]* is authorized to require an applicant to pay reasonable costs and expenses for certain activities which utilize the services of Town Staff. This includes such activities as inquiries concerning potential projects as well as site inspections not associated with a pending permit application.

g) The *[Stormwater Authority]* may require any applicant to pay an additional fee of [$30.00] per hour for review, inspection and monitoring services for any project filing that requires an excess of two (2) hours of review, inspection, and monitoring time by a Town Staff member.

h) Subject to applicable law, any unused portion of any fees collected shall be returned by the *[Stormwater Authority]* to the applicant within forty-five calendar days of a written request by the applicant, unless the *[Stormwater Authority]* decides in a public meeting that other action is necessary.

i) The Engineering and Consultant Review fees collected under this section shall be deposited in a revolving account. The *[Stormwater Authority]* shall include a full accounting of the revolving account as part of its annual report to the Town.

4. Revision Of Fee Schedules And Regulations Governing Fees

The *[Stormwater Authority]* may review and revise its regulations and fee schedules periodically as it sees fit.

a) Amendments shall be preceded by a public hearing.

b) A copy of the written decision will be filed with the town clerk within *[*10] days after final action is taken.

F) Public Hearings

The *[Stormwater Authority]* need not hold a public hearing for projects or activities outside the currently regulated jurisdiction of *[insert existing town boards, commissions and/or departments]*. For projects or activities within the currently regulated jurisdiction of *[insert existing town boards, commissions and/or departments], the applicable town board, commission and/or department* shall hold a public hearing in accordance with their own regulations and procedures.

G) Actions

The *[Stormwater Authority]*'s action, rendered in writing, shall consist of either:

1. Approval of the Stormwater Management Permit Application based upon determination that the proposed plan meets the Standards in Section 7 and will adequately protect the water resources of the community and is in compliance with the requirements set forth in this Bylaw;

2. Approval of the Stormwater Management Permit Application subject to any conditions, modifications or restrictions required by the *[Stormwater Authority]* which will ensure that the project meets the Standards in Section 7 and adequately protects water resources, set forth in this Bylaw;

3. Disapproval of the Stormwater Management Permit Application based upon a determination that the proposed plan, as submitted, does not meet the Standards in Section 7 or adequately protects water resources, as set forth in this Bylaw.

4. The *[Stormwater Authority]* may disapprove an application "without prejudice" where an applicant fails to provide requested additional information that in the *[Stormwater Authority's]* opinion is needed to adequately describe the proposed project. Information shall generally be limited to those items listed in Section 6.0 L) of these Regulations.

H) Failure of the *[Stormwater Authority]* to take final action upon an Application within *[30 calendar days]* of receipt of a complete application shall be deemed to be approval of said Application. Upon certification by the Town Clerk that the allowed time has passed without *[Stormwater Authority]* action, the *[Stormwater Authority]* must issue a Stormwater Management Permit.

I) Plan Changes

The permittee, must notify the *[Stormwater Authority]* in writing of any drainage change or alteration in the system authorized in a Stormwater Management Permit before any change or

alteration is made. If the *[Stormwater Authority]* determines that the change or alteration is significant, based on the Stormwater Management Standards in Section 7 and accepted construction practices, the *[Stormwater Authority]* may require that an amended application be filed.

J) Appeals of Actions of the *[Stormwater Authority]*

A decision of the *[Stormwater Authority]* shall be final. Further relief of a decision by the *[Stormwater Authority]* made under these Regulations shall be reviewable in the Superior Court in an action filed within *[60 days]* thereof, in accordance with M.G.L. Ch 249. § 4. An appeal of an action by a board, commission or department that has current regulatory authority for a project and/or activity shall be conducted under the applicable appeal provisions of said board, commission and/or department of the Town of *[____]*. Such an appeal shall result in revocation of the written approval as described under Section 4 of these Regulations, until such time as the appeal process of the applicable board, commission and/or department has been resolved.

K) Project Completion

At completion of the project the permittee shall submit as-built record drawings of all structural stormwater controls and treatment best management practices required for the site as required in Section 7. The as-built drawing shall show deviations from the approved plans, if any, and be certified by a Registered Professional Engineer.

L) Stormwater Management Plan Contents

1. The application for a stormwater management permit shall include the submittal of a Stormwater Management Plan to the *[Stormwater Authority]*. This Stormwater Management Plan shall contain sufficient information for the *[Stormwater Authority]* to evaluate the environmental impact, effectiveness, and acceptability of the measures proposed by the applicant for reducing adverse impacts from stormwater runoff. This plan shall be in accordance with the criteria established in these regulations and must be submitted with the stamp and signature of a Professional Engineer (PE) licensed in the Commonwealth of Massachusetts.

2. The Stormwater Management Plan shall fully describe the project in drawings, narrative, and calculations. It shall include:

    a) Contact Information. The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected;
    b) A locus map;
    c) The existing zoning, and land use at the site;
    d) The proposed land use;
    e) The location(s) of existing and proposed easements;
    f) The location of existing and proposed utilities;
    g) The site's existing & proposed topography with contours at 2 foot intervals,
    h) The existing site hydrology;
    i) A description & delineation of existing stormwater conveyances, impoundments, and wetlands on or adjacent to the site or into which stormwater flows;
    j) A delineation of 100-year flood plains, if applicable;
    k) Estimated seasonal high groundwater elevation in areas to be used for stormwater retention, detention, or infiltration;
    l) The existing and proposed vegetation and ground surfaces with runoff coefficients for each;

m) A drainage area map showing pre and post construction watershed boundaries, drainage area and stormwater flow paths, including municipal drainage system flows;

n) A description and drawings of all components of the proposed stormwater management system including:

i. Locations, cross sections, and profiles of all brooks, streams, drainage swales and their method of stabilization;
ii. All measures for the detention, retention or infiltration of water;
iii. All measures for the protection of water quality;
iv. The structural details for all components of the proposed drainage systems and stormwater management facilities;
v. Notes on drawings specifying materials to be used, construction specifications, and expected hydrology with supporting calculations;
vi. Proposed improvements including location of buildings or other structures, impervious surfaces, and drainage facilities, if applicable;
vii. Any other information requested by the *[Stormwater Authority]*.

o) Hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in this Regulation. Such calculations shall include:

i. Description of the design storm frequency, intensity and duration;
ii. Time of concentration;
iii. Soil Runoff Curve Number (RCN) based on land use and soil hydrologic group;
iv. Peak runoff rates and total runoff volumes for each watershed area;
v. Information on construction measures used to maintain the infiltration capacity of the soil where any kind of infiltration is proposed;
vi. Infiltration rates, where applicable;
vii. Culvert capacities;
viii. Flow velocities;
ix. Data on the increase in rate and volume of runoff for the specified design storms, and
x. Documentation of sources for all computation methods and field test results.

p) Post-Development downstream analysis if deemed necessary by the *[Stormwater Authority];*

q) Soils Information from test pits performed at the location of proposed stormwater management facilities, including but not limited to soil descriptions, depth to seasonal high groundwater, depth to bedrock, and percolation rates. Soils information will be based on site test pits logged by a Massachusetts Registered Soil Evaluator, or a Massachusetts Registered Professional Engineer;

r) Landscaping plan describing the woody and herbaceous vegetative stabilization and management techniques to be used within and adjacent to the stormwater practice.

M) Operation and Maintenance Plan Contents

An Operation and Maintenance plan (O&M Plan) is required at the time of application for all projects. The maintenance plan shall be designed to ensure compliance with the Permit, this Bylaw and that the Massachusetts Surface Water Quality Standards, 314, CMR 4.00 are met in all seasons and throughout the life of the system. The Operation and Maintenance Plan shall remain on file with the *[Stormwater Authority]* and shall be an ongoing requirement. The O&M Plan shall include:

1. The name(s) of the owner(s) for all components of the system;

2. A map showing the location of the systems and facilities including catch basins, manholes/access lids, main, and stormwater devices;

3. Maintenance agreements that specify:

    a) The names and addresses of the person(s) responsible for operation and maintenance;
    b) The person(s) responsible for financing maintenance and emergency repairs;
    c) An Inspection and Maintenance Schedule for all stormwater management facilities including routine and non-routine maintenance tasks to be performed;
    d) A list of easements with the purpose and location of each;
    e) The signature(s) of the owner(s).

4. Stormwater Management Easement(s)

    a) Stormwater management easements shall be provided by the property owner(s) as necessary for:

        i. Access for facility inspections and maintenance;
        ii. Preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities, including flood routes for the 100-year storm event;
        iii. Direct maintenance access by heavy equipment to structures requiring regular maintenance.

    b) The purpose of each easement shall be specified in the maintenance agreement signed by the property owner.

    c) Stormwater management easements are required for all areas used for off-site stormwater control, unless a waiver is granted by the [*Stormwater Authority*].

    d) Easements shall be recorded with the Plymouth County Registry of Deeds prior to issuance of a Certificate of Completion by the *[Stormwater Authority].*

5. Changes to Operation and Maintenance Plans

    a) The owner(s) of the stormwater management system must notify the *[Stormwater Authority]* of changes in ownership or assignment of financial responsibility.

    b) The maintenance schedule in the Maintenance Agreement may be amended to achieve the purposes of this Regulation by mutual agreement of the *[Stormwater Authority]* and the Responsible Parties. Amendments must be in writing and signed by all Responsible Parties. Responsible Parties shall include owner(s), persons with financial responsibility, and persons with operational responsibility.

7.0 POST-DEVELOPMENT STORMWATER MANAGEMENT CRITERIA

A) At a minimum all projects shall comply with the performance standards of the most recent version of Massachusetts Department of Environmental Protection (DEP) Stormwater Management Policy, as well as the following:

B) General Criteria

The following general performance criteria shall be applicable to all stormwater management plans, unless otherwise provided for in this Regulation:

1. No Untreated Discharges

   All stormwater runoff generated from land development and land use conversion activities shall not discharge untreated stormwater runoff directly to a wetland, local water body, municipal drainage system, or abutting property, without adequate treatment.

2. Channel Protection

   Protection of channels from bank and bed erosion and degradation shall be provided by

   [attenuating the 24-hour extended detention storage of runoff of the post-development 1-year, 24-hour return frequency storm event] (default option – optimal) OR

   [controlling the peak discharge rate from the 2-yr storm event to the pre-development rate as required by the MA DEP Stormwater Management Policy] (alternative option – minimum)

3. Overbank Flooding Protection

   Downstream overbank flood and property protection shall be provided by

   [attenuating the post-development peak discharge rate to the pre-development rate for the 10-year, 24-hour return frequency storm event as required by the MA DEP Stormwater Management Policy]. (default option - optimal)

4. Extreme Flooding Protection

   Extreme flooding and public safety protection shall be provided by

   [attenuating the peak discharge rate from the 100-yr, 24-hour return frequency storm event to the pre-development rates] (default option - optimal) OR

   [controlling and safely conveying the 100-year, 24 hour return frequency storm event such that flooding is not exacerbated] (alternative option - minimum) OR

   [evaluating the 100-year, 24-hour return frequency storm event to demonstrate no increased flooding impacts off-site, as required by the MA DEP Stormwater Management Policy] (another alternative option - minimum)

5. Recharge

   a) Annual groundwater recharge rates shall be maintained, by promoting infiltration through the use of structural and non-structural methods. At a minimum, annual recharge from the post development site shall mimic the annual recharge from pre-development site conditions.

   b) The stormwater runoff volume to be recharged to groundwater should be determined using the methods prescribed in the latest version of *[the Massachusetts DEP Stormwater Management Manual or an equivalent qualifying local manual].* The recharge requirements shall apply to all activities within the jurisdiction of this Regulation except as noted, and unless specifically waived by *[Stormwater Authority]*. The recharge criterion is not required for any portion of a site designated as a stormwater hotspot (see Section 7.10 of this Regulation). In addition, the *[Stormwater Authority*] may relax or eliminate the recharge requirement at its discretion, if the site is situated on unsuitable soils or is in a redevelopment area with documentation of prior contaminated soils.

6. Structural Practices for Water Quality

   a) Presumed Compliance with Massachusetts Water Quality Standards *(default option - minimum)*

      All structural stormwater management facilities shall be selected and designed using the appropriate criteria from the most recent version of the Massachusetts DEP Stormwater Management Manual.

      For other structural stormwater controls not included in the Massachusetts Stormwater Management Manual, or for which pollutant removal rates have not been provided, the effectiveness and pollutant removal of the structural control must be documented through prior studies, literature reviews, or other means and receive approval from the [*Stormwater Authority*] before being included in the design of a stormwater management system.

      Structural best management practices (BMPs) must be designed to remove [80%] of the average annual post development total suspended solids (TSS) and [40%] for total phosphorus [TP], and [30%] for total nitrogen (TN). It is presumed that a BMP complies with this performance goal if it is:

      i) Sized to capture the prescribed water quality volume;
      ii) Designed according to the specific performance criteria outlined in the *[Massachusetts Stormwater Management Manual or an approved local equivalent];*
      iii) Constructed properly; and
      iv) Maintained regularly.

   b) Pollutant Loading Calculation Assessment *(additional option - optimal)*

      i) For subdivisions of *[30]* lots or more, any commercial project with a building *[10,000]* square feet or more, or *[any project in an area designated by the Stormwater Authority as a sensitive/critical area],* a pollutant loading calculation shall be conducted to document compliance with water quality standards by calculating pre-development loads, calculating uncontrolled post-development loads and then

applying a prescribed pollutant removal efficiency to selected practices to arrive at a net pollutant load delivery. The post-developed load must be equal to or less than the pre-developed load.

ii) The methodology for this calculation shall be in accordance with *[reference approved local method/approach]*.

See Appendix A of these Model Stormwater Regulations for an example methodology for calculating pollutant load and assessing compliance.

7. Water Quality Volume

The prescribed water quality volume required in the sizing of a structural stormwater practice shall be

[calculated as 1.2 x total watershed area x runoff coefficient (Rv), where Rv = 0.05 + 0.009 (I%) and I% = percent of impervious area] *(default option – optimal) OR*

[0.50 inches x the total impervious area of the drainage area and 1.0 inches x the total impervious area of the drainage area in critical areas, as specified in the Massachusetts DEP Stormwater Policy] *(alternative option – minimum)*

8. Hydrologic Basis for Design of Structural Practices

For facility sizing criteria, the basis for hydrologic and hydraulic evaluation of development sites are as follows:

a) Impervious cover is measured from the site plan and includes any material or structure on or above the ground that prevents water from infiltrating through the underlying soil. Impervious surface is defined to include, without limitation: paved parking lots, sidewalks, roof tops, driveways, patios, and paved, gravel and compacted dirt surfaced roads.

b) Off-site areas shall be assessed based on their “pre-developed condition” for computing the water quality volume (i.e, treatment of only on-site areas is required). However, if an offsite area drains to a proposed BMP, flow from that area must be accounted for in the sizing of a specific practice.

c) Off-site areas draining to a proposed facility should be modeled as "present condition" for peak-flow attenuation requirements.

d) The length of sheet flow used in time of concentration calculations is limited to no more than 50 feet for predevelopment conditions and 50 feet for post development conditions.

e) Detention time for the one-year storm is defined as the center of mass of the inflow hydrograph and the center of mass of the outflow hydrograph.

f) The models TR-55 and TR-20 (or approved equivalent) will be used for determining peak discharge rates.

g) The standard for characterizing pre-development land use for on-site areas shall be woods.

h) For purposes of computing runoff, all pervious lands in the site shall be assumed prior to development to be in good condition regardless of conditions existing at the time of

computation.

i) If an off-site area drains to a facility, off-site areas should be modeled, assuming an "ultimate buildout condition" upstream.

j) Determination of flooding and channel erosion impacts to receiving streams due to land development projects shall be measured at each point of discharge from the development project and such determination shall include any runoff from the balance of the watershed which also contributes to that point of discharge.

k) The specified design storms shall be defined as a 24-hour storm using the rainfall distribution recommended by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) or the Northeast Regional Climate Center "Atlas of Precipitation Extremes for the Northeastern United State and Southeastern Canada."

l) Proposed residential, commercial, or industrial subdivisions shall apply these stormwater management criteria to the land development as a whole. Individual lots in new subdivisions shall not be considered separate land development projects, but rather the entire subdivision shall be considered a single land development project. Hydrologic parameters shall reflect the ultimate land development and shall be used in all engineering calculations.

9. Sensitive Areas

Stormwater discharges to critical areas with sensitive resources (i.e., shellfish beds, swimming beaches, aquifer recharge areas, water supply reservoirs) may be subject to additional criteria, or may need to utilize or restrict certain stormwater management practices at the discretion of the *[Stormwater Authority].* The *[Stormwater Authority]* may designate sensitive areas and specific criteria for these areas after conducting a public hearing in accordance with the provisions of Section 4.0 of the Town of *[_____]* Stormwater Bylaw.

10. Hotspots

Stormwater discharges from land uses or activities with higher potential pollutant loadings, known as "hotspots", as defined in the most recent version of the *[MA DEP Stormwater Management Manual or an equivalent qualifying local manual]* –require the use of specific stormwater management BMPs as specified in the most recent version of the *[MA DEP Stormwater Management Manual or an equivalent qualifying local manual]*. The use of infiltration practices without pretreatment is prohibited.

11. *[Stormwater Credits*

The use of Better Site Design and nonstructural stormwater management measures is encouraged to minimize reliance on structural stormwater management measures. The use of one or more site design measures by the applicant may allow for a reduction in the water quality treatment volume required and the stream channel protection volume required. The applicant may, if approved by the [Stormwater Authority], take credit for the use of stormwater better site design practices to reduce some of the requirements specified in the criteria section of these regulations. The site design practices that qualify for these credits and procedures for applying and calculating the credits are identified in Appendix B of this Model Regulation.]

8.0 WAIVERS

A) The *[Stormwater Authority]* may waive strict compliance with any requirement of the Town of *[_____]* Stormwater Bylaw or the rules and regulations promulgated hereunder, where:

1. such action is allowed by federal, state and local statutes and/or regulations,
2. is in the public interest, and
3. is not inconsistent with the purpose and intent of the Town of *[_____]* Stormwater Bylaw.

B) Any applicant may submit a written request to be granted such a waiver. Such a request shall be accompanied by an explanation or documentation supporting the waiver request and demonstrating that strict application of the Bylaw does not further the purposes or objectives of this bylaw.

C) All waiver requests shall be acted on within *[30 calendar days]* and written finding will be provided by the *[Stormwater Authority]*.

D) If in the *[Stormwater Authority's]* opinion, additional time or information is required for review of a waiver request, the *[Stormwater Authority]* may request an extension of the review period. In the event the applicant objects to an extension, or fails to provide requested information, the waiver request may be denied, "without prejudice" by the *[Stormwater Authority]*.

9.0 SURETY

The [*Stormwater Authority*] may require the permittee to post before the start of land disturbance or construction activity, a surety bond, irrevocable letter of credit, cash, or other acceptable security. The form of the bond shall be approved by town counsel, and be in an amount deemed sufficient by the *[Stormwater Authority]* to ensure that the work will be completed in accordance with the permit. If the project is phased, the *[Stormwater Authority*] may release part of the bond as each phase is completed in compliance with the permit but the bond may not be fully released until the *[Stormwater Authority]* has received the final inspection report as required by Section 11 of these Regulations and issued a Certificate of Completion.

10.0 CONSTRUCTION INSPECTIONS

A) Notice of Construction Commencement. The applicant must notify the *[Stormwater Authority]* in advance before the commencement of construction. In addition, the applicant must notify the *[Stormwater Authority]* in advance of construction of critical components of the SWM facility.

B) At the discretion of the *[Stormwater Authority],* periodic inspections of the stormwater management system construction shall be conducted by the Town Officer or a professional engineer or their designee who has been approved by the *[Stormwater Authority].* All inspections shall be documented and written reports prepared that contain the following information:

1. The date and location of the inspection;

2. Whether construction is in compliance with the approved stormwater management plan;

3. Variations from the approved construction specifications; and

4. Any other variations or violations of the conditions of the approved stormwater management plan.

C) The *[Stormwater Authority]* or its designee shall inspect the project site at the following stages, at a minimum:

1. Initial Site Inspection: prior to approval of any plan;

2. Erosion Control Inspection: to ensure erosion control practices are in accord with the filed plan;

3. Stormwater Management System Inspection: An inspection will be made of the completed stormwater management system, prior to backfilling of any underground drainage or stormwater conveyance structures.

4. Final Inspection

   a) After the stormwater management system has been constructed and before the surety has been released, all applicants are required to submit actual “as built” plans for any stormwater management facilities or practices after final construction is completed and must be certified by a Professional Engineer.

   b) The *[Stormwater Authority]* shall inspect the system to confirm its "as-built" features. This inspector shall also evaluate the effectiveness of the system in an actual storm. If the inspector finds the system to be adequate he shall so report to the *[Stormwater Authority]* which will issue a Certificate of Completion. As built plans shall be full size plans which reflect the “as built” conditions, including all final grades, developed by a Professional Engineer. All changes to project design should be recorded in red ink on plans to define changes made. All work deleted, corrections in elevations, and changes in materials, should be shown on the as built drawings.

D) Inadequacy of System

1. If the system is found to be inadequate by virtue of physical evidence of operational failure, even though it was built as called for in the Stormwater Management Plan, it shall be corrected by the applicant before the Certificate of Completion is released. If the applicant fails to act the *[Stormwater Authority]* may use the surety bond to complete the work.

2. If the *[Stormwater Authority]* determines that there is a failure to comply with the plan, the property owner shall be notified in writing of the nature of the violation and the required corrective actions. A Stop Work Order shall be issued until any violations are corrected and all work previously completed has received approval by the *[Stormwater Authority]*.

11.0 CERTIFICATE OF COMPLETION

A) Upon completion, the applicant is responsible for certifying that the completed project is in accordance with the approved plans and specifications and shall provide regular inspections sufficient to adequately document compliance.

B) The *[Stormwater Authority]* will issue a letter certifying completion upon receipt and approval of the final inspection and reports and/or upon otherwise determining that all work of the permit has been satisfactorily completed in conformance with this Regulation.

12.0 PERPETUAL INSPECTION AND MAINTENANCE

A) Maintenance Responsibility

1. Stormwater management facilities and practices included in a stormwater management plan with an inspection and maintenance agreement in accordance with Section 6.M of these Regulations must undergo ongoing inspections to document maintenance and repair needs and ensure compliance with the requirements of the agreement, the plan and this Regulation.

2. The owner of the property on which work has been done pursuant to this Regulation for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sedimentation controls, and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.

B) Maintenance Inspections

1. All stormwater management facilities must undergo inspections to document maintenance and repair needs and ensure compliance with the requirements of this bylaw and accomplishment of its purposes as specified in the Operation and Maintenance Plan and Maintenance Agreement described under Section 6.M of these regulations.

2. At a minimum, inspections shall occur during the first year of operation and at least once every [three] years thereafter. In addition, a maintenance agreement as specified under Section 6.M of these regulations between the owner and the *[Stormwater Authority]* shall be executed for privately-owned stormwater management systems that specifies the Responsible Party for conducting long term inspections.

3. Inspection reports shall be submitted to and maintained by the *[Stormwater Authority]* for all stormwater management systems. Inspection reports for stormwater management systems shall include:

   a) The date of inspection;
   b) Name of inspector;
   c) The condition of:

      i. Pretreatment devices
      ii. Vegetation or filter media
      iii. Fences or other safety devices
      iv. Spillways, valves, or other control structures
      v. Embankments, slopes, and safety benches
      vi. Reservoir or treatment areas
      vii. Inlet and outlet channels and structures
      viii. Underground drainage
      ix. Sediment and debris accumulation in storage and forebay areas (including catch basins)
      x. Any nonstructural practices
      xi. Any other item that could affect the proper function of the stormwater management system

   d) Description of the need for maintenance;

C) Right-of-Entry for Inspection

The terms of the inspection and maintenance agreement as specified in Section 6.M of these regulations shall provide for the [*Stormwater Authority*] or its designee to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. The *[Stormwater Authority]*, its agents, officers, and employees shall have authority to enter upon privately owned land for the purpose of performing their duties under this Regulation and may make or cause to be made such examinations, surveys, or sampling as the *[Stormwater Authority]* deems necessary, subject to the constitutions and laws of the United States and the Commonwealth.

D) Records of Maintenance and Repair Activities

Parties responsible for the operation and maintenance of a stormwater management facility shall provide records of all maintenance and repairs to the *[Stormwater Authority],* upon request. Parties responsible for the operation and maintenance of a stormwater management facility shall make records of the installation and of all maintenance and repairs, and shall retain the records for at least [5] years. These records shall be made available to the *[Stormwater Authority]* during inspection of the facility and at other reasonable times upon request.

E) Failure to Maintain

1. If a responsible person fails or refuses to meet the requirements of the inspection and maintenance agreement, the *[Stormwater Authority]*, after *[thirty (30)]* days written notice (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hours notice shall be sufficient), may correct a violation of the design standards or maintenance requirements by performing the necessary work to place the facility or practice in proper working condition. The *[Stormwater Authority]* may assess the owner(s) of the facility for the cost of repair work which shall be a lien on the property.

Note: Each Town should investigate whether the [Stormwater Authority] would be authorized to impose a lien on property through its regulations and/or has the ability to automatically establish a lien. The authority to establish a lien is sometimes by specific statute.

2. After notification is provided to the person responsible for carrying out the maintenance plan of any deficiencies discovered from an inspection of a stormwater management system, the person responsible for carrying out the maintenance plan shall have 30 days or other time frame mutually agreed to between the *[Stormwater Authority]* and the person responsible for carrying out the maintenance plan to correct the deficiencies. The *[Stormwater Authority]* shall then conduct a subsequent inspection to ensure completion of repairs.

13.0 ENFORCEMENT

A) The *[Stormwater Authority]* or an authorized agent of the *[Stormwater Authority]* shall enforce this Bylaw, regulations, orders, violation notices, and enforcement orders, and may pursue all civil, criminal and non-criminal remedies for such violations.

B) Notices and Orders

1. The *[Stormwater Authority]* or an authorized agent of the *[Stormwater Authority]* may issue a written notice of violation or enforcement order to enforce the provisions of this Bylaw or the regulations thereunder, which may include requirements to:

a) Cease and desist from construction or land disturbing activity until there is compliance with the Bylaw and the stormwater management permit;

b) Repair, maintain; or replace the stormwater management system or portions thereof in accordance with the operation and maintenance plan;

c) Perform monitoring, analyses, and reporting;

d) Fix adverse impact resulting directly or indirectly from malfunction of the stormwater management system.

2. If the enforcing person determines that abatement or remediation of adverse impacts is required, the order may set forth a deadline by which such abatement or remediation must be completed. Said order may further advise that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town of *[_____]* may, at its option, undertake such work, and the property owner shall reimburse the Town of *[_____]* for expenses incurred.

3. Within thirty (30) days after completing all measures necessary to abate the violation or to perform remediation, the violator and the property owner shall be notified of the costs incurred by the Town of *[_____]* including administrative costs. The violator or property owner may file a written protest objecting to the amount or basis of costs with the *[Stormwater Authority]* within thirty (30) days of receipt of the notification of the costs incurred. If the amount due is not received by the expiration of the time in which to file a protest or within thirty (30) days following a decision of the *[Stormwater Authority]* affirming or reducing the costs, or from a final decision of a court of competent jurisdiction, the costs shall become a special assessment against the property owner and shall constitute a lien on the owner's property for the amount of said costs. Interest shall begin to accrue on any unpaid costs at the statutory rate provided in G.L. Ch. 59, § 57, after the thirty-first day at which the costs first become due.

C) Any person who violates any provision of the Town of *[_____] Stormwater* Bylaw, or regulation, order or permit issued thereunder, may be ordered to correct the violation and/or shall be punished by a fine of not more than *[$_____]*. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

D) Non-Criminal Disposition. As an alternative to criminal prosecution or civil action, the Town of *[_____]* may elect to utilize the non-criminal disposition procedure set forth in G.L. Ch. 40, §21D and *[the citation town enabling vote/bylaw (if applicable)]* of the Town of *[_____]* in which case *[title or other authorized agent]* of the Town of *[_____]* shall be the enforcing person. The penalty for the 1st violation shall be *[$_____].* The penalty for the 2nd violation shall be *[$_____].* The penalty for the 3rd and subsequent violations shall be *[$ _____].* Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

E) Appeals**.** The decisions or orders of the [*Stormwater Authority*] shall be final. Further relief shall be to a court of competent jurisdiction.

F) Remedies Not Exclusive. The remedies listed in this Bylaw are not exclusive of any other remedies available under any applicable federal, state or local law.

14.0 SEVERABILITY

The invalidity of any section, provision, paragraph, sentence, or clause of these Regulations shall not invalidate any section, provision, paragraph, sentence, or clause thereof, nor shall it invalidate any permit or determination that previously has been issued.

Appendix A: Method of Pollutant Load Calculation for Compliance with Water Quality Standards

This appendix is included with the Model Stormwater Bylaw and Regulations to provide additional guidance to municipalities considering the adoption of the loading calculation approach as a requirement for large or complex projects, or projects located in sensitive areas. Prior to adoption of the sample approach presented here, each municipality should review the methodology in detail and generate the appropriate regulatory language to effectively implement this requirement.

For certain magnitude projects, a loading calculation analysis may be required by applicants to document compliance with water quality standards by calculating pre-development pollutant loads, calculating uncontrolled post-development pollutant loads and then applying a prescribed pollutant removal efficiency to selected practices to arrive at a net pollutant load delivery. The post-developed load must be equal to or less than the pre-developed load.

Pollutant Loading Calculation Approach for Compliance

Because of the potential for some projects to exceed pre-developed loads, even with Best Management Practices (BMPs) that are designed to meet performance standards, the *[Stormwater Authority]* may require applicants to prepare pollutant loading calculations that are intended to keep pollutant levels to the pre-developed condition baseline. The *[Stormwater Authority]* may require the maintenance of a "no net increase" in pollutant load; new development cannot exceed the pre-developed load based on pre-developed land cover conditions that are present at the time an applicant files for a Stormwater Management Permit. Loading from redevelopment projects may be required to be reduced 10% from existing levels. The *[Stormwater Authority]* may require a pollutant loading assessment for targeted pollutants to a receiving water body, based on pollutants of concern (i.e., phosphorus for freshwater systems, nitrogen for saltwater systems, and/or sediment).

The following computational exercise may be used to ensure that above provisions are met:

1. Loadings are computed for the pre-developed condition based on pre-development pollutant loading values;

2. The load from the proposed development is computed based on the proposed level of impervious cover and the appropriate loading factor for that land use. The *[Stormwater Authority]* shall require that the net difference between these two loads be reduced (or captured) by effective stormwater treatment practices.

This appendix presents data and a methodology for using the Simple Method (Schueler, 1987) to estimate pollutant load from a site or drainage area.

The Simple Method estimates stormwater runoff pollutant loads for urban areas. The technique requires a modest amount of information, including the subwatershed drainage area and impervious cover, stormwater runoff pollutant concentrations, and annual precipitation. With the Simple Method, an applicant can either break up land use into specific areas, such as residential, commercial, industrial, and roadway and calculate annual pollutant loads for each type of land, or

utilize more generalized pollutant values for "urban runoff." It is also important to note that these values may vary depending on other variables such as the age of development.

The Simple Method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$\mathbf{L = 0.226 * R * C * A}$$

Where: L = Annual pollutant load (lbs)
R = Annual runoff (inches)
C = Pollutant concentration (mg/l)
A = Area (acres)
0.226 = Unit conversion factor

For bacteria, the equation is slightly different, to account for the differences in units. The modified equation for bacteria is:

$$\mathbf{L = 103 * R * C * A}$$

Where: L = Annual load (billion colonies)
R = Annual runoff (inches)
C = Bacteria concentration (1,000/ ml)
A = Area (acres)
103 = Unit conversion factor

Stormwater pollutant concentrations can be estimated from local or regional data, or from national data sources. Table A.1 presents typical concentration data for pollutants in urban stormwater.

Table A.1 National Median Concentrations for Chemical Pollutants in Stormwater Runoff

Constituent	Units	Urban Runoff
TSS	mg/l	54.51
TP	mg/l	0.261
TN	mg/l	2.001
Cu	ug/l	11.11
Pb	ug/l	50.71
Zn	ug/l	1291
F Coli	1,000 col/ ml	1.52

Sources:
1: Pooled NURP/USGS (Smullen and Cave, 1998)
2: Schueler (1999)

In addition, some source areas appear to be particularly important for some pollutants. Table A.2 summarizes these data for several key source areas. It is important to note that, because the Simple Method computes runoff based on an impervious area fraction, it cannot be easily used to isolate pervious sources, such as lawns. In addition, a composite runoff concentration can be developed based on the fraction of lawn, driveway, and roof on a residential site, for example.

Table A.2 Pollutant Concentration from Different Source Areas/Land Uses							
Constituent	**TSS[1]**	**TP[2]**	**TN[3]**	**F Coli[1]**	**Cu[1]**	**Pb[1]**	**Zn[1]**
Units	mg/l	mg/l	mg/l	1,000 col/ ml	ug/l	ug/l	ug/l
Residential Roof	19	0.11	1.5	0.26	20	21	312
Commercial Roof	9	0.14	2.1	1.1	7	17	256
Industrial Roof	17	-	-	5.8	62	43	1,390
Commercial/Res Parking	27	0.15	1.9	1.8	51	28	139
Industrial Parking	228	-	-	2.7	34	85	224
Residential Street	172	0.55	1.4	37	25	51	173
Commercial Street	468	-	-	12	73	170	450
Rural Highway	51	-	22	-	22	80	80
Urban Highway	142	0.32	3.0	-	54	400	329
Lawns	80	2.1	9.1	24	17	17	50
Landscaping	37	-	-	94	94	29	263
Driveway	173	0.56	2.1	17	17	-	107
Heavy Industrial	124	-	-	-	148	290	1600
Residential (general)[4]	100	0.40	2.2	-	-	18	37
Commercial (general)[4]	75	0.20	2.0	-	-	370	250
Industrial (general)[4]	120	0.40	2.5	-	-	-	-
Sources: 1: Claytor and Schueler (1996) 2: Average of Steuer et al. (1997), Bannerman (1993) and Waschbusch (2000) 3: Steuer et al. (1997) 4: Caraco (2001), default values averaged from several individual assessments							

Pre-developed loads are usually estimated from specific loading rates based on pre-developed land cover. The following lists typical unit loading rates for key pollutant parameters from forest and rural land uses (Caraco, 2001).

Forest:

TSS: 100 lbs/acre/year
TP: 0.2 lbs/acre/year
TN: 2.0 lbs/acre/year
FC bacteria: 12 billion col/acre/year

Rural:

TSS: 300 lbs/acre/year
TP: 0.75 lbs/acre/year
TN: 5.0 lbs/acre/year
FC bacteria: 39 billion col/acre/year

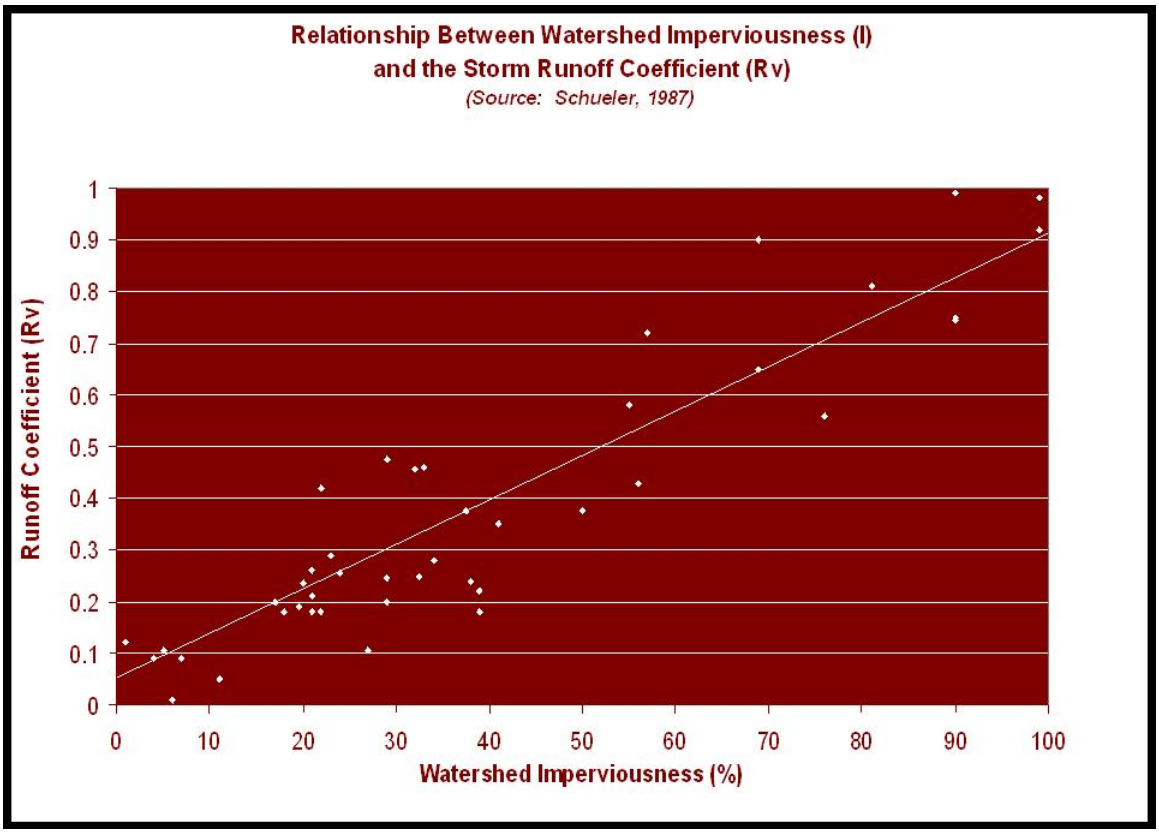

Figure A.1: Relationship between Watershed Imperviousness and the Stormwater Runoff Coefficient

The Simple Method calculates annual runoff as a product of annual runoff volume, and a runoff coefficient (Rv). Runoff volume is calculated as:

$$\mathbf{R = P * P_j * Rv}$$

Where: R = Annual runoff (inches)
P = Annual rainfall (inches)
P_j = Fraction of annual rainfall events that produce runoff (usually 0.9)
Rv = Runoff coefficient

In the Simple Method, the runoff coefficient is calculated based on impervious cover in the drainage area. This relationship is shown in Figure A.1. Although there is some scatter in the data, watershed imperviousness does appear to be a reasonable predictor of Rv. The following equation represents the best fit line the dataset (N=47, R2=0.71).

$$\mathbf{Rv=0.05+0.9I_a}$$

Where: I_a = Impervious fraction

The Simple Method uses different impervious cover values for separate land uses within a subwatershed. Representative impervious cover data, are presented in Table A.3 (Cappiella and Brown, 2001). In addition, Towns may have detailed impervious cover information if they

maintain a detailed land use/land cover GIS database, or applicants can measure impervious cover directly from site plans.

Table A.3 Land Use and Impervious Cover Estimates	
Land Use Category	**Mean Impervious Cover**
Agriculture	**2**
Open Urban Land*	**9**
2 Acre Lot Residential	**11**
1 Acre Lot Residential	**14**
1/2 Acre Lot Residential	**21**
1/4Acre Lot Residential	**28**
1/8 Acre Lot Residential	**33**
Townhome Residential	**41**
Multifamily Residential	**44**
Institutional**	**31-38%**
Light Industrial	**50-56%**
Commercial	**70-74%**

* Open urban land includes developed park land, recreation areas, golf courses, and cemeteries.

** Institutional is defined as places of worship, schools, hospitals, government offices, and police and fire stations

Source: Cappiella and Brown, 2001

The Simple Method should provide reasonable estimates of changes in pollutant export resulting from urban development activities. However, several caveats should be kept in mind when applying this method.

The Simple Method is most appropriate for assessing and comparing the relative stormflow pollutant load changes of different land use and stormwater management scenarios. The Simple Method provides estimates of storm pollutant export that are probably close to the "true" but unknown value for a development site, catchment, or subwatershed. However, it is very important not to overemphasize the precision of the results obtained. For example, it would be inappropriate to use the Simple Method to evaluate relatively similar development scenarios (e.g., 34.3% versus 36.9% Impervious cover). The Simple Method provides a general planning estimate of likely storm pollutant export from areas at the scale of a development site, catchment or subwatershed. More sophisticated modeling may be needed to analyze larger and more complex drainage areas.

In addition, the Simple Method only estimates pollutant loads generated during storm events. It does not consider pollutants associated with baseflow volume. Typically, baseflow is negligible or non-existent at the scale of a single development site, and can be safely neglected. However, catchments and subwatersheds do generate baseflow volume. Pollutant loads in baseflow are generally low and can seldom be distinguished from natural background levels (NVPDC, 1980). Consequently, baseflow pollutant loads normally constitute only a small fraction of the total pollutant load delivered from an urban area. Nevertheless, it is important to remember that the load estimates refer only to storm event derived loads and should not be confused with the total pollutant load from an area. This is particularly important when the development density of an area is low. For example, in a large low density residential subwatershed (Imp. Cover < 5%), as

much as 75% of the annual runoff volume may occur as baseflow. In such a case, the annual baseflow nutrient load may be equivalent to the annual stormflow nutrient load.

The removal efficiencies of various BMPs are also needed to determine final annual pollutant loads. Table A.4 provides estimates of the average pollutant removal efficiency of the five BMP categories.

Table A.4 Suggested Pollutant Removal Rate for Stormwater BMPs (%)

Constituent	TSS	TP	TN	Metals[1]	Bacteria
Wet Ponds	80	50 (51)	35 (33)	60 (62)	70
Stormwater Wetlands	80[2] (76)	50 (49)	30	40 (42)	80 (78)
Filtering Practices	85 (86)	60 (59)	40 (38)	70 (69)	35 (37)
Infiltration Practices[4]	90[3] (95)	70	50 (51)	90[3] (99)	90[4]
Water Quality Swales	85 (84)	40 (39)	50[5] (84)	70	0 (-25)[6]

1. Average of zinc and copper. Only zinc for infiltration
2. Many wetland practices in the database were poorly designed, and we consequently adjusted sediment removal upward.
3. It is assumed that no practice is greater than 90% efficient.
4. Data inferred from sediment removal.
5. Actual data is based on only two highly performing practices.
6. Assume 0 rather than a negative removal.

Note: Data in parentheses represent median pollutant removal data reported in the *National Pollutant Removal Database - Revised Edition* (Winer, 2000).
(Source: CWP, 2001)

These data were adjusted for convenience and to reflect biases in the data. These efficiencies represent ideal pollutant removal rates that cannot be achieved at all sites. Of particular importance is how to account for practices applied in series (e.g., two ponds applied in sequence). If the volume within the practices adds up to the total water quality volume, they are assumed to act as a single practice with that volume. Otherwise, total pollutant removal should be determined by the following equation:

$$\mathbf{R = L\ [(E_1) + (1- E_1)E_2 + (1-((E_1)+(1- E_1)E_2)E_3 + \ldots]}$$

Where: R = Pollutant Removal (lbs)
L = Annual Load from Simple Method (lbs.)
E_i = Efficiency of the ith practice in a series

Another adjustment can be made to these removals to account for loss of effectiveness and irreducible concentrations. Evidence suggests that, at low concentrations, BMPs can no longer remove pollutants. Table A.5 depicts typical outflow concentrations for various BMPs. Another simplified way to account for this phenomenon is to reduce the efficiency of a second or third practice in a series. For example, the estimated removal efficiency could be cut in half to reflect inability to remove fine particles.

Table A.5 Typical BMP Effluent Concentrations					
Constituent	**TSS** (mg/l)	**TP** (mg/l)	**TN** (mg/l)	**Cu** (ug/l)	**Zn** (ug/l)
Wet Ponds	17	0.11	1.3	5.0	30
Wetlands	22	0.20	1.7	7.0	31
Filtering Practices	11	0.10	1.12	10	21
Infiltration Practices	17[1]	0.05[1]	3.8[1]	4.8[1]	39[1]
Open Channel Practices	14	0.19	1.12	10	53
1. Data based on fewer than five data points (Source: Winer, 2000)					

Summary of The Simple Method Calculation Procedure

1. Calculate Pre-Development Pollutant Load
   - Use the equation L = 0.226 * R * C * A (or L = 103 * R * C * A for bacteria) to determine pre-development pollutant loading, where R = P * P_j * Rv, C is determined by values in tables A.1 or A.2, and A is the area of the site. Rv is the predeveloped volumetric runoff coefficient, usually in the range of 0.1 for woods to 0.2 for meadow.
2. Calculate "Uncontrolled" Post-Development Pollutant Load
   - Use the equation L = 0.226 * R * C * A (or L = 103 * R * C * A for bacteria) to determine post-development pollutant loading without BMPs, where R = P * P_j * Rv, C is determined by values in tables A.1 or A.2, and A is the area of the site. Rv is determined by Rv=0.05+0.9Ia, where values from I_a may be determined by Table A.3.
3. Determine Efficiency Removal Rates of proposed BMPs
   - Use Table A.4 to obtain pollutant removal rates for the proposed BMPs. If more than one BMP is to be used in series, calculate the total effective removal rate using R = L [(E_1) + (1- E_1)E_2 + (1-((E_1)+(1- E_1)E_2)E_3 + …]
4. Determine "Controlled" Post-Development Pollutant Load
   - Multiply the uncontrolled post-development pollutant load by the total pollutant removal rate, to obtain the amount of pollutant removed.
   - Subtract the total amount of pollutant removed from the uncontrolled post-development load, to obtain the "controlled" post-development pollutant load.
5. Compare Controlled Development Load versus Pre-Development Load
   - If the post-development controlled load is less than or equal to the pre-development load, then the proposed design complies with the prescribed loading calculation criteria. If not, the designer must revise the project design to reduce the pollutant loadings, or revise the design to include an alternate system of BMPs.

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Appendix B: Example System of Stormwater Management Credits and Incentives

B.1 Stormwater Credits

The current stormwater management criteria in Massachusetts provides a strong general incentive to reduce impervious cover at the site level. The storage required to meet all of the sizing criteria (water quality, recharge, 2-year, 10-year, and 100-year control) are directly related to impervious cover. Any reductions in impervious cover result in smaller required storage volumes and, consequently, smaller land consumption areas and lower construction costs. In an effort to apply a more holistic approach to stormwater management, five specific non-structural practices called *stormwater credits*, or incentives for better environmental site design, are provided for designers that will significantly reduce the size and cost of structural practices.

Non-structural practices are increasingly recognized as a critical feature of effective stormwater management, particularly with respect to site design. In most cases, non-structural practices will need to be combined with structural practices to meet stormwater requirements. The key benefit of non-structural practices is that they can reduce the generation of stormwater from the site. In addition, they can provide partial removal of many pollutants and contribute to groundwater recharge. The five proposed non-structural stormwater credits are:

Credit 1. Disconnection of Rooftop Runoff
Credit 2. Disconnection of Non-Rooftop Runoff
Credit 3. Stream Buffers
Credit 4. Grass Channels
Credit 5. Environmentally Sensitive Development

This section describes each of the credits for the five groups of non-structural practices and specifies minimum criteria to be eligible for the credit. Towns may need to update or revise some of the local subdivision regulations and/or zoning bylaws to ensure that the credit will be applicable to their jurisdiction. In addition, the Massachusetts Department of Environmental Protection (DEP) will need to validate the volume reductions in order to ensure compliance with the Massachusetts Wetlands Protection Act.

The application of these credits does not relieve the design engineer or reviewer from the standard of engineering practice associated with safe conveyance of stormwater runoff and good drainage design.

Several of the stormwater credits apply towards meeting the Massachusetts Stormwater Policy's recharge requirement. The Massachusetts Stormwater Policy currently only recognizes a volume based approach to meeting this criterion. Recently however, it has been demonstrated that disconnecting impervious area to drain over pervious areas can result in significant recharge to groundwater. Therefore, some jurisdictions (most notably the States of Vermont and Maryland) have developed recharge criterion that credit recharge based on an "area method," as opposed to strictly a volume method. To better understand this approach both the "volume method" and "area method" are described as follows.

The intent of the recharge criteria (which is often denoted as Re_v) is to maintain pre-developed groundwater recharge rates at development sites to preserve existing water table elevations, thereby helping to support baseflow to streams and wetlands, as well as to help augment drinking water supplies.

The objective of the criteria is to mimic the average annual recharge rate for the prevailing hydrologic soil group(s) (HSG) present at a development site. Therefore, the recharge volume can be determined as a function of annual predevelopment recharge for a given soil group, average annual rainfall volume, and amount of impervious cover at a site. Being a function of site impervious cover, the criterion provides an incentive to engineers and developers to reduce site imperviousness.

The recharge can be satisfied by one of two methods or a combination of both. The first is designated as the "**Percent Volume Method**," and is based on infiltrating the recharge volume using one or more of the approved structural practices (such as infiltration trench, infiltration basins, or drywells). The second method is designated as the "**Percent Area Method**," and is based on draining runoff from some or all of a site impervious area through one or more of the approved nonstructural practices.

Based on this approach, the **Percent Volume Method** is as follows:

$Re_v = (F)(A)(I)/12$

Where:
- Re_v = Recharge volume (acre-feet)
- F = Recharge factor (in inches, see below)
- A = Site area (in acres)
- I = Site imperviousness (expressed as a decimal)

Hydrologic Soil Group	Recharge Factor (F)
A	0.40
B	0.25
C	0.10
D	waived

An example calculation of this method is provided below.

> *Example*: A 50-acre site is to be developed as a residential subdivision near Burlington, MA. The impervious area for the development will be 20 acres (i.e., 40% imperviousness). Half of the impervious area overlays HSG "B" soils and half of the impervious area overlays HSG "C" soils. The recharge requirement would be calculated as follows:
>
> Compute a weighted F = [(0.25 in)(10 ac) + (0.10 in)(10 ac)]/20 ac = 0.175 inches
> Re_v = (0.175 in) (50 ac) (0.4)/(12 in/ft) = 0.29 ac-ft

Under the **Percent Area Approach**, the recharge requirement can be met by draining a calculated recharge area through one or more of several nonstructural approaches (this is where stormwater credits are most applicable). The calculation is as follows:

$Re_a = (F)(A)(I)$

Where: Re_a = Recharge area requiring treatment (acres)
F = Recharge factor based on HSG (same values as above, but dimensionless)
A = Site area in acres
I = Site imperviousness (expressed as a decimal)

The required recharge area (Re_a) is equivalent to the recharge volume and can be achieved by a non-structural practice (e.g., filtration of sheet flow from disconnected impervious surfaces). In addition, a combination of both of the methods can be used to meet the recharge requirement at a site.

If an applicant elects to utilize both the Percent Volume and Percent Area Methods to meet the recharge requirement, the following applies:

1. Calculate both the Re_v and Re_a for the site.
2. The site impervious area draining to an approved nonstructural practice is subtracted from the Re_a calculation from step 1, above;
3. The remaining Re_a is divided by the original Re_a to calculate a pro-rated percentage that needs to be met by the Percent Volume Method;
4. The pro-rated percent is multiplied by the original Re_v to calculate a new Re_v that must be met by an approved structural practice(s)

With this basic understanding of how the recharge requirement can be met on a project, it is now appropriate to review the suite of stormwater credits that can meet both recharge, water quality and, in a few cases, some of the water quantity controls as well.

B.2 Credit No. 1: Disconnection of Rooftop Runoff Credit

A credit is given when rooftop runoff is "disconnected" and then directed over to a pervious area where it can either infiltrate into the soil or flow over it with sufficient time and velocity to allow for filtering. The credit is typically obtained by grading the site to promote overland flow through vegetated channels or by providing bioretention[1] areas either on-lot or in common areas.

If a rooftop is adequately disconnected, the disconnected impervious area can be deducted from total impervious cover, therefore reducing water quality volume requirements. In addition, disconnected rooftops can be used to meet the recharge requirement as a non-structural practice under the **Percent Area Method**.

Restrictions on the Credit

The rooftop disconnection credit is subject to the following restrictions:

- Disconnection must be designed to adequately address the issue of basement seepage;
- The contributing length of rooftop to a discharge location shall be 75 feet or less;
- The rooftop contributing area to any one discharge location cannot exceed 1,000 $ft^{2;}$
- The length of the "disconnection" shall be equal to or greater than the contributing rooftop length;
- Disconnections will only be credited for residential lot sizes greater than 6,000 sq. ft;
- The entire vegetative "disconnection" shall be on a slope less than or equal to 5.0%;
- Where provided, downspouts must be at least 10 feet away from the nearest impervious surface to discourage re-connection to the drainage network;
- Where a gutter/downspout system is not used, the rooftop runoff must drain as either sheetflow from the structure or drain to a subsurface drain field that is not directly connected to the drainage network;
- Disconnections are encouraged on relatively permeable soils (HSGs A and B); therefore, no soil evaluation is required;
- In less permeable soils (HSGs C and D), the water table depth and permeability shall be evaluated by a professional engineer to determine if a spreading device is needed to provide sheetflow over grass surfaces. In some cases, dry wells (see Figure B.1), french drains or other temporary underground storage devices may be needed to compensate for a poor infiltration capability;
- For those rooftops draining directly to a stream buffer, one can only use either the rooftop disconnection credit or the stream buffer credit (Credit 3), not both; and
- To take credit for rooftop disconnection for a designated hotspot land use, the rooftop runoff must not co-mingle with runoff from any paved surfaces.

[1] Bioretention systems (also referred to as "rain gardens" or "biofilters") are so-called low impact development stormwater management systems that manage and treat stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. The method combines physical filtering and adsorption with bio-geochemical processes to remove pollutants. The system consists of an inflow component, a pretreatment element, an overflow structure, a shallow ponding area (less than 9" deep), a surface organic layer of mulch, a planting soil bed, plant materials, and an underdrain system to convey treated runoff to a downstream facility.

An example of this credit is provided below.

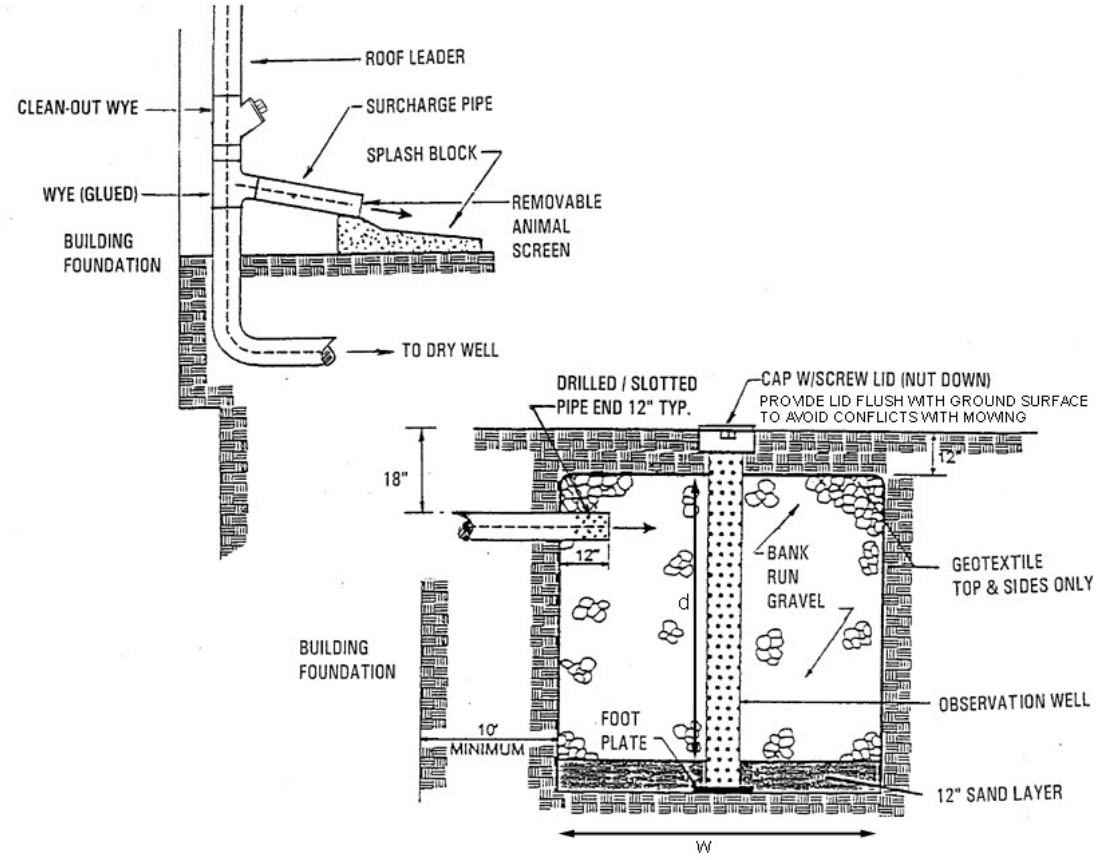


Figure B.1 Schematic of Dry Well (Source: adapted after Howard County, MD)

Rooftop Disconnection Credit Example Application

Given the following base data:
Site Data: 108 Single Family Residential Lots (~ ½ acre lots)
Site Area = 45.1 ac
Original Impervious Area = 12.0 ac;
Site Soils Types: 78% "C", 22% "D"
Composite Recharge Factor, F = 0.08
Original Re_v = 0.08 acre-feet; Re_a = 0.96 acres
Original water quality requirement = 1.0"/impervious acre = 1.0"(12.0 ac)/12 = 1.0 acre-foot
(site is located in a critical area)

Rooftop Credit (see Figure B.2)
42 houses disconnected
Average house area = 2,500 ft^2
Net impervious area reduction = (42)(2,500 ft^2) / (43,560 ft^2/ac) = 2.41 acres
New impervious area = 12.0 – 2.41 = 9.59 acres;

Required recharge (Re_a) is 0.96 acres and 2.41 acres were disconnected thereby meeting 100% of the recharge requirement.

New water quality volume = 1.0" (9.59)/12 = 0.80 acre-feet; or a 0.20 acre-foot reduction

Percent Reductions Using Rooftop Disconnection Credit:

- Re_v = 100%
- Water quality = (1.0 – 0.8) / 1.0 = 20.0%

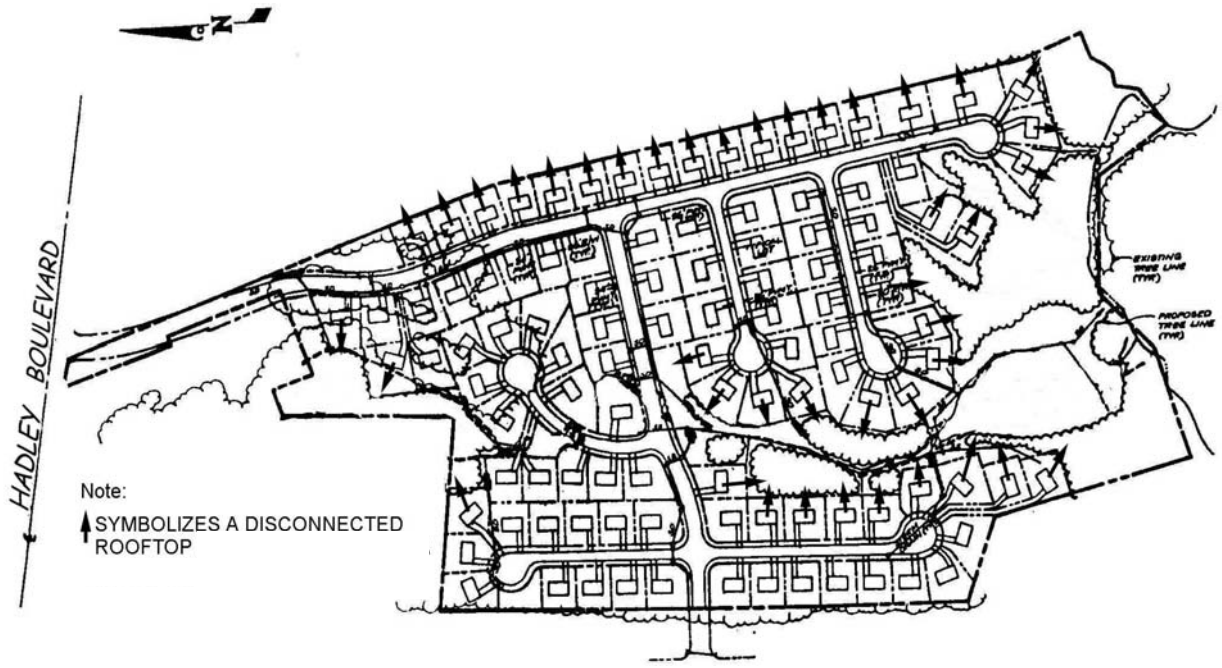


Figure B.2 Schematic of Rooftop Disconnection Credit

B.3 Credit No 2: Disconnection of Non-Rooftop Runoff Credit

Credit is given for practices that disconnect surface impervious cover runoff by directing it to pervious areas where it is either infiltrated into the soil or filtered (by overland flow). This credit can be obtained by grading the site to promote overland vegetative filtering.

These "disconnected" areas can be subtracted from the site impervious area when computing the water quality treatment volume. In addition, disconnected surface impervious cover can be used to meet the recharge requirement as a non-structural practice under the **Percent Area Method**.

Restrictions on the Credit

The credit is subject to the following restrictions:

- The maximum contributing impervious flow path length shall be 75 feet;
- Runoff cannot come from a designated hotspot land use;
- The length of the "disconnection" must be equal to or greater than the contributing length;
- The entire vegetative "disconnection" shall be on a slope less than or equal to 5.0%;
- The surface impervious area to any one discharge location cannot exceed 1,000 ft^2;
- Disconnections are encouraged on relatively permeable soils (HSGs A and B); therefore, no soil evaluation is required;
- In less permeable soils (HSGs C and D), the water table depth and permeability shall be evaluated by a professional engineer to determine if a spreading device such as a french drain, gravel trench or other temporary storage device is needed to compensate for poor infiltration capability; and
- For those areas draining directly to a buffer, only the non-rooftop disconnection credit or the stream buffer credit can be used, not both;

See Section B.8 for an example application of this credit draining to a filter strip.

B.4 Credit No. 3: Stream Buffer Credit

This credit is given when stormwater runoff is effectively treated by a stream buffer. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to a stream buffer and treating runoff through the overland flow in a natural vegetative or forested buffer. The use of a filter strip is also recommended to treat overland flow in the green space of a development site (see Figure B.3). The credits include:

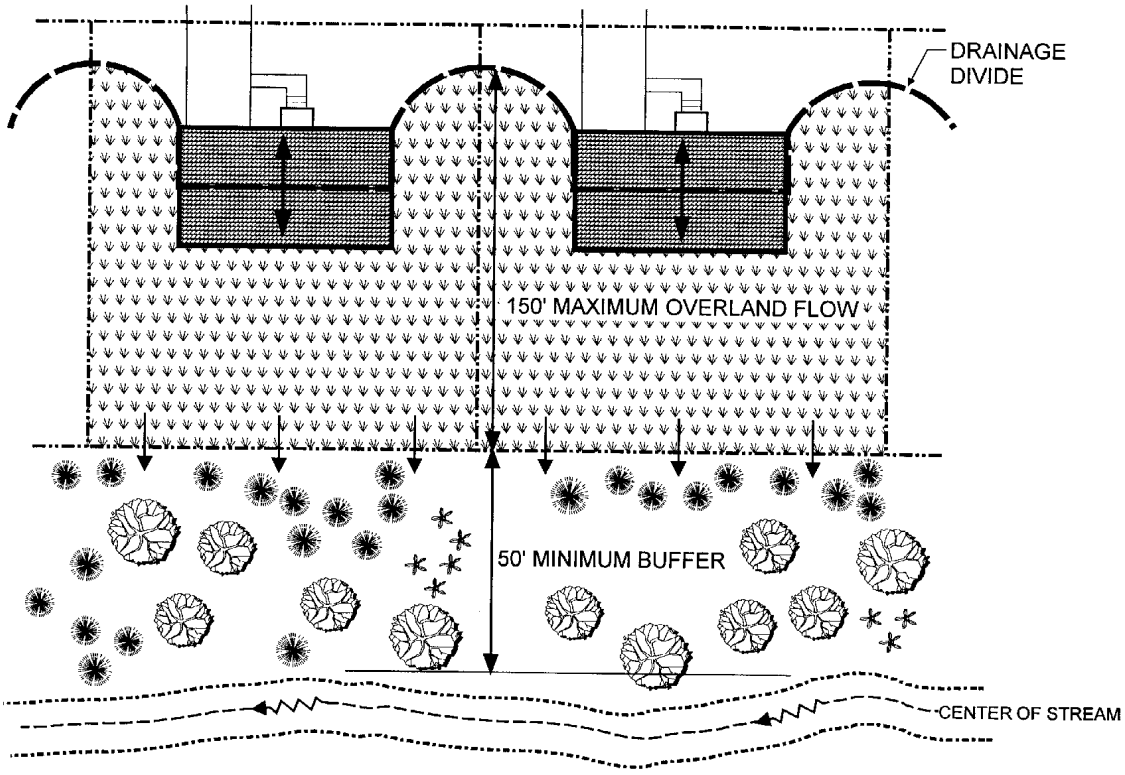
- The impervious area draining by sheet flow to a stream buffer is subtracted from the site's initial impervious area in the water quality calculation.
- The impervious area draining to stream buffer contributes to the recharge requirement, (Re_v), under the **Percent Area Method**.

Restrictions on the Credit

The credit is subject to the following conditions:

- The minimum stream buffer width (i.e., perpendicular to the stream flow path) shall be 50 feet as measured from the bank elevation of a stream or the boundary of a wetland;
- The maximum contributing path shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces;
- The average contributing overland slope to and across the stream buffer shall be less than or equal to 5.0%;
- Runoff shall enter the stream buffer as sheet flow. A level spreading device shall be utilized where local site conditions prevent sheet flow from being maintained;
- The credit is not applicable if rooftop or non-rooftop disconnection is already provided (i.e., no double counting); and
- Stream buffers shall remain ungraded and uncompacted, and the over-story and under-story vegetation shall be maintained in a natural condition;

See Section B.8 for an example application of this credit.



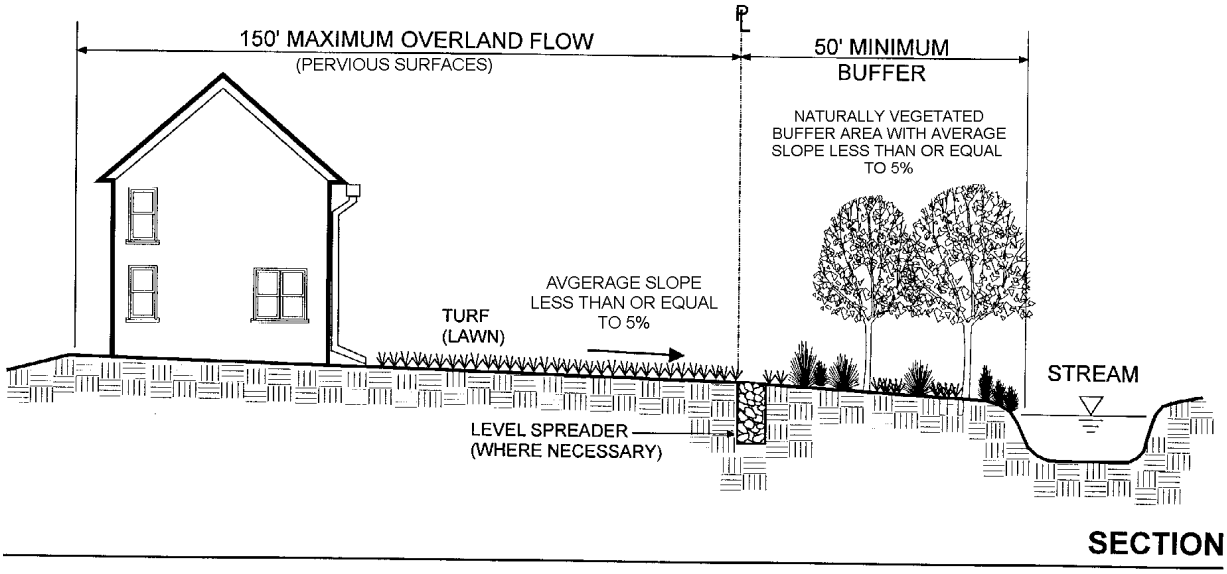


Figure B.3 Example of Stream Buffer Credit Option

B.5 Credit No. 4: Grass Channel Credit

Credit may be given when open grass channels are used to reduce the volume of runoff and pollutants during smaller storms (i.e., 1.0 inches and less).

Use of a grass channel will automatically meet the minimum recharge Re_v requirement (under the **Percent Area Method**) regardless of the geometry or slope. If designed according to the following design criteria, the grass channel will meet the water quality treatment requirements for certain kinds of residential development.

Note: Runoff curve numbers (CNs) for 2-year, 10-year, and 100-year control will not change.

Grass Channel Design Criteria

The credit is obtained if a grass channel meets the following criteria.

- Land use is moderate to low density residential (maximum density of 4 du/ac);
- The bottom width shall be 2 foot minimum and 6 foot maximum (if a larger channel is needed, a compound cross section may be used);
- The side slopes shall be 3H:1V or flatter;
- The channel slope shall be less than or equal to 4.0%; and
- The length of the grass channel shall be equal to the roadway length.

Grass Channel Credit Example Application

Base Data
Site Data: 108 Single Family Residential Lots (~ ½ acre lots)
Site Area = 45.1 ac
Original Impervious Area = 12.0 ac; or I = 12.0/45.1 = 26.6%
Site Soils Types: 78% "C", 22% "D"
Composite F = 0.08
Original Re_v = 0.08 acre-feet; Re_a = 0.96 acres
Original WQ_v = 1.0 acre-feet

Grass Channel Credit (see Figure B.4)
Entire site is open section road, but only 11.2 acres meet the water quality requirement design criteria for the grass channel credit (i.e., 3:1 sideslopes, 2 foot bottom width and slope less than or equal to 4%).

Required recharge (Re_a) is 0.96 acres and the full site is drained by grass channels, thereby meeting 100% of the recharge requirement.

New water quality Area = (45.1 – 11.2) = 33.9 acres, assume new impervious cover = 0.266(33.9 ac) = 9.0 acres.
New WQ_v = 1.0"(9.0)/12 = 0.75 acre-feet; or a 0.25 acre-foot reduction

Percent Reductions Using Grass Channel Credit:

- Re_v = 100%
- WQ_v = (1.0 – 0.75) / 1.0 = 25.0%

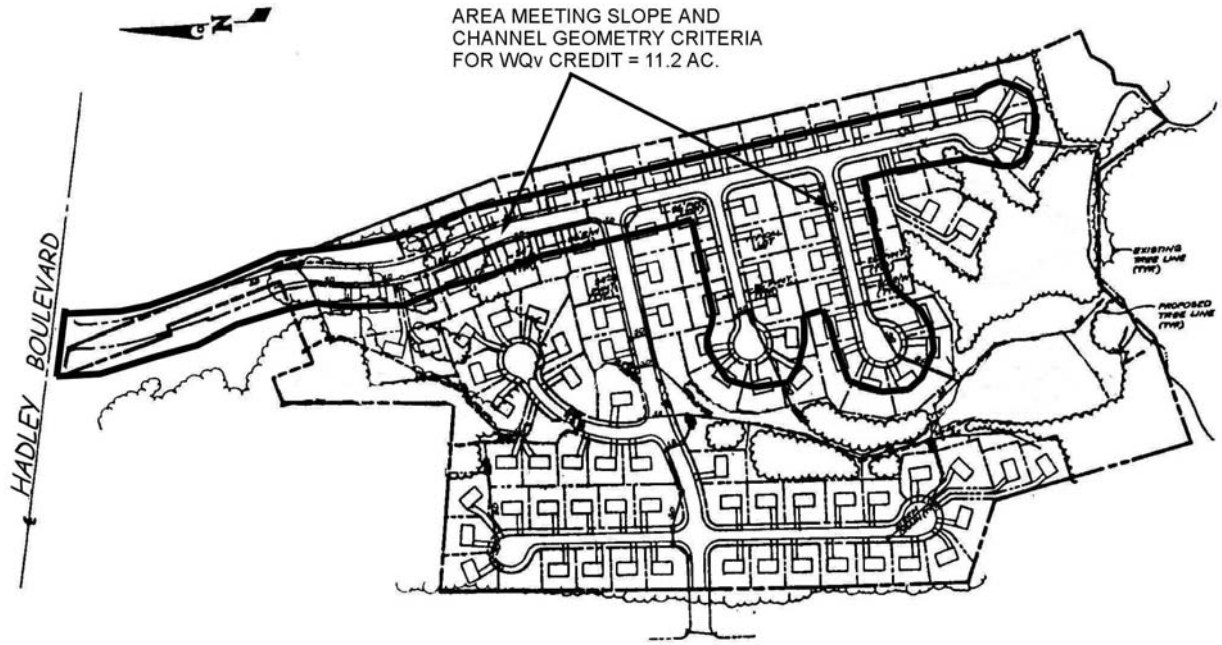


Figure B.4 Schematic of Grass Channel Credit

B.6 Credit No. 5: Environmentally Sensitive Development Credit

This credit is given when a group of environmental site design techniques are applied to lower density or rural residential development. The credit eliminates the need for structural practices to treat both the Re_v and water quality and can reduce required volumes for peak control of the 2-year, 10-year and 100-year storms.

Minimum Criteria for Credit

The Re_v and water quality requirements are completely met without the use of structural practices in certain low density (less than 1 dwelling unit per acre) residential developments when the following conditions are met:

- The total impervious cover footprint is less than 15 % of lot area;
- A minimum of 25% of the site is protected in natural conservation areas.
- Rooftop runoff is disconnected in accordance with the criteria outlined under Credit 1 (Section B.2);
- Grass channels are used to convey runoff versus curb and gutter for roads and/or driveways (with no specific constraints on water quality volume, velocity or minimum retention time); and
- Stream buffers are incorporated into the site design on both perennial and intermittent streams (where applicable).

The designer must still address applicable stormwater detention for all roadway and connected impervious surfaces (i.e, 2-year, 10-year, and 100-year control).

Environmentally Sensitive Rural Development Credit Example Application

Base Data
Site Data: a single family lot that is part of an 8 acre low density subdivision in a critical area
Lot Area = 2.5 ac
Conservation Area = 0.65 ac
Impervious Area = .35 ac = 14%
Site Soils Types: 100% "B"
F = 0.25
Original water quality volume = 1.0" (.35) (43,560/12) = 1,270.5 ft^3
Original Re_v = (2.5) (0.08) (.25) (43,560/12) = 182 ft^3

Environmentally Sensitive Rural Credit (see Figure B.5)
Required recharge is considered met by site design.
Required water quality volume is considered met by site design.
2-year, 10-year & 100-year control: No change in CN, t_c may be longer which would reduce storage requirements.

Percent Reductions Using Environmentally Sensitive Rural Credit:

- Re_v = 100%
- Water quality requirment = 100%

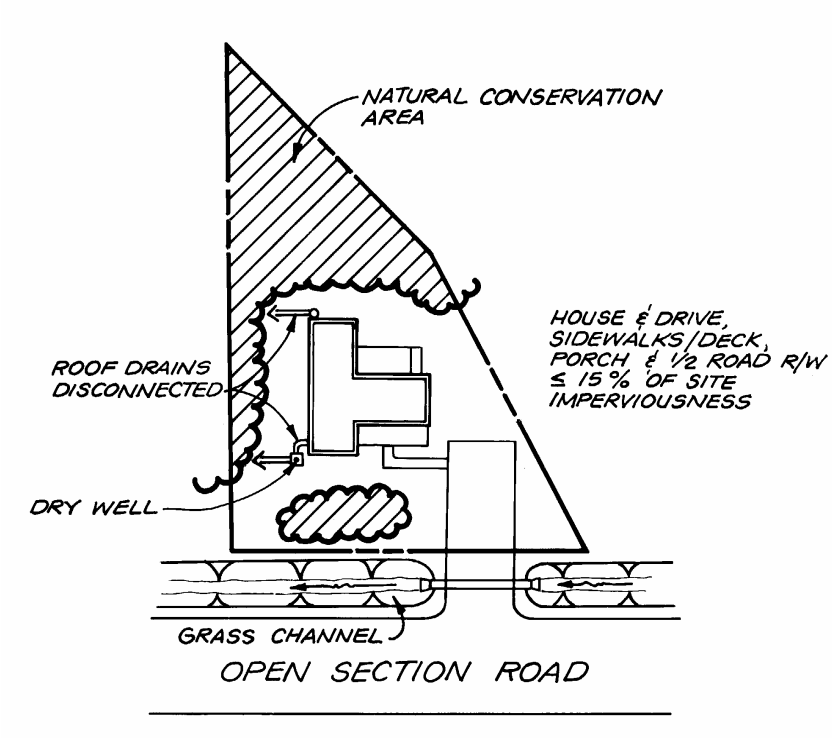


Figure B.5 Schematic of Environmentally Sensitive Rural Development Credit

B.7 Dealing with Multiple Credits

Site designers are encouraged to utilize as many credits as they can on a site. Greater reductions in stormwater storage volumes can be achieved when many credits are combined together (e.g. disconnecting rooftops and utilizing grass channel for drainage design). However, credits cannot be claimed twice for an identical area of the site (e.g. claiming credit for stream buffers and disconnecting rooftops over the same site area, draining to the same location).

B.8 Other Strategies to Reduce Impervious Cover

Site planning practices that reduce the creation of impervious area in new residential and commercial developments and therefore reduce the water quality requirements for the site should be encouraged whenever feasible[2]. Examples of progressive site design practices that minimize the creation of impervious cover include:

- Narrower residential road sections;
- Shorter road lengths;
- Smaller turnarounds and cul-de-sac radii;
- Permeable spill-over parking areas (these areas should be valued as 50% impervious, unless designed specifically for infiltration);
- Smaller parking demand ratios;
- Smaller parking stalls for a percentage of lots;
- Angled one way parking;
- Cluster subdivisions;
- Smaller front yard setbacks;
- Shared parking and driveways; and
- More creatively designed pedestrian networks.

Where these techniques are employed, it may be possible to reduce stormwater storage volumes. For example, since the water quality treatment volume is directly based on impervious cover, a reduction in impervious cover reduces required storage. For 2-year, 10-year, and 100-year management, the designer can compute curve numbers (CNs) based on the actual measured impervious area at a site using the following equation (adopted from TR-55, 1986):

$$(98)\ I + (CN)\ P = CN$$

where: I = percent impervious area at the site
P = percent pervious area at the site
CN = curve number for the appropriate pervious cover

[2] The reader is referred to the following two references for a more detailed presentation of better site design and low impact development: 1) Center for Watershed Protection. 1998. *Better Site Design A Handbook for Changing Development Rules in Your Community*. Ellicott City, MD; and 2) Prince George's County MD Dept. of Environmental Resources. 1999. *Low Impact Development Design Strategies: An Integrated Design Approach.* Largo, MD.

Figures B.6 and B.7 show an example of a retail site designed as a conventional development, and as a site planned using improved site design practices and techniques, respectively. Some of the noteworthy features of the innovative site plan include: preservation of some forested areas, establishment of a stream buffer, reduced parking ratios, compact and pervious overflow parking spaces, and use of vegetated stormwater practices such as filter strips and bioretention areas.

Though not all land use types and developments are amenable to every approach described here, there are more opportunities for flexibility and creativity in site design than many realize. Redevelopment sites also can utilize several of these practices and techniques in the redesign of an area.

The following example (using Figures B.6 and B.7) quantifies the water quality and recharge requirement reductions that can be realized by implementing several of these practices and design techniques.

Base Data (see Figure B.6)
Site Area = 9.3 ac
Original Impervious Area = 6.5 ac; or I = 6.5/9.3 = 69.9%
Site Soils Types: 50% "B", 50% "C," split evenly over the impervious area
Composite F = [0.25 (6.5/2) + 0.10 (6.5/2)]/6.5 = 0.18
Original Re_v = 0.18 (6.5)/12 = 0.10 acre-feet
Original Water Quality Requirement = 1.0"(6.5 ac)/12 = 0.54 acre-feet

Site Planning Strategies (see Figure B.7)
The revised site incorporates the following features:

- 1.8 acres preserved in a conservation easement.
- 0.46 acres of parking lot drain to a buffer with an overland flow path less than 75 feet (Credit No. 3: stream buffer credit).
- 0.28 acres of parking lot/loading area drain to a filter strip with an overland flow path less than 75 feet (Credit No. 2: disconnection of non-rooftop runoff credit).
- The total site impervious area was reduced from 6.3 acres to 5.8 acres by the site design revision; the new site I = 5.8/9.3 = 62.4%.

The new storage requirements for Re_v:

- New composite F = [0.25 (5.8 ac/2) + 0.10 (5.8 ac/2)]/5.8 = 0.18
- New Re_v (**Percent Volume Method**) = 0.18 (5.8 ac)/12 = 0.09 acre-feet
- New Re_a (**Percent Area Method**) = FAI = 0.18 (9.3 ac)(.624) = 1.04 acres
- Using the **Percent Area Method** and noting that 0.46 acres drain to the buffer and 0.28 acres drain to a filter strip, then Re_a = 1.04 ac – (0.46 ac + 0.28 ac) = 0.3 acres
- Therefore, the remaining Re_v = (0.3 ac/1.04 ac) (0.09 ac-ft) = 0.02 acre-feet

0.02 acre-feet must be managed by an approved "structural" practice.

The new storage requirement for water quality control is:

- New Impervious Area (to take credit for non-rooftop disconnection and buffer credits) = 5.8 ac – (0.28 ac + 0.46 ac) = 5.06 acres;
- New water quality requirement = 1.0”(5.06 ac)/12 = 0.42 acre-feet; or a 0.12 acre-foot reduction

Percent Reductions Using Site Planning Strategies:

- $Re_v = (0.10 – 0.02) / 0.10 = 80.0\%$
- $WQ_v = (0.54 – 0.42) / 0.54 = 22.0\%$

Also, with a 0.5-acre net reduction in site imperviousness, the CN for computing the 2-year, 10-year and 100-year control will be lower, thereby reducing the storage requirements for these storms by a modest amount.

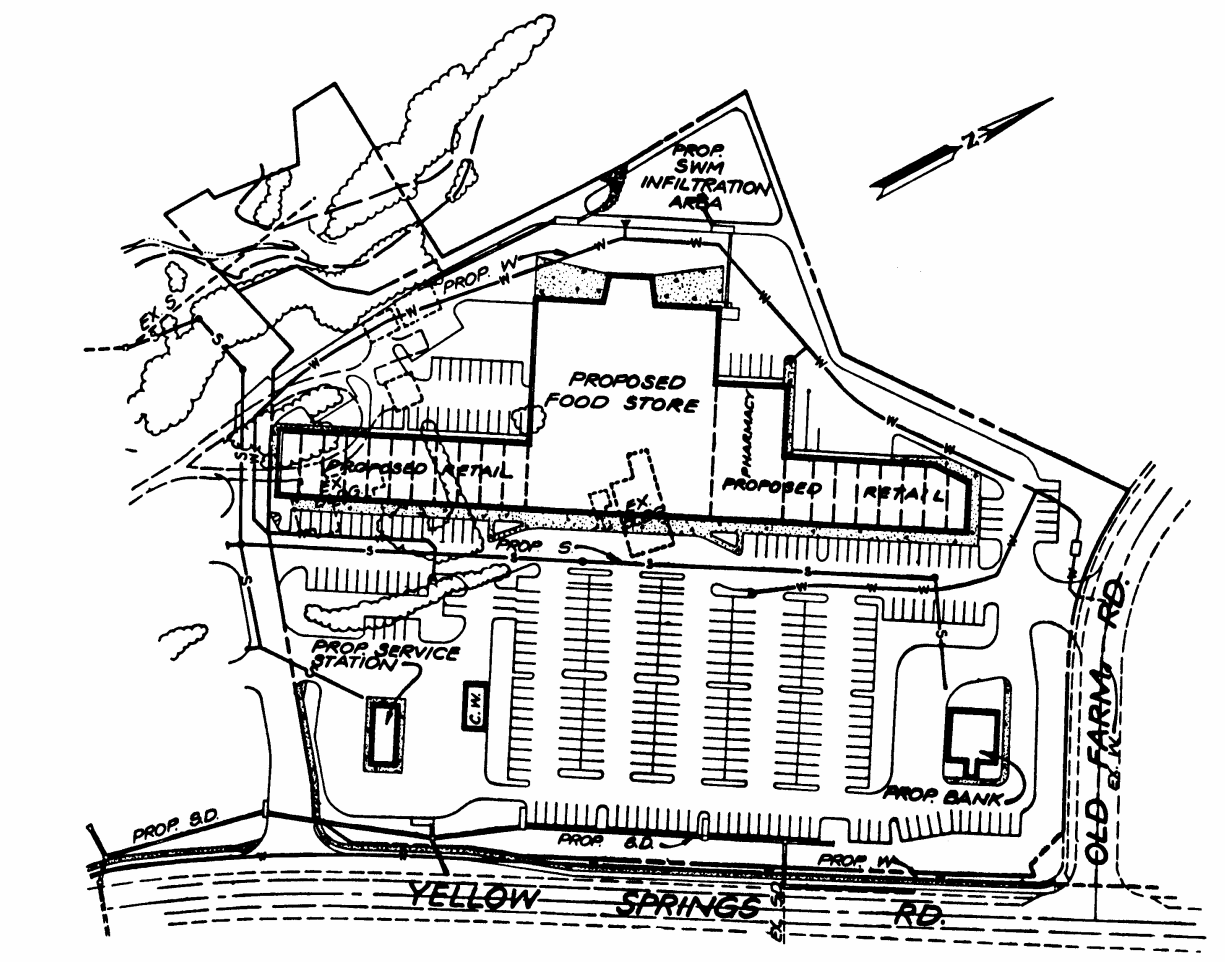


Figure B.6 Example of Conventional Retail Site Design

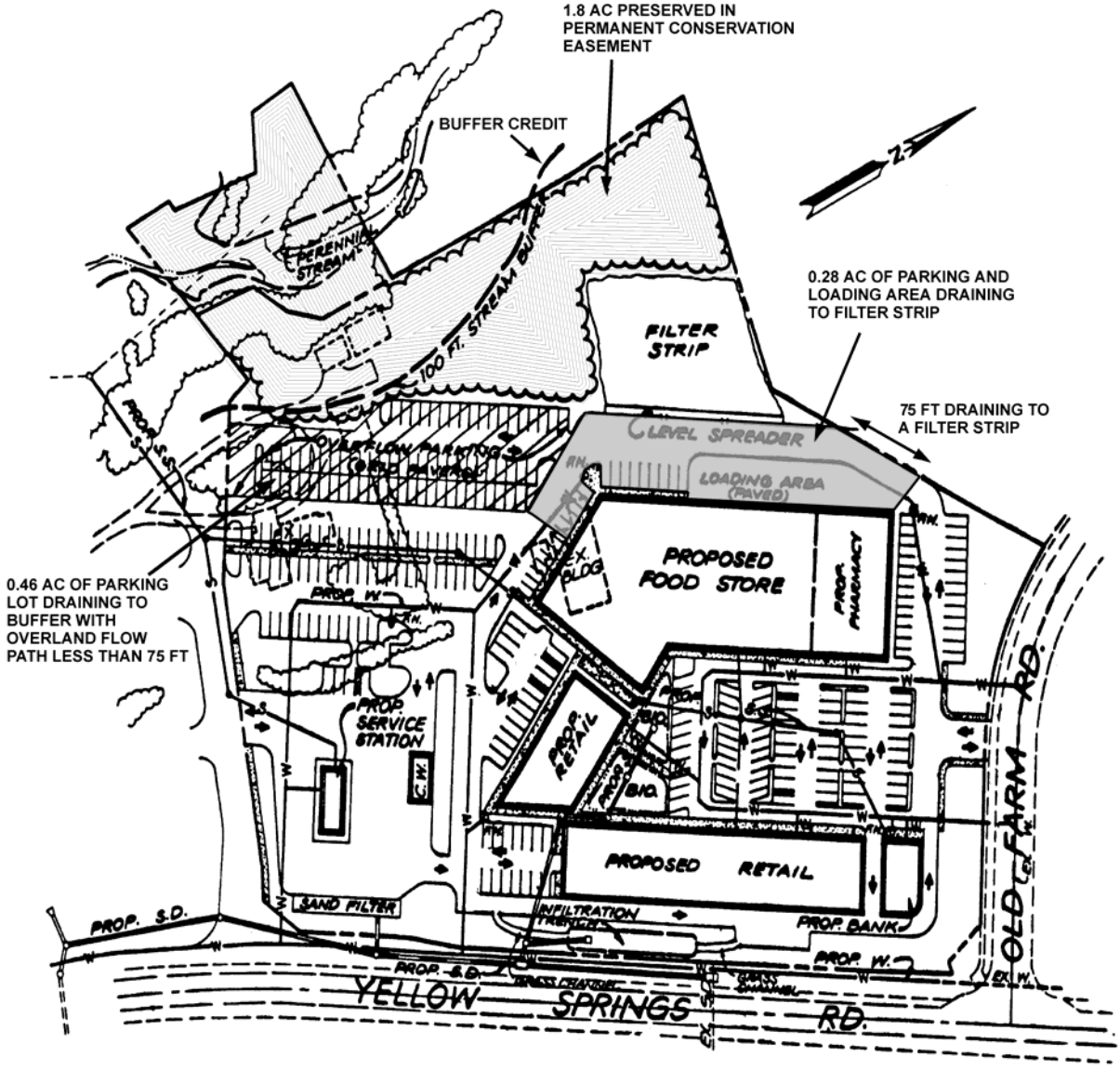


Figure B.7 Example of Improved Retail Site Design

Case Study Examples

Stormwater Fee Discounts

CO: Denver

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater fee equitability

Description: Fees are based on actual impervious area at each site as determined by aerial photography, so the less impervious surface, the lower the fee charged.

Beneficiary: All properties

Reference(s): http://www.semswa.org/fees.htm#surface

FL: Gainesville

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Management Utility Exemption

Description: Gainesville's Stormwater Management Utility reduces monthly fees for nonresidential properties with privately maintained, onsite stormwater management retention systems. The utility's base fee is established according to the property's impervious area and one-half its pervious parking areas. Credits of up to 100% are available based on the volume of onsite retention provided. Detention volume is not considered because that stormwater is discharged. Most credits range from 15% to 35%.

Beneficiary: Nonresidential properties

Reference(s): http://www.cityofgainesville.org/Portals/0/pw/pw_StormWater_MgtUtility.pdf

Doll, A., and G. Lindsey. 1999. Credits Bring Economic Incentives for Onsite Stormwater Management. Watershed and Wet Weather Technical Bulletin, January 1999, Water Environment Federation. http://stormwaterfinance.urbancenter.iupui.edu/PDFs/LindseyDoll.pdf

FL: Orlando

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Utility Discount

Description: Orlando's stormwater utility provides a lower rate for commercial and multi-family residential properties with onsite stormwater management facilities. Properties with approved onsite retention or detention get a 42% credit on the rate charged per equivalent residential unit.

Beneficiary: Commercial and multi-family residential

Reference(s): Overview of Stormwater Utility Fee Billing: http://www.cityoforlando.net/public_works/Stormwater/fee.htm

Flow Chart for Rate Determination: http://www.cityoforlando.net/public_works/Stormwater/Utility%20Fee/FLOWCHART%20FOR%202008%20BILLING%20YEAR.pdf

FAQs: http://www.cityoforlando.net/public_works/Stormwater/faq.htm#04.3

GA: Gwinnett County

Incentive Type: Stormwater Fee Discounts

Program Name: Stormwater Credits Program

Description: The County provides stormwater credit to landowners who install four types of practices: watershed stewardship, water quality, peak flow and channel protection. The total maximum credit for any property is 40%. Watershed stewardship practices include: public participation, low impact parcels, farmland deep tillage, stream restoration / streambank stabilization, watershed improvement project participation, conservation easements, conservation use valuation, assessment (CUVA) properties, county approved training programs, stream buffers that exceed 75' standards, fencing livestock out of streams, rain barrels, automatic sprinkler sensors, direct discharges, septic tank maintenance, and connection to sanitary sewers. Water quality credits of up to 10% are earned by property owners who install facilities that capture pollutants, thereby providing treatment of stormwater before it enters streams. There are several practices to accomplish this available to all property owners. Porous pavement, roof gardens and green roofs are acceptable practices to receive this credit. Residential property owners can install rain gardens to earn this credit. Channel protection credit (maximum 10%) is earned by property owners who provide protection of stream channels from bank and stream bed erosion by detaining and reducing the volume of stormwater from their properties. Peak flow credit (maximum 10%) is earned by property owners who install basins that delay the highest flows from reaching the drainage system, thereby protecting downstream properties.

Beneficiary: Property owner in Gwinnett County.

Reference(s): http://www.gwinnettcounty.com/cgi-bin/gwincty/egov/ep/gcbrowse.do?channelId=-24201&pageTypeId=536880236

GA: Henry County

Incentive Type: Stormwater Fee Discount

Program Name: Utility fee credit

Description: Credits are available for eligible properties that install, alter, or conduct activities that reduce the costs of services provided by the County. A 10% reduction of the stormwater fee is allowed for property owners; a 1% reduction is allowed for each percent of stormwater directed to rain garden. If all stormwater is treated on site, no fee is charged.

Beneficiary: All properties

Reference(s): Contact the Stormwater Management Department at (770) 288-7246 or visit http://www.co.henry.ga.us/Stormwater/FAQs.shtml

KS: Wichita

Incentive Type: Stormwater Fee Discount

Program Name:

Description: Wichita's stormwater utility offers two types of credits only for properties with 50 or more equivalent residential units. Up to a 40% credit is available for detention that equals or exceeds the city's new development standards, which are based on a 100-year storm. An 80% credit is available for retention of all runoff

from the site. Wichita has not issued any credits, because the standards are difficult to achieve.

Beneficiary: Residential

Reference(s): Source: Doll, A., and G. Lindsey. 1999. Credits Bring Economic Incentives for Onsite Stormwater Management. Watershed and Wet Weather Technical Bulletin, January 1999, Water Environment Federation. http://stormwaterfinance.urbancenter.iupui.edu/PDFs/LindseyDoll.pdf

KY: Louisville/Jefferson County

Incentive Type: Stormwater Fee Discount

Program Name: Drainage Charge Credit

Description: The Louisville and Jefferson County Metropolitan Sewer District (MSD) provides credits primarily for commercial properties with onsite detention for controlling peak flows. The credit amount depends on how the detention basin functions. Basins must be sized for 2-, 10-, or 100-year storms, and limit discharges to predevelopment runoff rates. Credits are available for each type of storm, with an 82% maximum credit if all criteria are met. Currently, MSD is evaluating ways to incorporate stormwater quality measures into its credit approach.

Beneficiary: Commercial

Reference(s): http://www.msdlouky.org/pdfs/msdrates09.pdf

KY: Sanitation District No. 1

Incentive Type: Stormwater Fee Discount

Program Name: Storm Water Surcharge Credit

Description: Any non-residential property owner who has either installed an approved on-site post-construction storm water control facility, implemented an approved best management practice (BMP), or developed and implemented an approved education program, may apply for a reduction of the Surcharge applied to that specific parcel. The District will evaluate each case individually in determining the appropriate level of credit. A total maximum of an 80% credit against the Surcharge may be granted:

- The credit is applied by reducing the number of billable equivalent residential units.
- The property parcel can qualify for both water quantity and water quality credits.
- The maximum allowable water quantity credit percentage = 35%.
- The maximum allowable water quality credit percentage = 50%

Beneficiary: Commercial

Reference(s): Stormwater Credit Policy overview: http://www.sd1.org/stormwater/credit.asp

MA: Reading

Incentive Type: Stormwater Fee Discounts

Program Name: Stormwater Enterprise Fund Fee Abatement

Description: The City allows single and two-family residential properties to abate up to 50% of the total fee if they install and maintain infiltration systems or other means to reduce runoff. Commercial/industrial/multi-family properties are allowed this abatement if they install and maintain "state-of-the-art" stormwater treatment and infiltration systems. Typical devices that qualify are drywells, infiltration chambers, detention ponds. Drinking water filtration systems and rain barrels do not qualify. The stormwater abatement continues as long as the impervious surface does not change.

Beneficiary: Property owner in Reading, Massachusetts.

Reference(s): http://www.ci.reading.ma.us/Pages/ReadingMA_Engineering/faq

MN: Minneapolis

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Quality Credit

Description: Residential storm water fee credit determined by the percent of a property's impervious area that drains to a stormwater management tool/practice (BMP). The maximum credit allowed is equal to 50% of the total percentage of impervious area draining to a BMP.

Beneficiary: Residential

Reference(s): Overview:
http://www.ci.minneapolis.mn.us/stormwater/fee/stormwaterQualityCredits.asp

Credit Application Form:
http://www.ci.minneapolis.mn.us/stormwater/docs/Stormwater_QualityChklstApp_Instruct.pdf

MN: Minneapolis

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Quantity Credit

Description: The Standard Quantity Reduction Credit is a 50% credit on a property's stormwater fee, based on a property's stormwater quantity management tools/practices being able to retain the 10-year, 24-hour type II SCS storm event to pre-developed conditions. To qualify for this credit, the property owner must demonstrate that all stormwater from the property is controlled with an on-site BMP. The Additional Quantity Reduction Credit is a 100% credit on a property's stormwater fee if the property's stormwater quantity management tools/practices can retain the 100-year, 24-hour type II SCS storm event to pre-developed conditions.

Beneficiary: Commercial

Reference(s): http://www.ci.minneapolis.mn.us/stormwater/fee/stormwaterQualityCredits.asp

Credit Application Form:
http://www.ci.minneapolis.mn.us/stormwater/docs/Stormwater_QualityChklstApp_Instruct.pdf

MN: New Brighton

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Utility Credits

Description: City allows property owners discounts on utility fee based upon the property's average runoff depth and how that depth compares to the mean depth for the property's class type. For every percentage point the property's runoff depth is below 20% of the average class type flow, the property owner gets a percentage point discount. Additional discounts are given if the property's peak outflow rate is less then predevelopment for the five and 100 year storms, if a property's wet pond meets Nationwide Urban Runoff Program (NURP) standards, or if a residential property owner installs and maintains a biorention/raingarden.

Beneficiary: Property owner in New Brighton, Minnesota.

Reference(s): City Code

http://www.ci.new-brighton.mn.us/index.asp?Type=B_BASIC&SEC={935DAF6C-8103-4A58-832F-26F917416992}&DE={0196EBC2-26B7-4AFA-8692-73F29EF10707}

MN: Saint Paul

Incentive Type: Stormwater Fee Discount

Program Name: Rate of Discharge Credit

Description: St. Paul provides a rate of discharge credit for nonresidential properties, which is based on parcel acreage and a standardized peak runoff rate determined for selected land-use classifications. Where the peak stormwater runoff rate from a parcel is limited by onsite facilities such as detention ponds owned and maintained by the property owner, a credit of up to 25% is available. A 10% credit is given for parcels that provide onsite storage for 5-year storms and also limit discharge to a maximum of 0.11 m3/ha/s (1.64 ft3/ac/s). An additional 15% credit is allowed for parcels that provide onsite storage for 100-year storms and limit discharge to a maximum of 0.11 m3/ha/s (1.64 ft3/ac/s). Both new developments and redevelopment projects may apply for the credit. Existing nonresidential properties can retrofit their systems to provide onsite storage for 5-year storms for a 10% credit. Most credits were provided in the first few years after the program was established. Currently, approximately three to four credits are approved annually. In St. Paul, the credit approach increased the political acceptability of the storm sewer system charge.

Beneficiary: Nonresidential properties

Reference(s): Source: Doll, A., and G. Lindsey. 1999. Credits Bring Economic Incentives for Onsite Stormwater Management. Watershed and Wet Weather Technical Bulletin, January 1999, Water Environment Federation. http://stormwaterfinance.urbancenter.iupui.edu/PDFs/LindseyDoll.pdf

MO: Kansas City

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Fee Ratio Credit

Description: Properties with a large amount of pervious area (e.g. grass, gravel), when compared to the amount of impervious area, may qualify. The Ratio Credit is a 50% credit that is granted to parcels where the ratio of the Total Parcel Area to

the Runoff Surface area is at least 30: 1. Property owners do not need to apply for this credit as it is automatically determined and applied by computer processes.

Beneficiary: Residential

Reference(s): http://www.kcmo.org/water.nsf/web/ordinances?opendocument

MO: Kansas City

Incentive Type: Stormwater Fee Discount

Program Name: Detention Basin Credit

Description: Properties served by a privately owned, and properly maintained, detention structure will be granted a stormwater fee credit. A 10% credit of the monthly stormwater fee is allowed if greater than 50% of the stormwater runoff from impervious surfaces is detained in the detention basin. 50% credit is the maximum allowable, only if 100% of stormwater runoff is detained in detention basin.

Beneficiary: Residential and Commercial

Reference(s): http://www.kcmo.org/water.nsf/web/ordinances?opendocument

NC: Charlotte

Incentive Type: Stormwater Fee Discount

Program Name: Storm Water Services Credit

Description: A credit toward reducing a ratepayer's storm water user fee. The storm water fee is proportional to the amount of impervious area on a given property. The credit is also developed to be proportional to the effective reduction in impervious area. The credit is allowed for all properties except single-family residential properties, except in extraordinary situations. Credit will only be allowed for properties that maintain their structural controls in fully functional condition and according to maintenance criteria and BMP standards. Credit will be allowed for previously constructed controls. A maximum of 100 percent of the user fee can be granted in credit with a maximum of 40% for peak reduction and 60% for volume reduction.

Beneficiary: Commercial and Some Residential

Reference(s): http://www.charmeck.org/Departments/StormWater/Storm+Water+Fee/Can+I+reduce+my+storm+water+fee%3f.htm

Fee Credit Manual:
http://www.charmeck.org/NR/rdonlyres/ez47jvb2blxko5opj7tx2d5ok7wwdl45ydx7invbiiert5nzr3kqcgaf6v3knodp27k7fv54gyisgbajiszvxladiwd/FeeCreditManualJune2008.pdf

NC: Charlotte

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Credit Fee

Description: Charlotte provides one or more credits to commercial, industrial, institutional, and multifamily residential properties and homeowner associations that provide stormwater management measures. Eligibility for credits is proportional to the extent that the measures address the impacts of peak discharge, total runoff

volume, and annual pollutant loading from the site. Up to 100% credit is available as follows:

- Up to 50% credit for reducing peak discharge from a 10-year, 6-hour storm;
- Up to 25% credit for reducing total runoff volume from a 2-year, 6-hour storm; and
- Up to 25% credit for reducing annual pollutant loading.

Each credit is conditional on continued compliance with the Charlotte-Mecklenburg Land Development Standards Manual and may be rescinded for noncompliance with those standards.

Beneficiary: Commercial, industrial, institutional, multifamily residential

Reference(s): http://www.charmeck.org/Departments/StormWater/Storm+Water+Fee/Can+I+reduce+my+storm+water+fee%3f.htm

Fee Credit Manual: http://www.charmeck.org/NR/rdonlyres/ez47jvb2blxko5opj7tx2d5ok7wwdl45ydx7invbiiert5nzr3kqcgaf6v3knodp27k7fv54gyisgbajiszvxladiwd/FeeCreditManualJune2008.pdf

NC: Durham

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater credit

Description: Durham provides up to a 25% pollution credit for selected structural stormwater controls on nonresidential properties. The city first offered credits for onsite retention basins based on the pool volume for retention. Later, the city offered credits for onsite extended detention and extended detention-retention basins based on drawdown time. Currently, the maximum pollution credit goes to standard basin designs that achieve maximum pollutant removal efficiency under North Carolina's performance standards. For other structural controls listed in the state's standards, the city's pollution credit is linearly variable, with a maximum 25% credit for a removal efficiency of 85% of total suspended solids. The city recently approved the use of sand filters in addition to approved onsite basin designs, but no pollution credits have been established yet for their use. Durham receives few applications for credits.

Beneficiary: Nonresidential properties

Reference(s): Source: Doll, A., and G. Lindsey. 1999. Credits Bring Economic Incentives for Onsite Stormwater Management. Watershed and Wet Weather Technical Bulletin, January 1999, Water Environment Federation. http://stormwaterfinance.urbancenter.iupui.edu/PDFs/LindseyDoll.pdf

NC: Raleigh

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Facility Credit

Description: A maximum 50% credit against stormwater fees for installing Stormwater Facilities exceeding City requirements specified in the Stormwater Ordinance. To qualify, customers must demonstrate that their existing Stormwater or New Stormwater Facility manages stormwater generated from their immediate property and/or upstream tributary areas.

Beneficiary: Commercial

Reference(s): http://www.raleighnc.gov/portal/server.pt/gateway/PTARGS_0_2_306_202_0_43/http%3B/pt03/DIG_Web_Content/category/Resident/Stormwater/Utility_Information/Cat-FAQ-20041129-154204-Stormwater_Fee_Credit.html

NC: Raleigh

Incentive Type: Stormwater Fee Discount

Program Name: NPDES Credit

Description: Customers holding National Pollution Discharge Elimination System (NPDES) MS4 permits are eligible for a Credit of an amount to be determined by the City on a case-by-case basis and not to exceed 15%. The Credit will be determined based on a comparison between the City's NPDES program and the Customer's NPDES program. Credit will be given for elements of the programs that are similar to those offered by the City.

Beneficiary: Commercial

Reference(s): http://www.raleighnc.gov/portal/server.pt/gateway/PTARGS_0_2_306_202_0_43/http%3B/pt03/DIG_Web_Content/category/Resident/Stormwater/Utility_Information/Cat-FAQ-20041129-154204-Stormwater_Fee_Credit.html

OH: Columbus

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Peak Flow Credit

Description: A reduction in a portion of stormwater service fees available by reducing the peak flow of runoff from your property through the use of stormwater detention or retention. The credit ranges from 20% to 80% of the stormwater fee.

Beneficiary: Commercial

Reference(s): Source: Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio, Cincinnati, Ohio, and their respective Legal Counsel. 2007. Green infrastructure program: A report evaluating the concept of a major storm water minimization program, utilizing green infrastructure and related methods. http://www.msdgc.org/wetweather/greenreport.htm.

OH: Columbus

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Maintenance Credit

Description: A reduction in a portion of stormwater service fees available by performing your own maintenance on the part of the public, open channel stormwater system that goes through your property. The credit is given on a dollar per linear foot per year basis of two channel types and cannot exceed 100% of the fee.

Beneficiary: Commercial

Reference(s): Source: Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio, Cincinnati, Ohio, and their respective Legal Counsel. 2007. Green infrastructure program: A report evaluating the concept of a major storm water minimization program, utilizing green infrastructure and related methods. http://www.msdgc.org/wetweather/greenreport.htm.

OK: Tulsa

Incentive Type: Stormwater Fee Discount

Program Name:

Description: Tulsa's stormwater drainage system service charge incorporates credits for private maintenance of approved onsite detention or retention facilities. The credit amount varies depending on what the estimated cost would be to the city to provide maintenance. The maximum credit is 60%, because approximately that percentage of Tulsa's stormwater utility budget goes to maintenance. To be approved, an onsite facility must provide at least 50% more detention than required by the city. If an onsite facility is found to be performing inadequately, the property owner must pay the typical stormwater drainage service charge.

Beneficiary:

Reference(s): http://www.cityoftulsa.org/media/17773/Title11A_000.pdf

OR: Portland

Incentive Type: Stormwater Fee Discount

Program Name: Clean River Rewards Incentive and Discount Program

Description: Provides financial incentives to property owners who manage stormwater on their site through a discount on their monthly stormwater utility charge. The Portland City Council instituted a two-part rate—35% of the charge for providing drainage services to the property and 65% of the charge to provide drainage services to the public right of way that served the property. Not only did the charge breakdown reinforce that street drainage is an issue the City must deal with, it also allowed a portion of the rate to be discounted for properties providing onsite stormwater management. So with 35% of the stormwater rate up for a potential discount, some properties could be encouraged to make retrofit changes. The CRID has a simplified discount program for residential properties based on volume control, and a more complex commercial property program that requires water quality and flow control for the full discount.

Beneficiary: Residential and Commercial

Reference(s): http://www.portlandonline.com/BES/index.cfm?c=41976

OR: Sandy

Incentive Type: Stormwater Fee Discount

Program Name: Credit Program

Description: Sandy's incentive program is intended to encourage property owners to utilize source control facilities on new development or redevelopment, or to make improvements to existing properties to mitigate stormwater discharges. Credits under the incentive program are given on the basis of Equivalent Residential Units (ERUs) mitigated. The maximum credit allowed is 1/3 (33%) of the total number of ERUs. Additional credits may be available for property owners that completely eliminate impervious surfaces on their property.

Beneficiary: Commercial, industrial, and multi-family properties

Reference(s): http://www.ci.sandy.or.us/index.asp?Type=B_BASIC&SEC={A9D3CDDE-3BA0-42DE-BE30-4E321A155AA8}

PA: Philadelphia

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Fee Reduction and Retrofit Assistance

Description: Yet to be adopted. A 50% discount would be offered for residents and businesses to decrease directly connected impervious areas using rain gardens, porous asphalt and sidewalks, swales, and green roofs.

Beneficiary: Residential and commercial properties

Reference(s): http://ddoe.dc.gov/ddoe/frames.asp?doc=/ddoe/lib/ddoe/stormwaterdiv/Phila._Water_Dep.pdf, see slide 64 of 75

SC: Beaufort County

Incentive Type: Stormwater Fee Discounts

Program Name: User Fee Credit Program

Description: The County provides six options for property owners to get credits towards reducing stormwater user fees – 1) The Integrated Non-Structural BMP Program Credit: A 10% credit adjustment may be applied if 6 of the 9 BMPs have been met on the site - Educational Program, On-Site Refuse Control Program, On-Site Stormwater System Maintenance and Cleaning Program, Paved Area Sweeping Program, Used Motor Oil Recycling Program, Sanitary Sewer/Storm Sewer Cross-Connection Inventory, Landscaping for Run-Off Rate Control and Water Quality, Storm Drain Stenciling Program, and Designated Vehicle Washing Area. 2) NPDES Industrial Stormwater Permit Credit: A 5% credit adjustment may be applied at a non-residential facility if that facility is covered by a NPDES industrial stormwater permit, is in compliance with all permit requirements and discharges wastewater which is 10% below all applicable effluent discharge limits. The sample results must be submitted to the County. 3) Other Non-Structural BMP Credit: A maximum of 5% credit may be given to nonresidential customers who implement a unique approach to improving water quality. 4) Education Credit: Schools can be given credit for providing education to students and employees in water quality awareness and protection. 5) Stormwater Quality Control Structural BMP Credit: Credit (up to 20%) can be given for the installation of approved BMPs to treat stormwater. 6) Stormwater Volume Control Credit: Credit may be given for the installation of approved BMPs or the preservation of vegetated open spaces to reduce stormwater volume at a site.

Beneficiary: Non-residential property owners and other privately owned stormwater facility operators in Beaufort County, South Carolina.

Reference(s): **Manual**

http://www.bcgov.net/Stormwater/documents/AdjustmentandCreditManaul9-5-07.pdf

TX: Austin

Incentive Type: Stormwater Fee Discount

Program Name: Reduced Drainage Charge

Description: Austin's Drainage Utility provides a 50% credit to commercial property owners that construct and maintain approved onsite detention facilities. The user of a non-residential benefited property with an on-site detention or water-quality pond

that receives storm water runoff from the property must register the pond to be entitled to request a reduced drainage charge. The city inspects these onsite facilities annually to ensure proper maintenance.

Beneficiary: Nonresidential property

Reference(s): http://www.amlegal.com/nxt/gateway.dll/Texas/austin/thecodeofthecityofaustintexas?f=templates$fn=default.htm$3.0$vid=amlegal: austin_tx$anc=

VA: Chesapeake

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Utility Credit

Description: Stormwater utility fee credits are available by providing water quality improvements and/or water quantity improvements (reduced peak discharge). In order to qualify for one or both of these credits, an application form must be submitted which shows compliance with this policy. The credit system consists of a two-part credit where each part allows for a 20% reduction in the stormwater utility fee for privately owned and operated systems. Any credits provided, water quality or water quantity, shall be reduced by half (50%) if a public facility is used to accomplish the reduction. This reduction in credit is necessary since the City must maintain the system. The 50% reduction applies only to the credit and not the total stormwater fee. The percentage of credit for both quantity and quality varies based on the contribution to the City's stormwater system as determined by the City's Drainage Engineer based on information contained in the application.

Beneficiary: Non-residential property owners, although multi-family residential properties are included

Reference(s): http://www.chesapeake.va.us/services/depart/pub-wrks/pdffiles/BMP-Credit-App.pdf

VA: Prince William County

Incentive Type: Stormwater Fee Discounts

Program Name: Partners for Water Quality

Description: The County’s Department of Public Works presents quarterly stormwater management educational sessions and by enrolling annually in the program, businesses and non-profits can earn a 10 percent rebate on their previous year's storm water management bill. Businesses and non-profits can earn an additional 10% for providing proof of implementation of a Great 'Scapes Nutrient Management Plan from Virginia Cooperative Extension and conduct parking lot or common area clean-up once a year. Another 10% can be deducted for conducting a site clean-up in cooperation with agencies such as Prince William Soil and Water Conservation District (Adopt-a-Stream), Clean Community Council (Adopt-a-Spot), or other pre-approved site clean-ups in the community.

Beneficiary: Businesses or non-profits in Prince William County, Virginia.

Reference(s): http://www.pwcgov.org/default.aspx?topic=020008001920001183

WA: Bellevue

Incentive Type: Stormwater Fee Discount

Program Name:

Description: Bellevue's Storm and Surface Water Utility's rate structure classifies each property according to its percentage of developed land. A reduction of one development classification is given for installation and maintenance of approved onsite detention facilities. The approach has worked well to get approved detention facilities built on large residential and commercial plats.

Beneficiary:

Reference(s): Source: Doll, A., and G. Lindsey. 1999. Credits Bring Economic Incentives for Onsite Stormwater Management. Watershed and Wet Weather Technical Bulletin, January 1999, Water Environment Federation. http://stormwaterfinance.urbancenter.iupui.edu/PDFs/LindseyDoll.pdf

WA: King County

Incentive Type: Stormwater Fee Discount

Program Name: Stormwater Facility Discount

Description: Surface Water Mgmt. fee reduction to one rate category lower for operating one or more stormwater flow control or water quality treatment facilities approved to be functioning properly within County standards. Facility inspection occurs annually by engineers. Residential parcels meeting this condition will receive a discount equal to half the residential fee, or $51.00. Both residential and commercial properties are eligible. Discount may not be combined with other runoff mitigation discounts.

Beneficiary: Residential / Commercial

Reference(s): http://www.kingcounty.gov/environment/wlr/surface-water-mgt-fee/discount.aspx

WA: King County

Incentive Type: Stormwater Fee Discount

Program Name: Sixty-Five-Ten Discount

Description: Discount on fee assessment if your property is at least 65% forested, has no more than 10% effective impervious area and BMP for dispersing and infiltrating runoff are being met. Other conditions may apply and at least one site visit will be required for approval, but qualification for this discount would lower your assessment by one-rate category. Residential parcels meeting this condition will receive a discount equal to half the residential fee, or $51.00. Both residential and commercial properties are eligible. This discount may not be combined with other runoff mitigation discounts

Beneficiary: Residential / Commercial

Reference(s): http://www.kingcounty.gov/environment/wlr/surface-water-mgt-fee/discount.aspx

WA: King County

Incentive Type: Stormwater Fee Discount

Program Name: Pervious Surface Absorption Discount

Description: 25% discount on fee assessment if implement county-approved flow control BMPs and at least 10% of the impervious surface is served by these practices. Not eligible for discount if already receive another runoff mitigation discount. Only commercial properties are eligible.

Beneficiary: Commercial

Reference(s): http://www.kingcounty.gov/environment/wlr/surface-water-mgt-fee/discount.aspx

WA: Marysville

Incentive Type: Stormwater Fee Discount

Program Name: Surface Water Utility Reductions

Description: The surface water utility rate can be reduced by a minimum of 10 percent for any new or remodeled commercial building that uses a permissive rainwater harvesting system properly sized to use the available roof surface of the building. Rate reductions in excess of 10 percent will be considered dependent upon the amount of rainwater harvested divided by the mean annual runoff volume generated by the total impervious surface area at the parcel. Additionally, properties using low impact development techniques as recommended in the Marysville Municipal Code may be eligible for a reduction in their surface water utility rate.

Beneficiary: Commercial properties

Reference(s): Chapter 14.19.080 of http://www.codepublishing.com/wa/marysville/

WA: Seattle

Incentive Type: Stormwater Fee Discount

Program Name: Rainwise Incentive Program

Description: The City of Seattle is currently working on an incentive program called Rainwise, which would offer drainage rate reductions for owners who use sustainable stormwater management techniques. While this program is not yet implemented, developers who are putting in infrastructure now can benefit from the rate reductions in the future.

Beneficiary: Property owners

Reference(s): http://www.seattle.gov/dpd/cms/groups/pan/@pan/@plan/@proj/documents/Web_Informational/cos_005050.pdf

Development Incentives

FL: Sarasota County

Incentive Type: Development Incentives

Program Name: Green Building and Green Development Program

Description: Green buildings or green developments shall qualify for expedited permitting and priority inspections. Green buildings and developments shall be defined and certified as appropriate by the U.S. Green Building Council (i.e. Leadership in Energy and Environmental Design (LEED) certification) or the Florida Green Building Coalition. The County discontinued the permit fee rebate previously offered to these projects as well on December 28, 2007.

Beneficiary: Qualified developer in Sarasota County.

Reference(s): https://building.scgov.net/OSG/Sarasota/Green%20Building/GreenBuilding.htm

IL: Chicago

Incentive Type: Development Incentives

Program Name: Green Permit Program

Description: Chicago's Department of Construction and Permits (DCAP) has created an incentive that encourages inclusion of environmentally conscious design elements by promising developers savings of both time and money. Architects, developers and building owners can be part of an expedited permit process by adding elements of green building strategies and technologies from a menu of items created by DCAP. Projects admitted into the Green Permit Program can receive permits in less than 30 business days as opposed to the 60 to 90 that are normally allotted for permit issuance. Participants that display a particularly high level of green strategy can possibly have consultant code review fees waived as well. A team of green building design experts compiled by the city help applicants navigate the permit process to ensure timely implementation of these technologies.

Beneficiary: Architects, developers, and building owners

Reference(s): http://www.chicagocodes.com/display_news.cfm?news_id=252

IL: Chicago

Incentive Type: Development Incentives

Program Name: Zoning Bonus Ordinance

Description: The Chicago Department of Zoning states, "A floor area premium shall be granted for a roof that is covered with plants that reduce the 'urban heat island' effect and storm-water runoff of buildings in the central business district. To qualify for a floor area premium, a minimum of 50 % of the roof area at the level of the green roof or a minimum of 2000 square feet (whichever is greater) shall be covered by vegetation and shall meet..." certain standards.

Beneficiary: High-density districts in the downtown area

Reference(s): Source: http://www.greenroofs.com/Greenroofs101/industry_support.htm

NY: New York

Incentive Type: Development Incentive

Program Name: Green Roof Tax Abatement

Description: Building owners in New York City can apply for a one-time tax credit of up to $100,000 for the installation of a green roof. The green roof must be on at least 50% of available rooftop space. The credit would be equal to $4.50 per square foot of roof area that is planted with vegetation. It is a state program for New York City residents only and is administered by the city. The program sunsets in 2013 unless extended by the state legislature. The program will begin accepting applications on January 1, 2009.

Beneficiary: Building owners in New York City, New York.

Reference(s): Not yet available.

PA: Philadelphia

Incentive Type: Development Incentives

Program Name: Green Roofs Tax Credit

Description: Business owners may receive a credit for a green roof covering at least fifty percent (50%) of the building's rooftop or seventy-five percent (75%) of eligible roof top space. They may claim a tax credit of twenty-five percent (25%) of all costs actually incurred to construct the green roof, provided that total tax credits for a green roof do not exceed $100,000. The tax credit is applied against the applicant's total business privilege tax liability for the Tax Year during which the applicant certifies completion of the green roof, provided that any unused credits may be carried forward until fully used.

Beneficiary: Commercial businesses

Reference(s): http://webapps.phila.gov/council/attachments/3533.pdf

OR: Portland

Incentive Type: Development Incentives

Program Name: Floor Area Ratio Bonus

Description: Projects that install ecoroofs in the Central City Plan District are eligible for a floor area ratio bonus, which increases the building's allowable area, and can use ecoroofs to conform to the Central City Design Guidelines. Buildings can receive bonus FAR based on three ranges of ecoroof coverage in relation to the building's footprint: 10-30%, 30-60% and 60% or greater earns one, two and three square feet of additional floor area per square foot of ecoroof respectively.

Beneficiary: Commercial buildings in the Central City area of Portland.

Reference(s): http://www.portlandonline.com/osd/index.cfm?a=114728&c=42113

http://www.portlandonline.com/shared/cfm/image.cfm?id=53363, see 510-28

TN: Knox County

Incentive Type: Development Incentives

Program Name: Stream and Vegetated Buffers Credit

Description: Credit may be granted when stormwater runoff is effectively treated by a stream buffer or other vegetated buffer. Effective treatment constitutes treating runoff as overland sheet flow through an appropriately vegetated and forested buffer.

Beneficiary: Developer

Reference(s): http://www.knoxcounty.org/stormwater/pdfs/vol2/5-2%20Water%20Quality%20Volume%20Credits.pdf

TN: Knox County

Incentive Type: Development Incentives

Program Name: Use of Vegetated Channels

Description: This credit may be granted when vegetated (grass) channels are used for water quality treatment. Site designers will be able to subtract the areas draining to a grass channel and the channel area itself from the total site area when computing water quality volume requirements.

Beneficiary: Developer

Reference(s): http://www.knoxcounty.org/stormwater/pdfs/vol2/5-2%20Water%20Quality%20Volume%20Credits.pdf

TN: Knox County

Incentive Type: Development Incentives

Program Name: Impervious Area Disconnection

Description: This credit may be granted when impervious areas are disconnected from the stormwater control system via overland flow filtration/infiltration (i.e., pervious) zones. These pervious areas are incorporated into the site design to receive runoff from rooftops or other small impervious areas. If impervious areas are adequately disconnected in accordance with the criteria listed below, they can be deducted from the total site area when computing the water quality volume requirements.

Beneficiary: Developer

Reference(s): http://www.knoxcounty.org/stormwater/pdfs/vol2/5-2%20Water%20Quality%20Volume%20Credits.pdf

TN: Knox County

Incentive Type: Development Incentives

Program Name: Water Quality Volume Credits (General term for all specific credits)

Description: Allows for a reduction in the water quality treatment volume (WQv). The credit system directly translates into cost savings to the developer by reducing the size of structural stormwater control and conveyance facilities. If a developer incorporates one or more of the credited practices in the design of the site, the requirement for capture and treatment of the WQv will be reduced. Site designers are encouraged to utilize as many credits as they can on a site. Greater reductions in stormwater storage volumes can be achieved when many credits are combined (e.g., disconnecting rooftops and protecting natural conservation areas).

Beneficiary: Developer

Reference(s): http://www.knoxcounty.org/stormwater/pdfs/vol2/5-2%20Water%20Quality%20Volume%20Credits.pdf

WA: Seattle

Incentive Type: Development Incentives

Program Name: Density Bonus Incentive

Description: The Density Bonus incentive offers downtown commercial, residential and mixed-use developments greater height and/or floor area if a green building standard of LEED Silver or higher is met.

Beneficiary: Commercial

Reference(s): http://www.seattle.gov/dpd/GreenBuilding/OurProgram/PublicPolicyInitiatives/DevelopmentIncentives/

Grants

CA: Santa Monica

Incentive Type: Grants

Program Name: Sustainable Landscape Grant Program

Description: Grants are awarded for up to 50% of the cost of the project, not to exceed $5,000, including a maximum of $3,500 for qualified irrigation equipment and a

maximum of $1,500 for climate-appropriate plants defined as very low, low, and medium water use plants. No turf or high water using plants or invasive plants will be funded. In addition to the $5,000, applicants may also apply for rebates for specific irrigation equipment including weather-based irrigation controllers, rotary nozzles for sprinklers and synthetic turf. The grant is a reimbursement grant, paid upon completion of the approved project. Invoices to substantiate costs will be required for all reimbursements. This grant is a first come, first served program available until funds run out. Projects in the parkway will receive priority funding. Projects must be completed within 180 days of grant award to receive funding. Partial funding for incomplete projects will not be permitted.

Beneficiary: Individuals, property owners, businesses, non-governmental organizations and public agencies who are water customers in Santa Monica; new construction and major remodel projects are not eligible.

Reference(s): http://www.smgov.net/epd/residents/Water/Landscape_Grant.htm

IL: Chicago

Incentive Type: Grants

Program Name: Green Roof Improvement Fund

Description: A one year pilot redevelopment program to provide financial assistance for the installation of Green Roofs on certain eligible commercial facilities. Eligible Applicants can receive a grant for up to 50% of Eligible Costs, with a maximum assistance of $100,000 per project and per applicant. All grants shall be in the form of reimbursement funding to be awarded only after the Green Roof is installed and all other requirements for funding are met.

Beneficiary: Commercial

Reference(s): http://egov.cityofchicago.org/city/webportal/portalContentItemAction.do?contentOID=536943451andcontenTypeName=COC_EDITORIALandtopChannelName=DeptandchannelId=0andprogramId=0andentityName=Planning+And+DevelopmentanddeptMainCategoryOID=-536884767

OR: Portland

Incentive Type: Grants

Program Name: Ecoroof Grant Program

Description: The City of Portland offers grants as incentives to property owners and developers to add more ecoroofs. The incentive program is part of Portland's Grey to Green initiative to increase sustainable stormwater management practices, control non-native, invasive plants, and protect sensitive natural areas. The grants fund up to $5 per square foot of an ecoroof project. Installation costs for ecoroofs in Portland range from $5 to $20 per square foot.

Beneficiary: Property owners and developers

Reference(s): http://www.portlandonline.com/bes/index.cfm?c=48724

OR: Portland

Incentive Type: Grants

Program Name: Community Watershed Stewardship Grants

Description: Watershed stewardship grants provide up to $10,000 to schools, churches, businesses and other community organizations for projects that protect and enhance watershed health at the local level. Groups can use grant money for supplies, materials, equipment, room rentals, feasibility studies or technical assistance. Past projects include education and monitoring, ecoroofs, stormwater features, restoration, and naturescaping.

Beneficiary: Community organizations

Reference(s): http://www.portlandonline.com/BES/index.cfm?c=43077

OR: Portland

Incentive Type: Grants

Program Name: Willamette Stormwater Control Program

Description: Provides technical and financial assistance for a limited number of pilot projects that control stormwater runoff. Funded 15 demonstration projects to retrofit existing sites in targeted areas. Up to $30,000 was available for design and construction for projects that were part of an existing development, located in the city's combined sewer target area, and removed runoff from at least 10,000 ft^2 of paved or roof area.

Beneficiary: Commercial

Reference(s): http://www.nrdc.org/water/pollution/storm/chap12.asp

U.S. Virgin Islands

Incentive Type: Grants

Program Name: Non-Point Source Pollution Conservation Schools

Description: Through the program, "Youth Putting a LID On Non-Point Source Pollution," schools are encouraged to manage resources on their school grounds and surrounding areas, in ways that will help mitigate Non-Point Source Pollution through Low Impact Development. The objective of the program is to increase the level of environmental awareness among public schools and the community at large. Grants may be awarded to schools willing to participate in the program. Awards of $1,000 to $4,000 will be available to schools or individual classes. Schools that participate will be considered as a "NPS Pollution Conservation School."

Beneficiary: Schools

Reference(s): http://www.dpnr.gov.vi/dep/pubs/2005_9_18_nps_schools.htm

WA: King County

Incentive Type: Grants

Program Name: Impervious Surface Cost Share and Credit Program

Description: As an incentive to reduce impervious surface, the county is making funds available for sharing the costs of converting impervious surface to (1) native-vegetated landscape, (2) compost-amended lawn or (3) grassed, modular-grid pavement. To qualify, a plot plan, technical information and description must be submitted to county engineers who will work with the customer to develop the plan. 50% of costs up to $20K will be reimbursed after the job is complete and

inspected. Reducing impervious surface could potentially place the property into a lower rate category, reducing the surface water fee.

Beneficiary: Commercial

Reference(s): http://dnr.metrokc.gov/wlr/surface-water-mgt-fee/swm-discount.htm

WA: King County

Incentive Type: Grants

Program Name: King County Green Building Grants

Description: The King County LEED Grants Program provides funding to projects built in King County, outside of the City of Seattle, that meet stringent criteria for resource conservation, and help educate the public about the importance of green building. Public, private, and not-for-profit organizations seeking LEED certification for building projects are eligible and encouraged to apply. Grant awards range from $20,000 to $30,000 depending on performance level achieved.

Beneficiary: Commercial

Reference(s): http://your.kingcounty.gov/solidwaste/greenbuilding/incentives/commercial.asp

WA: Seattle

Incentive Type: Grants

Program Name: Aquatic Habitat Matching Grant

Description: Seattle Public Utilities provides matching grants for individuals or groups to help improve Seattle's aquatic habitat along creeks and shorelines. Award amounts begin at $2,000 per project, with $300,000 in total awards available. Projects require a one-to-one match. Projects considered are those that improve, preserve, and/or restore aquatic habitat and/or ecological diversity and enhancement; address water flow and/or quality; or improve/prevent impacts from the City's drainage system.

Beneficiary: Individuals or groups

Reference(s): http://www.seattle.gov/util/Services/Drainage_&_Sewer/Get_Involved/Aquatic_Habitat_Grants/index.asp

WA: Seattle

Incentive Type: Grants

Program Name: Environmental Grants (Neighborhood Improvement Grants, etc)

Description: The Watershed Climate Action Grant will provide volunteer groups one to three weeks of support by EarthCorps, a service organization that engages young adults in restoring key ecological sites around Puget Sound. They will provide tailored support to your volunteer group that could include removing invasive plants, providing plants and mulch, and planting and caring for new trees.

Beneficiary: Volunteer groups

Reference(s): http://www.seattle.gov/util/Services/Drainage_&_Sewer/Get_Involved/Environmental_Grants/index.asp

Rebate/Installation Financing

CA: Santa Monica

Incentive Type: Rebate/Installation Financing

Program Name: Rain Gutter Downspout Redirect Rebate, Rain Barrel Rebate, Cistern Rebate

Description: 1. Rain Gutter Downspout Redirect Rebate (rainwater percolation): Up to $40 per qualified rain gutter downspout (up to and including all downspouts on one's property), includes labor and materials. Rebates are available for the cost of redirecting rain gutter downspouts to permeable surfaces, such as landscaped areas.

2. Rain Barrel Rebate (rainwater storage): Rebates up to $100 per barrel (limited to 125 gallon maximum capacity), includes design, labor and materials.

3. Cistern Rebate (rainwater storage): Up to $500 per cistern (limited to cisterns over 500 gallons each), includes design, labor and materials.

Beneficiary: Any property owner (resident, institution or business) in the City of Santa Monica and any tenant of said property with the permission of the owner.

Reference(s): http://www.smgov.net/epd/residents/Urban_Runoff/rain_harvest_rebates.htm

CA: Palo Alto

Incentive Type: Rebate/Installation Financing

Program Name: City of Palo Alto Innovative Stormwater Measures Rebate Program

Description: 1. Rain Barrel Rebate: $50 rebate for purchase and installation of a rain barrel to collect and harvest rainwater runoff from rooftops.

2. Permeable Pavement Rebate: Rebate of $1.50 per square foot for installation of permeable pavement (porous asphalt concrete, pervious Portland cement concrete, or permeable interlocking concrete pavers) to reduce storm water runoff from driveways, walkways, patios, and parking lots.

3. Cistern Rebate: Rebate of 15 cents per gallon for purchase and installation of a cistern to collect and harvest rainwater runoff from rooftops and site runoff

4. Green Roof Rebate: Rebate of $1.50 per square foot for the installation of a green (vegetated) roof to minimize storm runoff from rooftops.

Rebates are limited to a maximum of $1,000 per single-family residential property and $10,000 for commercial/industrial and multi-family residential properties.

Beneficiary: Residential, commercial, or governmental property owner in the City of Palo Alto, California.

Reference(s): http://www.cityofpaloalto.org/stormwater

DC: Washington

Incentive Type: Rebate/Installation Financing

Program Name: River Smart Homes

Description: This program offers incentives to homeowners interested in reducing stormwater pollution from their properties. Homeowners receive up to $1,200 to adopt one or

more landscape enhancements, including shade trees, above-ground cisterns/rain barrels, permeable/porous pavers, rain gardens, and BayScaping.

Beneficiary: Residential properties

Reference(s): http://ddoe.dc.gov/ddoe/cwp/view,a,1209,q,497794.asp

FL: Maitland

Incentive Type: Rebate/Installation Financing

Program Name: City of Maitland Incentive Programs

Description: The City has three stormwater/water quality incentive programs. Through the Shoreline Revegatation Program, the City will reimburse qualified residents up to 50% of the cost to purchase and install aquatic plants along their property shoreline. A maximum one-time reimbursement of $200 is being offered. The Wetland Tree Planting Program provides lakefrond homeowners up to three, 8-10 foot tall, bald cypress trees at a cost of only $25 per tree. A City representative works with the homeowner to establish the ideal location for the trees to ensure that the trees will benefit the lake and the shoreline. Finally the City has an Environmental Swale Program which pays for 20% of the cost to grade and sod a swale, or $500 per property whichever is less. A City representative helps establish the best location for the swale to ensure that the lakes/canals have maximum water quality benefit.

Beneficiary: Property owner in Maitland, Florida

Reference(s): http://www.ci.maitland.fl.us/pubworks_lakesFaq.asp

IL: Chicago

Incentive Type: Rebate/Installation Financing

Program Name: Green Roof Grants

Description: Residential and small commercial building owners can qualify for $5,000 for a green roof project.

Beneficiary: Residential and commercial properties

Reference(s): http://www.cityofchicago.org/city/webportal/portalContentItemAction.do?BV_SessionID=@@@@1021838484.1229132155@@@@&BV_EngineID=ccccadefmdlgmfecefecelldffhdfif.0&contentOID=536932287&contenTypeName=COC_EDITORIAL&topChannelName=Dept&blockName=Environment%2FGreen+Roof+%26+Cool+Roof+Grants+Programs%2FI+Want+To&context=dept&channelId=0&programId=0&entityName=Environment&deptMainCategoryOID=-536887205

IL: Chicago

Incentive Type: Rebate/Installation Financing

Program Name: Roll Out the Barrel Events

Description: Events held where rain barrels sold at discounted prices ($15 - $20) to residents. Barrels were built by the City's ex-offender job training program by retrofitting recycled 55-gallon plastic barrels. City provided information on installing and maintaining rain barrels, as well as information on stormwater management and water conservation. Pilot program cost ~$40K excluding city labor.

Beneficiary: Residential

Reference(s): http://www.cityofchicago.org/city/webportal/portalContentItemAction.do?blockName=Conserve+Chicago+Together%2f2004%2fI+Want+ToanddeptMainCategoryOID=-536890176andchannelId=0andprogramId=0andentityName=Conserve+Chicago+TogetherandtopChannelName=SubAgencyandcontentOID=536913711andFailed_Reason=Invalid+timestamp,+engine+has+been+restartedandcontenTypeName=COC_EDITORIALandcom.broadvision.session.new=YesandFailed_Page=%2fwebportal%2fportalContentItemAction.doandcontext=dept

IL: Rock Island

Incentive Type: Rebate/Installation Financing

Program Name: Rain Gardens for Rock Island

Description: City reimburses residents $4/square foot of rain garden space and if a rain is incorporated into the design the City will supply one for free. The City must approve the design prior to installation and inspect the rain garden upon completion prior to paying the incentive payment.

Beneficiary: Residential property owner in Rock Island, Illinois.

Reference(s): http://www.rigov.org/citydepartments/publicworks/raingarden.html

MD: Montgomery County

Incentive Type: Rebate/Installation Financing

Program Name: RainScapes Rewards

Description: Up to $1,200 is offered per single-family lot or up to $5,000 per multi-family or commercial lot for installation of rain gardens, cisterns green roofs, native plants, shade trees and permeable pavement.

Beneficiary: Residential and commercial properties

Reference(s): http://www.stormwaterpartners.org/PDF/RainScapesRewardsApplication.pdf

MN: Burnsville

Incentive Type: Rebate/Installation Financing

Program Name: Rain Garden Retrofit Project

Description: $150K project to target homeowners in a specific neighborhood near Crystal Lake in an effort to compel residents to build rain gardens in their yards to reduce stormwater runoff. An architect met w/ residents free of charge to design the gardens and residents helped to build them. The city installed 6-ft. curb cuts w/ 2-ft. tapering sections on either side to direct stormwater off the streets and into the gardens. The project reduced runoff by 90% compared to neighboring control area. Homeowners maintain gardens w/ city assistance if needed.

Beneficiary: Residential

Reference(s): Source: Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio, Cincinnati, Ohio, and their respective Legal Counsel. 2007. Green infrastructure program: A report evaluating the concept of a major storm water minimization program, utilizing green infrastructure and related methods. http://www.msdgc.org/wetweather/greenreport.htm.

MN: Maplewood

Incentive Type: Rebate/Installation Financing

Program Name: Street Redesign and Reconstruction

Description: As part of large-scale redesign of existing streets and utilities, the City offered to construct standard-size rain gardens in the public boulevard right-of-way on the front edge of residential properties. These gardens handle drainage from yards, rooftops, driveways and some runoff from the street. Residents volunteer to have the garden built by the City and are responsible for planting the provided plants and maintaining the gardens with free technical assistance from the City.

Beneficiary: Residential

Reference(s): http://www.ci.maplewood.mn.us/DocumentView.asp?DID=246

RESOLVE. 2007. Public Funding Incentives for Private Residential and Commercial Watershed Protection Projects: Report on Key Case Studies and Community Workshop. http://www.resolv.org/rainscapesworkshop/Report.pdf.

MN: Minneapolis

Incentive Type: Rebate/Installation Financing

Program Name: Rain Barrel Discount Program

Description: 2,000 rain barrels made available to Minneapolis households at a reduced cost ($45). Barrels made available thanks to a $100,000 grant from the EPA's Region 5 Great Cities Program and in partnership w/ Minnesota/Metro Blooms and the Green Institute.

Beneficiary: Residential

Reference(s): Source: Metropolitan Sewer District of Greater Cincinnati, Hamilton County, Ohio, Cincinnati, Ohio, and their respective Legal Counsel. 2007. Green infrastructure program: A report evaluating the concept of a major storm water minimization program, utilizing green infrastructure and related methods. http://www.msdgc.org/wetweather/greenreport.htm.

MN: Minneapolis

Incentive Type: Rebate/Installation Financing

Program Name: Ramsey-Washington Metro Watershed's BMP Cost Share Program

Description: The Ramsey-Washington Metro Watershed District (RWMWD) BMP Cost Share Program offers financial assistance to efforts that protect and improve water and natural resources within the watershed. BMP Cost Share assistance may be used by public or private landowners implementing programs and projects that (1) Promote actions that prevent flooding or lessens the effect of drought; (2) Improve water quality or increases the capacity of the watershed to store water; (3) Preserve, protect, and restore native plant and wildlife communities, especially lakes, rivers and wetlands; (4) Protect and preserves groundwater quality and quantity; and/or (5) Treat the natural environment as intrinsically valuable in land use decisions.

The RWMWD has allocated $250,000 for the BMP Cost Share program and projects for 2009. The RWMWD will provide applications year round until funds are depleted for the year. The minimum grant amount available is $100.00. The

maximum grant amount is residential: $2,000.00, commercial and government: $30,000.00. Funds are a reimbursement of 50% match for materials and labor. The funds must be used within one year of receiving grant approval.

Beneficiary: Residential, commercial, and government properties

Reference(s): http://www.rwmwd.org/index.asp?Type=B_BASIC&SEC={E5745966-78DF-4558-8C39-431D6D450673}&DE=

OH: Cincinnati

Incentive Type: Rebate/Installation Financing

Program Name: Mt. Airy Rain Catchers

Description: Reverse auction to encourage the installation of rain barrels and rain gardens. Bids were received from qualified residents which outlined what rain catcher projects they agreed to have installed and the incentive payment they requested to do so. The bids were selected based upon the project(s) they agreed to install, their scoring within an Environment Benefit Index and the amount of the incentive payment requested. The selected project(s) were installed for free and the residents were paid the bid amount as a one-time incentive payment. The first round of the reverse auction in 2007 resulted in 50 rain gardens and 100 rain barrels installed at 67 of the approximately 350 residential properties in the watershed. In 2008, the auction was repeated and an additional 35 rain gardens and 74 rain barrels were installed.

Beneficiary: Residential property owner in the Shepherd Creek watershed.

Reference(s): http://www.epa.gov/nrmrl/pubs/600r08129/600r08129.htm

OR: Portland

Incentive Type: Rebate/Installation Financing

Program Name: Downspout Disconnection Program

Description: Targets property owners to disconnect roof downspouts onto lawns and flowerbeds, or use onsite stormwater mgmt. facilities such as drywells and soakage trenches. The City's Plumbing division works directly with homeowners to disconnect downspouts without the homeowner having to get a plumbing permit. A target area of CSO basins is selected and Disconnection Program staff go to work, door-to-door canvassing to get voluntary agreement from property owners to complete the disconnection. Owners then complete the disconnection themselves and receive a $53 per downspout incentive, or have the City complete the disconnection for them free of charge. The program is funded primarily by a mixture of capital and operating funds due to this ability to remove enough stormwater from the CSO system, that collection pipes may be able to be downsized providing significant pipe construction cost savings.

Beneficiary: Residential

Reference(s): http://www.portlandonline.com/bes/index.cfm?c=43081

TX: Austin

Incentive Type: Rebate/Installation Financing

Program Name: Rain Barrel Sales Program

Description: City of Austin water customers may purchase rain barrels from Austin Water Conservation at a discounted price of $61 per barrel.

Beneficiary: Residential

Reference(s): http://www.ci.austin.tx.us/watercon/rbsales.htm

TX: Austin

Incentive Type: Rebate/Installation Financing

Program Name: Rainwater Harvesting Rebates

Description: The City offers a rebate of up to $500 on the cost of installing a larger capacity rainwater harvesting system (over 300 gallons). Rainwater harvesting systems must collect a minimum of 300 gallons. Life expectancy of the system should be a minimum of 20 years. Applicants must agree to open the site to the public if so requested.

Beneficiary: Applicants must receive 100% of their water from the Austin Water Utility or qualifying municipal utility.

Reference(s): Contact: Department of Water Quality at (512) 974-2550 or visit http://www.ci.austin.tx.us/watercon/rwrebates.htm

WA: Seattle

Incentive Type: Rebate/Installation Financing

Program Name: Seattle Rain Barrels

Description: The Seattle Conservation Corps (SSC), a work-training program for homeless adults, and Seattle Public Utilities (SPU) partner to offer SPU customers discounted rain barrels. SSC piloted the program in 2003, selling 1,500 barrels in just a few hours. The Corps subsequently formed a partnership with SPU to establish an ongoing program, which SPU advertises on its Website. The Corps assembles the rain barrels out of shipping containers (usually for olives or peppers from the Mediterranean) sent to them from packing plants around the U.S. and handles all sales. SPU and SCC handle marketing jointly. The current program offers homeowners in SPU's direct service area the opportunity to buy rain barrels at a cost of $59, about $20 less than barrels of comparable quality sold elsewhere. SCC sells the rain barrels for $69, but SPU customers pay $59 and SPU pays $10 as a subsidy for their customers, to encourage participation by keeping customer costs low. Residents call the SCC to order a barrel and either pick up the barrel(s) at a central location, or can have barrels delivered for an additional fee of $15 for the first barrel, and $5 for each additional barrel. SPU offers discounts on barrel purchases and delivery to low-income families. There is no limit on barrel purchases. The program sold approximately 5,000 barrels in 2005, and about 1,500 in 2006.

Beneficiary: Residents

Reference(s): http://www.seattle.gov/util/Services/Yard/Natural_Lawn_&_Garden_Care/BuyCompostBinsRainBarrels/index.htm

Awards/Recognition

IL: Chicago

Incentive Type: Awards and Recognition Programs

Program Name: Mayor Daley's GreenWorks Awards

Description: Mayor Daley's GreenWorks Awards promote a green city by recognizing businesses, non-profits, schools and government agencies whose buildings, practices, and products or services are environmentally responsible. The GreenWorks Awards are presented annually.

Beneficiary: Projects/buildings must be located in the city of Chicago. The award program is open to businesses, non-profits, schools, and government agencies.

Reference(s): http://www.cityofchicago.org/city/webportal/portalDeptCategoryAction.do?BV_SessionID=@@@@1791384520.1225235751@@@@&BV_EngineID=cccdadefieleijdcefecelldffhdfhk.0&deptCategoryOID=-536895154&contentType=COC_EDITORIAL&topChannelName=Dept&entityName=Environment&deptMainCategoryOID=-536887204

OR: Portland

Incentive Type: Awards and Recognition Programs

Program Name: Businesses for an Environmentally Sustainable Tomorrow (BEST)

Description: Since 1993, the BEST Awards have been presented annually to Portland area companies demonstrating excellence in business practices that promote economic growth and environmental benefits. The BEST Awards recognize businesses with significant and unique achievements in the following categories: (1) BEST Practices for Sustainability for Small, Medium and Large companies, (2) Sustainable Products or Services, (3) Innovations in Resource Conservation, (4) Green Building, and (4) Sustainable Food Systems.

Beneficiary: Local businesses

Reference(s): http://www.portlandonline.com/OSD/index.cfm?c=41891

OR: Portland

Incentive Type: Awards/Recognition

Program Name: Eco-logical Business Program

Description: A certification and recognition program to highlight environmentally friendly businesses. After a certification visit, participating shops receive a shop display package, press coverage, listing on the program web site, and promotion on the radio and at public events.

Beneficiary: Commercial

Reference(s): http://www.ecobiz.org/

PA: Philadelphia

Incentive Type: Awards and Recognition Programs

Program Name: Philadelphia Sustainability Awards

Description: Projects are granted recognition awards for sustainability in a variety of categories, including water efficiency/conservation, pollution prevention,

landscaping/greening, habitat protection, best management practices, stormwater management, and green building elements, among many others.

Beneficiary: Businesses, non-profits, community organizations, individuals, schools and government agencies in the Greater Philadelphia region

Reference(s): http://www.philadelphiasustainabilityawards.org/

PA: Philadelphia

Incentive Type: Awards and Recognition Programs

Program Name: Stormwater BMP Recognition Program

Description: The BMP Recognition Program recognizes innovative stormwater Best Management Practices (BMPs) in the southeastern region of Pennsylvania. The program is looking for projects such as rain gardens, green roofs, infiltration swales, and treatment wetlands. Those who are recognized will receive a certificate and/or award from top officials of the Department of Environmental Protection (DEP) and the City of Philadelphia; recognition at an awards ceremony; and region-wide media exposure, such as in partner newsletters and the PWD newsletter, which reaches over half a million households and businesses in the region, in addition to acknowledgment on the PWD website.

Beneficiary: Landscape architects, engineers, developers, university students, neighborhood residents and others

Reference(s): http://www.stormwaterbmp.org/stormwaterbmp/

WA: King County

Incentive Type: Awards/Recognition

Program Name: Businesses for Clean Water

Description: The Businesses for Clean Water program recognizes companies that successfully prevent storm water pollution at their sites.

Beneficiary: Commercial

Reference(s): http://www.envirostars.com/news/articles/detail.cfm?Article=3andCategory=4andList=30,16,26,25,9,3

WA: King County

Incentive Type: Awards and Recognition Programs

Program Name: Greening In Place Awards

Description: Annual awards that honor the planning and design teams of public facilities that reflect environmental sustainability.

Beneficiary: Planning and design teams

Reference(s): http://www.estormwater.com/King-County-Wash-Presents-Greening-in-Place-Awards-newsPiece16766

September 2007

CSI Utility

You slipping on a banana peel is comedy. Me slipping on a banana peel is tragedy.—Groucho Marx

Friday, August 31, 2007

By Andy Reese
Comments

Additional Article Content
- CSI Utility
- Table One
- Acknowledgement
- References

You may also be interested in...
- Information-Oriented Watershed Planning
- The Evolving BMP
- Weather Monitoring and Mapping
- Reforest the Bluegrass
- Westchester County Airport Meets Tough International Standards
- Green Stormwater

The nation's first stormwater utility was established in 1974. Since that time, many successful stormwater utilities have been reaping the benefits of dedicated revenue to appropriately manage their stormwater needs. *Some* of these utilities were challenged legally in court but upheld. *All* were challenged in the more exacting court of public acceptance.

Not all stormwater utilities succeed. This article addresses the 10 most common reasons stormwater utilities fail. I thought of writing an article on the top 10 ways to succeed. But it is often more instructive, if not more interesting, to be a stormwater crime scene investigator than a theoretical stormwater student.

So bring up the music, let the Florida sunrise fill the screen, strap on your detective gear, get your polymerase chain reaction DNA analysis kit ready, and let's investigate a few stormwater utility crime scenes.

Defining Failure

To fully understand success, it is necessary first to understand what we mean by failure. There are perhaps two major ways that stormwater utilities fail.

Failure to Initiate

Dipping your toes in the water and deciding *not* to swim is not failure—it may, in fact, be wisdom. Failure to actually come to completion as a stormwater utility is not failure. However, *unexpectedly* and *badly* failing to initiate a stormwater utility *is* failure. What I mean by this is that we often begin the process of establishing a stormwater utility but make a calculated decision not to proceed. It may begin with a does-it-make-sense (DIMS) study, a feasibility study, or a stormwater business plan that has a financial component. The DIMS study is a one- or two-day, fast-paced, and low-cost approach designed to stimulate both discussion and interest about the concept of a stormwater utility among staff and potentially recalcitrant political leaders. It asks and seeks answers to a set of key questions necessary prior to a go–no go decision. It is also low risk. It is dipping our toes in the water. Many smaller towns and cities take this route first.

The feasibility study, or business plan, is a longer and more involved study that actually builds momentum toward stormwater utility acceptance and implementation while it explores similar questions. It often involves a citizen group.

Both of these study types, when done right, are foolproof. By that I mean that you cannot fail. If, on the one hand, it is found that the utility is a good idea, the study is a success. On the other hand, if it is found that a utility is not a good idea at this time or another form of funding is appropriate, the study is equally successful. It did its job in smoking out reasons not to go forward and the idea is set aside peacefully without embarrassment, recrimination, or negative publicity. It was a success.

I personally have been involved in more than 30 such studies. Often, in the course of stormwater business planning, a sound program path is created, support is built, and, in the end, another funding package (taxes, one-time fees, property transfer tax funding, sales tax, tax increment funding, GO bonding, etc.) not including a stormwater user fee is preferred. I should go on record saying that I believe that a stormwater user fee, like a water and wastewater user fee, is in the end the best long-term solution for most comprehensive stormwater programs and that by 2020 there will be 10,000 such utilities—one for each town and urbanized county with more than 10,000 in population. The advantages of such an approach are just too overwhelming.

However, the landscape is littered with aborted attempts to establish a stormwater utility that did not follow a thoughtful and careful process and proceeded down the expert ski slope with a beginner's skill level. You sometimes make it. But it is high risk and low probability, and when you fail it is often spectacular—at least for the municipal beat reporter looking to sell papers.

One of the main reasons we fail to initiate is that we fail to understand there is a political and human process for bringing about change. The process does not ignore us, even if we ignore it. There is a simple model that defines the potential for success in any human system change endeavor. Its usefulness and simplicity of applicability has been proven, at least in the author's experience, many times in widely varied situations and through more than 20 years of setting up stormwater utilities. The model is a simple "equation," S¢ = D * V * P, where S¢ is a measure of the potential for successful introduction of a user fee; D is a subjective measure of the degree of dissatisfaction with the current status quo or desperation of felt need for change; V is a subjective measure of the compelling-ness of a vision for the future (it defines a different stormwater program in ways that provoke a desire to move from the old paradigms to better ones); and P is a subjective measure of the appeal, practicality, and reasonableness of the plan to move from D to V.

I have seen over the years that there is indeed a multiplication effect that takes place when all three elements are effectively in place. So, for example, a community can be very and clearly dissatisfied with its current situation (say a 10 out of 10), can have heard of and talked about some good ideas on things that can be done differently (say a 5), but can have no viable plan to move ahead or a consensus to do so (say a 0). And the resulting multiplication is zero. The effort fails. The goal is to try to take each of these key elements to as near a 10 as possible—to "bat a thousand."

Failure to Meet Reasonable Expectations

The second, and subtler, way in which utilities fail is in the failure to form an entity that meets performance expectations. Sometimes impossibly high expectations are created unintentionally during the setup process itself, but most often they are simply the expectations of a reasonable citizen anticipating effective stormwater service.

Figure 1. "Impervious" layer

that the utility is targeted to handle only one aspect of a comprehensive stormwater program (e.g., National Pollutant Discharge Elimination System, or NPDES, compliance) and thus cannot handle citizen flooding or maintenance complaints. It may be that a lot is being done but not appropriately publicized. This often then leads to bad feelings, angry phone calls, and a public black eye. In a case or two, it has led to repeal of the stormwater utility itself. Once trust is lost, it is very hard to regain.

Top 10 List

There are many specific reasons utilities fail. Over the last 20 years of practice, I have come up with my favorite Top 10 List. So, with apologies to David Letterman, here they are. I'll start with the least common or explosive and move toward the spectacular. See if they resonate. Get out your fingerprint brush.

Reason #10: Our database was messed up without the ability to easily fix problems.

Billing is all about three things: (1) getting almost all the bills right the first time, (2) handling customer complaints and inquiries with polite efficiency and smart policies, and (3) quickly admitting when you are wrong and making things right with alacrity. Of course, it helps in the first place that your public education program was effective and that the rates actually make sense even to your brother-in-law.

Getting things right the first time places great reliance on the basic rate methodology to define required accuracies and precision and to measure what you say you are measuring. I have learned that many MIS personnel have an

amazing ability to answer your question correctly from their perspective but incorrectly from yours. That is because none of their databases is actually intended to produce an impervious layer suitable for stormwater billing. Figure 1, for example, was one MIS director's affirmative answer to the question, "Do you have an impervious coverage?"(Names and locations throughout the article have been obfuscated to protect the author!) I have tried since sixth-grade mathematics, and you simply cannot find the area of a line—even if it does surround an impervious parking lot.

A Southern county decided to bill on the basis of current zoning (Figure 2). This, of course, led several farmers, who had obtained industrial park zoning for their farms in anticipation of a secure retirement, to receive bills of many thousands of dollars. For example, the property on the right of the photo is coded correctly, while the farm on the left is not. When the farmers called, they were shuttled from department to department with little chance of appeal. Needless to say, the utility (and county engineer) eventually went down in flames with refunds of all bills.

Figure 2. Zoning-based rate methodology

One Western town used satellite data with little correction and a rate structure "measured" to the nearest 10 square feet of impervious area. In the end, the rate structure could not be supported by the data accuracy, generating errors and complaints that were unacceptably high. When the calls started coming in, the partially trained temporary staff members were so overwhelmed that they simply began forwarding calls to the next available staff person, relevant or not. A simple adjustment to the rate structure would have solved the problem and increased revenue at the same time.

Smart policies and polite customer service will go a long way. And you will be skewered when they are lacking. One Midwestern city billed one year in arrears without warning, had inadequately trained customer service capacity, and had a database riddled with mistakes. The $14,000 bill to a particularly well-connected and poorly treated resident made the front page, leading the city to decide that, indeed, not all publicity is actually good publicity.

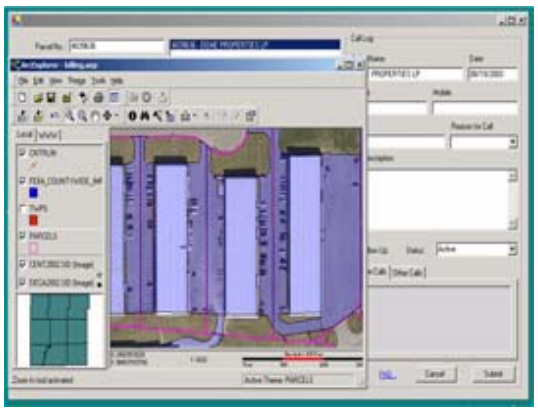


Figure 3. Web-based customer service system

As a fix, AMEC Earth & Environmental Inc. established a hybrid public-private stormwater customer service system with the ability to automatically generate a digital picture of each property with the impervious layer and various statistics superimposed on it (Figure 3). The picture could be e-mailed to the customer in real time during the course of the call to solve problems. A Web-based system was established to allow customers to look at their own property and billing information online.

Another Midwestern town billed on the tax bill and, because there were no accounts for nonprofits, simply chose not to bill them—leading, after long foot-dragging, to embarrassing explanations and hand-establishment of a separate billing system.

Reason #9: Our program or performance did not meet community expectations.

In my experience, there are several ways to succeed at this kind of failure, but one is most common: having a program that does not scratch people where they itch in a timely way. This can happen in several ways.

The first is to have a rate structure that has a singular focus in a world that has multiple problems. It then generates too little revenue to actually construct needed improvements and is mismatched fatally with customer expectations. There was a stormwater utility in the South that was established, despite internal misgivings and external warnings, to only partially meet the unfunded mandate of NPDES Phase II. It went forward with a user fee of less than $0.50 per month. Now it is under fire for not meeting the perceived needs of its customers and for wanting an almost doubled rate increase … which it desperately needs in order to actually meet the needs of the customers. It was put in a difficult catch 22. Explaining this programmatic nuance to a shark-infested pool of citizens and reporters turned into a public bloodbath.

A second variation on this theme is simply to replace general fund sources with user-fee sources without actually improving the stormwater program. This has led several cities to repent in dust and ashes as the flood of citizen calls

came in demanding better service for their new “rain tax” and not being in the least satisfied that it was simply a more equitable way of billing for an existing, and underfunded, service. This is especially embarrassing when there is no actual tax rebate to offset the new fee.

The third variation is to have a program focus that does not produce brick and mortar in the field. People do not want to pay to plan, to be regulated, or to be educated. They want problems fixed—but good. Every city has capital needs that do not need master plans or prioritization schemes to fix; everybody knows they are the most important. So *while* we are planning, we should be fixing. In addition, people do not know whether the dirt that is being moved is million-dollar dirt or $40,000 dirt. So use your limited funds to move $40,000 dirt in lots of visible places, not in one $1 million place. By the way, it goes without saying that if those many places just happen to be situated, one each, in every council district, with the local council members cutting the ribbons on much-needed projects, you will get more council support.

Fourthly is delay in scratching the itch. A utility in the Midwest promised that there would be several million dollars in capital investment and several new maintenance crews in the first year of operation. After three years, it still had not attained this impossibly aggressive schedule. The customers were howling for the head of the director and for council to pull the plug. The planners and consultants failed to realize that their staff, used to drinking from a trickling garden hose, could not efficiently handle the flow of revenue from a fire hose when the utility was switched on—and that things take time even while revenue is accumulating. Only a generous “warm and breathing” credit saved the day and reduced the bloat.

Reason #8: Our rate structure unexpectedly limited our ability to move forward with our program.

This is a little like the last one but has an important difference. Many towns and cities operate on the premise that some money is better than no money. And so they work a deal in the rate structure giving away credits, reductions, exemptions, and rate caps indiscriminately. This works fine as long as some limited program is better than no program, and as long as “surely our citizens will understand” also prevails. The problem is that, when someone’s property is flooded or his or her garage is eroding away, nuanced understanding often is replaced by blind rage.

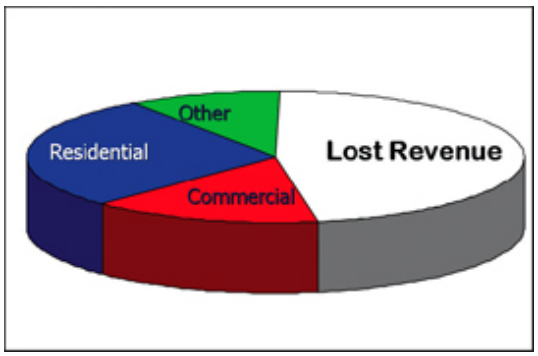


Figure 4. Lost revenue due to rate caps

For example, in order to “get started,” a town in one state decided to artificially cap the charges to non-residential property. Citizens, being charged $3.50 a month, did not find it important to sue on the basis of break in rational nexus of the charges. Businesses who were undercharged, and knew it, also did not challenge the fee. Smart, huh? However, as illustrated in Figure 4, the utility staff and consultant failed to realize that in a normal city or town fully 60% of the revenue should have come from non-residential properties. They thus created, through the monthly residential stormwater bill, the expectation of an effective stormwater program without the revenue-stream reality to deliver. Three years later, they were worse off politically than if they had never set one up at all.

In another state, it was decided by a number of communities to charge a “water-quality fee” or a “clean-water surcharge.” First of all, the very idea was challenged in court as illegal. Secondly, the small charge simply aggravated citizens when their need for stormwater services—their itch—was not able to be scratched by the severely limited revenues earmarked for something else. The phone calls eventually overwhelmed one city engineer, causing him to move on to greener pastures.

Another city had promised not to raise the rate for seven years, locking it into a program that could not meet the demand its effective public awareness program had created. The city began with about 500 complaints and, after completing 500 projects, had a backlog of 700 legitimate complaints as citizens who long ago had given up calling began to dial City Hall again.

I recall one young engineer telling me that he was almost shot when he told one flooded resident that, as a cost-saving measure, the city had opted not to go off the right of way with maintenance or flood control services and that he could not help the person even though that resident’s property was flooded by city street runoff. The city lost the lawsuit because public street water flooding downstream citizens is no different from *any* upstream development flooding a downstream development. It led the city to take a more

- Figure 5. Arm political leaders with clear and concise information

proactive stance in identifying its “public” stormwater system as anywhere public water flows.

Reason #7: We didn’t prepare our elected officials for vocal complaints.

No matter how good a job you do with public education, unless you have Kiefer Sutherland turn in the middle of a tense scene in *24* and tell people about the stormwater fee, many people will not know what the fee is until they are asked to pay it. Thus it is important for you to help elected officials see the light long before they feel the heat. They need to be educated, armed with facts, and made to look like heroes stewarding the infrastructure, protecting the environment, defending against federal intrusion, and guiding development. This is what happens when you don’t:

An Eastern city did a poor job both in public education and in control of political leadership expectation. When the calls came in, the political leaders were not armed with appropriate answers to tough questions or with a set of compelling reasons for the new “rain tax.” They pulled the plug and lined up at the podium to denounce the poor public works director whom they had told to “establish the fee and get us some money” months before.

- In a recent news article, a small town council in North Carolina, feeling exposed and unable to justify the rate, publicly voided a stormwater user fee, saying, “There were a number of things we missed in the setup—we did not want to miss them,” which turned out to be code language for “Watch the heads roll.”
- The pressure on the political leaders in a Western county was such that each of them stood up in the meeting set to adopt the ordinance and surprisingly (at least to staff) denounced the stormwater fee as unfair and unfocused.

Also think timing. No elected official wants to fall on the knife for stormwater. A Western town that delayed in executing a contract to implement a stormwater utility found that pushing the utility campaign into the political “silly season” caused it to become a political hot potato, eventually losing the support of the several incumbents and causing its demise.

Reason #6: We couldn’t explain our program and funding strategy or rates.
Keep it simple. Keep it intuitive. Keep it explainable to an eighth grader.

All stormwater rate structures are made up of three components: basic rate methodology, secondary funding methods, and rate modifiers. There are hundreds of combinations, and a bit of tailoring is always is order. But there is an inherent logical simplicity to stormwater user fees: “The more you pave, the more you pay.” Because we are so smart, we want to forever tweak the rate structure to improve equity and reflect all sorts of added factors. First of all, each additional factor increases complexity and cost—both at first and in long-term maintenance. Secondly, it begins to lose the intuitive nature and becomes the sort of thing people simply throw up their hands over when it initially is explained by the proud but misguided rate expert.

For urban development (as opposed to agricultural land), imperviousness is the single most important factor reflecting increase in the three biggest categories of urban impact: peak flow, pollution, and flow volume. The courts have stated again and again

exempt from the fee

that mathematical exactitude is not necessary for rational nexus to exist. We should get more complex only when we have to, not because we are smart enough to. Here are a few examples:

$8.29 per month

Figure 6. The hard-to-justify fee structure

- A Western county had a rate structure that was so complex, seeking to reflect various kinds of pollution loading, that it was difficult to explain it to those with questions and would have been a nightmare to maintain and defend in court.
- A Southern state, in a fit of political cover, passed legislation mandating that this statement appear on each stormwater utility bill: “This tax mandated by Congress,” which would be true, except it is not a tax and it is not mandated by Congress.
- A mid-Southern city, on the basis of a detailed and very convoluted rate study done by a Big Eight accounting firm, decided to charge homeowners a fee of more than $8 (reasoning that is what the numbers showed) while exempting large industrial and commercial sites on the basis that they were direct dischargers to a local river. Needless to say, council fell all over itself lining up to vote against the utility and defend the poor homeowners.
- A Southern county decided to master-plan for the first five years of the stormwater utility in order to have a sound and prioritized capital plan. When it hit the papers it sounded like bureaucratic mumbo-jumbo and red tape in actually getting things fixed. It did not help when a spokesperson could not explain the facts in front of a public meeting, while the ones who knew what to say died a thousand deaths in the back of the room.

Reason #5: We didn’t involve the community early enough or in the right ways.

There is one key rule of public involvement: “Bring me in early and I’m your partner. Bring me in late and I’m your judge.” We all know there are many “publics” and many ways to get messages out. Political leadership wants “more fingerprints on the knife” when they stand up to vote for a new fee. They want others to have suggested or, better, *demanded* it first. Key to success is not skimping on one-on-one efforts and having a detailed plan covering the who, what, when, and how of getting key messages to the right people in the right ways. It doesn’t have to be painful involving the public. But it often is.

The Charlotte Observer

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Editorials

Don’t delay drainage plan

■ Task force outlines good policies for a storm water utility, but its suggestion that city wait deserves to go down the drain.

Figure 7. The result of Charlotte's editorial board initiatives

- In the eleventh hour, a group of developers did an end run around the team developing the utility and, not being invited to the table, convinced the mayor that this was a bad idea and an attempt to “put something over” on the public.
- A Southern county developed a citizen group made solely of environmental proponents and flood victims. Needless to say, the backlash from the rest of the legitimate stakeholders was intense, sinking all efforts.
- A Midwestern town failed to keep its key staff leaders in the loop, causing them to make unfortunate statements about the size of the fee and forcing a cutback in the planned program and the effectiveness of the effort.
- As Figure 7 shows, in Charlotte, NC, the result of investing several meetings with the local editorial board helped head off a last-minute delay tactic by a developer group.

Citizen groups also can be high risk, but not if suitable controls are in place.

- “In 30 years of public service, this is the single most fulfilling thing I have done.” So ended the last meeting of the stormwater advisory committee in a Southern town.
- “If this is the way things are going to be, I’m in.” So the threatened lawsuit in a large Eastern city was dropped by a satisfied citizen after a wonderful welcome dinner and an efficient and effective group kickoff meeting.
- “I’d like to propose a toast … to stormwater management.” Lots of laughter. That is how the mayor kicked off the first of six meetings with a select group of local leaders over steak grilled by the public works department.

It can work. See my article entitled “Developing Technical Policy With Citizen Groups” for more details on those suitable controls (Reese 2002).

Reason #4: It was not legal.

We always assume we will go to court—and we intend to prevail. In every utility project I have done for the past 10 years, I always tell my clients from the point of the first greeting onward that they should not write, e-mail, or note anything they would be embarrassed to have their mother hear in court, or worse, read in the headlines. As stormwater utilities proliferate, court cases in states where they proliferate become less and less common—unless someone tries something that appears to be both illegal and harmful to a customer willing to sue to settle the problem. In the many states where utilities are just gaining a foothold, things are different. Stormwater management program fees have been the subject of litigation resulting in reported opinions from at least 17 states, including many cases involving final decisions by the state's highest court (NAFSMA 2006):

- Montana—1966
- Colorado—1986 and 1993
- Kentucky—1989 and 1996
- Ohio—1990
- Oregon—1992 and 1993
- Kansas—1994
- Florida—1995, 1998, and 2003
- Washington—1997
- Virginia—1998
- Tennessee—1998
- Michigan—1998 and 2001
- North Carolina—1998 and 1999
- South Carolina—1999
- Alabama—2001
- California—2002
- Georgia—2004
- Illinois—2005

When you go to court, it is important to have an airtight approach and to have met several critical tests of legality. Remember that there is a considerable legal difference between a tax (designed primarily for revenue generation without regard to rational nexus); an exaction (where someone pays a price to obtain a benefit from the city, like an impact fee or a franchise fee); an assessment (such as a capital assessment district where direct and special benefit is key); and a user fee (where rational nexus between the charge and the use of the system—not benefit, by the way—is key). If it is a user fee that you are attempting to develop, then there are certain rules that must be followed.

- A Western city attempted to impose a stormwater fee but was unable to prove the fee was not incidental to property ownership—and thus a tax—thus subjecting it to a citizen vote.
- A Northern city in a non-home-rule state started down the utility pathway only to find out late in the process that its local attorney did not feel it had legal authority to establish such an entity, thereby causing some embarrassment as it pulled the plug on efforts.
- A Midwestern city failed to prove that the fee was legal and appropriate for federal facilities using an argument that may not have taken full advantage of appropriate precedent or key legal arguments that did have sufficient precedent.
- An Eastern city billed stormwater fees on the basis of water meter size. This lack of rational nexus created a situation wherein lawsuits were filed and citizen support was low.
- A Midwestern city, deciding that stormwater credits might take away too much revenue, failed to offer such credits and lost the utility in court, partially on the basis that there was no recognition of reduced usage of the stormwater system—no way to "refuse service."

There are a number of bases for lawsuits, the most common being the following:

- The rate is not perceived as being fair and reasonable.
- It is seen as illegally discriminatory or confiscatory.
- The costs are not seen as substantially related to provision of facilities and services.
- The rate is not based loosely on demand.
- The rate is not legal by charter or legislation.
- Funds were not segregated and dedicated to stormwater.
- Proper procedures were not followed, such as Sunshine or public noticing provisions.
- There was no "opt out" provision created through crediting.

Reason #3: We didn't understand the process.

Most successfully developed stormwater utilities follow along several interrelated tracks of effort: program development, financial analysis, database and billing development, public education and involvement, and governance structure. These should operate in a coordinated way for things to go smoothly.

For example, the rate structure should reflect basic decisions about the program components and directions. The rate methodology should reflect both the availability of data and the drivers for the program. Certain policies on extent and level of service must precede decisions about cost and rate—but must not be done blindly, forcing a higher rate than the citizenry will bear.

There is an established order of things in the establishment of a stormwater utility. This is what can happen when you don't know or follow it:

- A Midwestern city simply developed an approximate fee and began billing, only to find out later that it had not followed legal process or appropriate due diligence. It canceled the fee and issued an apology to citizens.
- A Midwestern city decided, on the basis of a political deal, to charge an amount less than it needed and simply wrote the amount into an ordinance. When called to justify the rate, the city found that all the necessary studies were lacking—as was its legal basis for the utility itself.
- A Southern city developed the user fee based on a funding shortfall in its local budget and began to establish it without resorting to an appropriate cost-of-service analysis or rate structure. In district court, the fee was disallowed as a tax, causing a refund with interest.
- A Western city decided to charge a small surcharge on a water bill because it was easy. Today the city is still stuck with this fee as its only funding source after council improperly reasoned that the city "got its fee" and moved on to other things.

Reason #2: We didn't present a true compelling case.

In the change model discussed early in the article, the first component is "D": desperation for change. We call that making a compelling case for change. What is your compelling case—not *your* compelling case personally as a staff wonk, but what is Mrs. Minerva Schmedlap's compelling case? If it doesn't sell in the neighborhoods, it will eventually not sell downtown.

- A Midwestern city stated that the reason for the utility was that the federal government was requiring it. When it was found out, an embarrassing (and entertaining) set of news articles documented the dance to avoid embarrassment and acknowledgement of the error, thus reducing the fee and causing a couple of lost elections.
- A Southern county tried to sell the need for the user fee on the basis of staff-felt needs rather than citizen-felt and -generated needs, causing a very tough technical sell to the public and eventual defeat of the utility resolution in council.
- A Midwestern town tried to explain the fee by saying it was "out of money," causing a backlash among low-income citizens who said they, too, were out of money but had to live within their means.

In every community there are good, even compelling, reasons to change the way things are done. It might be a beloved stream that is becoming increasingly impacted by upstream development, a lack of riparian park space, decaying drainage infrastructure and mounting complaints, unfunded regulatory mandates, local flooding, mounting financial pressures, loss of fish, beach closings, a roadway or bridge collapse, lawsuits, etc. Some are compelling and core in that they draw people, key stakeholders, and leaders to opportunities and to solve visible problems. Some are more tolerated and change comes but more grudgingly.

Assembling a "compelling case" is the first step in bringing about change. People in general are motivated along two complementary sources of argument—people are essentially "left brain" or "right brain." Left-brain people want facts and statistics. Right-brain people are moved to action by horror stories and pictures. So when we begin to quantify and qualify the level of dissatisfaction, and to stir it up, we seek to address both sides of the brain (Table 1).

Building a compelling case and knowing when, how, and to whom to present it is more of a political and technical art form than a learned skill. But taking time to build informed consent that there are sufficient problems to move forward, and building support for change, is vitally necessary.

There is a generic set of drivers we have discovered over the years that can contribute to any city needing to look to a user fee. *Not* on that list are "We are out of money," "The government is making us do this," and "You will get a tax break." *On* that list might be things such as flooding or water quality.

Reason #1: We did it the convenient and inexpensive way, not the right way.

Perhaps the one key to success that flows through all of the Top 10 is something called due diligence, not just legal due diligence but in every aspect of the project. Due diligence is important along the five "tracks" or major areas of concern mentioned above:

1. *Program*: Does the program make sense? Is it compelling? Is it within ability and willingness to pay? Does it meet citizen perceptions? Is it action oriented?
2. *Finance*: Are legal tests satisfied? Is it simple yet fitted to the local situation? Does it have the perception of equity? Are proper steps followed? Does it support the stormwater program?
3. *Governance*: Are the partners to the utility and the stormwater program appropriately involved, supportive, and sensing that the end result will be both equitable and effective?
4. *Public*: Are there appropriate levels of involvement of key stakeholders? Is the general public correctly handled? Is the media appropriately involved? Is customer service accounted for? Are staff and political leadership elements accounted for and appropriately handled?
5. *Database*: Is the database accurate within legal requirements? Is there an appeals process? Is it maintainable within reasonable cost constraints? Are anomalies accounted for? Is customer service appropriate and responsive?

With appropriate due diligence in mind, a process can be developed that accounts for bringing about change and effectively and efficiently implementing a stormwater utility. When you don't:

- A Southern county billed on the basis of zoning classification in a county where zoning and on-the-ground reality had only a passing relationship. Because of the inaccuracy in the bills, the utility eventually failed, resulting in a refund of the money collected.
- A Midwestern town decided to forego investment in a public involvement campaign, only to find strong backlash and editorials opposing the hidden rain tax.
- A Western county decided to avoid stakeholder involvement in the process, only to start over from the beginning after two years of effort as the public caught on to what was happening and council decided to involve them.

Figure 8. Some right-brain convincing

The cost of appropriate due diligence is not insignificant but should be put in perspective. Experience has shown that, should a stormwater utility fail for whatever reason, it normally takes five to seven years for there to be a staff willingness and political forgetfulness to make another attempt. The opportunity cost of failure is then five to seven years' revenue. The cost to do a thorough job in due diligence along the five tracks mentioned is rarely more than one to three months' revenue, at the low end of the range for larger utilities.

For example, for a stormwater utility that raises $2 million per year, the opportunity cost of failure is $10 million to $14 million, while the cost to develop the utility in a comprehensive way is probably less than $450,000.

Additional benefits of appropriate due diligence on the front end include:

- More efficient long-term database maintenance, leading to lower costs and better customer service
- Better initial and long-term public knowledge and cooperation, leading to greater support and participation
- A funding rate structure that matches and meets program needs, both short-term and long-term, leading to stable, adequate funding for program needs
- A stormwater program that can meet both the capital and operations needs of the local community, leading to better services and ability to meet regulatory demands

Those communities that have cut corners in due diligence, even if the stormwater user fee should go forward, normally find themselves hampered in ability to manage the database, meet customer expectations, solve flooding problems, meet regulatory needs, and bend to meet changing program demands.

Summary

By this point in the TV CSI investigation, all the lab tests have taken scant minutes to perform by beautiful and competent people, the staff seems to have an encyclopedic knowledge of a vast range of arcane facts ("Why, yes, the jub-jub tree, which grows only in one Florida county, does excrete a substance that causes natural rubber on the soles of Nike shoes to turn yellow"), the crime has been solved neatly, the bad guys are hauled off to jail, and the music comes up to a shot of the fading south Florida sunset.

It's not always so in the real world. No matter how skilled we are, how experienced we have become, how good the process is, and how much time and money we have to establish a stormwater utility the right way, something unexpected and unknown may happen and kill the whole thing. Its is not rocket science—it is harder. Rockets do not react emotionally, irrationally, and politically. We all have the scars to prove it.

Most places eventually realize and become willing to have a sound, comprehensive surface-water management program. They realize they cannot pay for it using current sources. That is, in fact, the bottom line in any discussion about our ability to improve stormwater management.

It is worth going for it, and doing it right, even if it does not go forward … this time. As stated in Reason #1, the cost of trying and failing may be high. But the cost of doing nothing is higher still. We have one chance to develop things right—to provide for safe and attractive neighborhoods, ecological balance, and clean water. If we mess it up, it will take decades and millions of dollars to fix it later. After 20 years of establishing stormwater utilities, I can now visit a town or county in which I played a small role in founding a utility and see a vibrant program and a proud staff. Flooding is solved, parks are built, water is cleaned, and development is being guided into greener and less impacting approaches. Stable, adequate, and equitable funding is the most effective best management practice ever invented and should be a good candidate for grant funding.

And, of course, our team looks knowingly into the setting Florida sun, walking in slow motion, as the warm breeze blows our hair, the music comes up, and the picture fades to black.

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Topics:

- BMP Post Construction
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SAMPLE TALKING POINTS

In order to make stormwater urgent and relevant—and to inspire action—we need to tell stories about people who have suffered the economic and health costs of stormwater pollution. This message comes best from someone in your community who can speak out at public meetings or provide quote for press releases. It could be talking about your river that you can't swim in or your beach that has been closed because of stormwater pollution. In a nutshell: Know what your audience cares about. Create a message that speaks to their concerns. Tell stories that do the same. And paint a picture of the solution.

Use your responses to the Strategic Development Questions above to customize the talking points below with ***specific examples and testimonials from your community.***

The **core messages** and **talking points** below are a platform or guideposts for communicators talking in their own language, from their own experience. In all cases, the message is strengthened by talking about specific examples and local conditions.

CORE MESSAGES

① We need a stormwater utility because many of our rivers and streams are polluted. The major cause of water pollution is the runoff after a rainstorm that picks up trash, motor oil, lawn fertilizer and other chemicals that accumulate on our roads, parking lots, roofs and driveways and then washes into our streams and rivers. We can no longer swim in or consume the fish from most local waterways because they are so polluted. In short, we have not been good stewards of our environment for decades and we are now paying the price.

② Our lives depend on having clean, healthy water.

③ Our communities depend on safe, efficient ways of protecting our waters by reducing pollution.

④ Innovative, efficient ways to manage our storm water bring additional important economic benefits to our community.

⑤ Stormwater utilities are a fair way to pay for the reduction of polluted storm water that is harming our local rivers, streams and the Bay.

⑥ Ignoring storm water pollution leads to flooding, health problems and property damage. We must address this problem together, in ways that are fair to people in every part of the community.

⑦ Ignoring storm water pollution and our aging, obsolete infrastructure will increase our future costs, and threatens the security of everyone in the community.

⑧ We have a responsibility to help care for creation.

⑨ Our children, grandchildren and wildlife deserve clean water.

continues >

TALKING POINTS

Benefits of stormwater management to [your community]

Ⓐ Investing to reduce polluted run-off will improve our community, reduce flooding and clean-up our local rivers, streams and the Bay.

Ⓑ Projects funded through a stormwater utility will create valuable, local jobs.

Ⓒ We needed a stormwater utility so that committed funds can be used to overcome the polluted runoff from our paved surfaces including parking lots, driveways and roads.

Ⓓ Smart stormwater projects will allow more water to soak into the ground and, at the same time, beautify our community.

Ⓔ Dirty water causes harm to human health and the local economy.

Ⓕ Stormwater management is more than diverting rain water into pipes and channels to keep it from flooding streets and properties, but includes conservation practices to remove or keep pollutants out of our rivers, streams and the Bay. These practices will also enhance and beautify our communities.

The low cost of the utility

Ⓐ The average homeowner will pay $XX/month, much less than they pay for cable television.

Ⓑ A dedicated funding source will ensure that our money stays in our community to fix our stormwater problem.

It's the right and the fair thing to do

Ⓐ As towns and cities grow, we add parking lots, roads, roofs and other surfaces where rain cannot soak into the land. If we don't address the problem, we will leave our rivers and streams too polluted for our children to swim or fish in.

Ⓑ We all cause pollution, we all need to work and pay to clean it up.

Ⓒ All community residents have a right to have clean drinking water, a reduced risk of flooding and healthy rivers and streams.

SAMPLE SPEECH BASED ON THIS OUTLINE

Audience: Members of a civic organization, monthly meeting
Speaker: Homeowner, member of association

Good evening. My name is John Thomas and I am a longtime resident of this community. I asked to be on tonight's agenda because I am concerned about the amount of trash that has accumulated in our local neighborhoods and waterways. The growing pollution problem has contributed to the degradation of this prized part of the community and puts our local creeks and the ocean at risk.

It is imperative to clean up our neighborhoods, so we can continue to enjoy our beautiful community. We should all be concerned with keeping our parks healthy and safe place for our children to play. And because we live nearby (insert name) creek, what we do locally has a direct impact on the area's water quality.

At one time or another, we have all contributed to our storm water runoff – the accumulation of motor oil, animal waste, yard waste and trash pose the greatest harm to our waterways, wildlife, public health and the surrounding environment – though probably without full understanding of the impact. Storm water pollution is created when trash, including recyclables, end up on the ground and are washed into local waterways. These contaminants pollute our local creeks and rivers and threaten the health of wildlife and the environment. At last count, more than 680 water bodies in California were contaminated with a variety of pollutants. And that is just what we know about, as state scientists continue to collect more data on the thousands of waterways that bisect the state. The number of identified polluted waterways is likely to increase.

We need to do what we can to protect (name of local waterway). Our families deserve clean and safe lakes, rivers and beaches where they can enjoy recreational activities.

I believe this is a serious problem. But one that we can help solve. Together we can take steps to reduce pollution at the community level and reduce the amount of litter and debris finding its way into the storm drain system and our waterways.

I would like to propose that we organize a (neighborhood or waterway) clean up event on Sunday, May 8. If everyone would commit one hour, we would make a significant contribution in keeping this waste off our streets and out of our (specify waterway).

Who will volunteer to help? [Pass around a signup sheet]

Who can bring litter bags? Gloves?

Who will volunteer to dispose of the trash? And the recyclables?

Can everyone meet at 10 o'clock Saturday morning? I'm certain we can be done by noon. If enough people are interested, maybe we could conclude the morning with a picnic lunch.

This is a great response. Thank you. I will call everyone on the list the Wednesday before the 8th and touch base with you. See you on Sunday the 8th.

SAMPLE MEDIA ADVISORY

*** MEDIA ALERT * MEDIA ALERT * MEDIA ALERT ***

[NAME OF AREA] CLEAN UP DAY LETS RESIDENTS
BE PART OF THE POLLUTION SOLUTION

Volunteers pitch in to reap big rewards for local water quality

WHAT: To help keep our community and environment clean, the [NAME OF ORGANIZATION] is hosting a community (or streamside) clean up day in [NAME OF CITY] as part of California's Erase the Waste campaign (www.erasethewaste.com). Volunteers will work to remove litter, discarded cigarette butts and other trash and plant trees throughout the local neighborhood. These activities will beautify the community and help prevent this debris from ending up in our local waterways (or ocean) and contributing to storm water pollution. Participants will also learn about opportunities to get involved in [NAME OF ORGANIZATION]'s ongoing clean up activities.

WHY: Due to the polluting behaviors of many residents, the local community has become littered with trash and debris. These pollutants create a local health and safety risk for families and contribute to widespread water pollution throughout the region. These clean up efforts will help refurbish the local community and take a proactive step towards stopping harmful contaminants from entering our nearby waterways.

WHERE: [NAME OF PARK]
[Intersection or Address]

WHEN: [DATE] [TIME]

WHO: [NAME OF COMMUNITY GROUP OR ORGANIZATION]
[LIST STAFF NAMES, TITLES], Mayor Mary Doe, concerned residents

VISUALS: Piles of trash collected, newly planted trees, kids and adults removing trash from the river

CONTACT: [NAME]
[NAME OF ORGANIZATION]
(XXX) XXX-XXXX

# # #

What is stormwater?

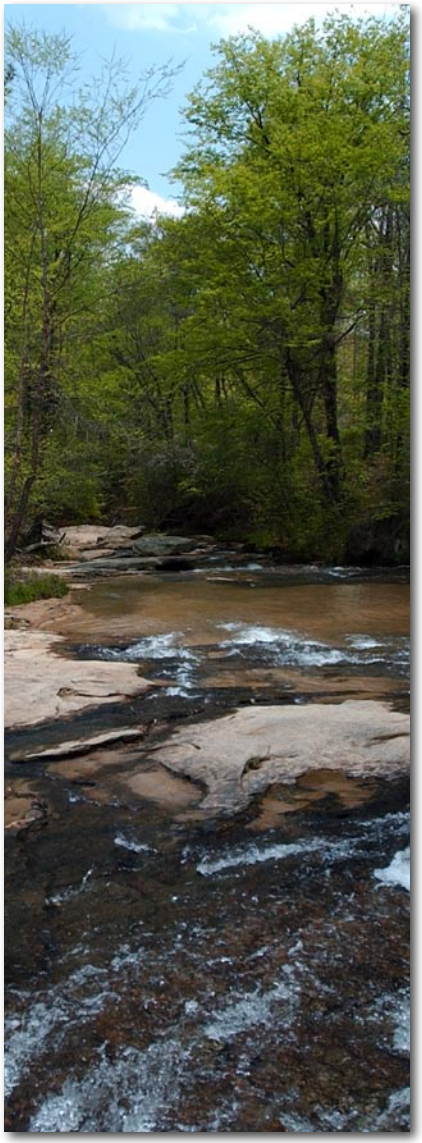
Stormwater is water from the rain. As rain falls to earth in agricultural and undeveloped areas, it is either absorbed or it slowly runs off and dissipates. Impervious surfaces such as rooftops and paved areas not only prevent water from being absorbed but cause it to run off at a much faster rate. As a result, unmanaged stormwater runoff can cause nuisance flooding and possible threats to public health and safety. Gwinnett County has infrastructure in place to manage this stormwater runoff, but the system must be maintained to keep the system clean and functioning. Additionally, pipes and structures are aging and need repair or replacement.

Example of stormwater pollution

gwinnettcounty
department of public utilities
stormwater management division
684 winder highway
lawrenceville, GA 30045

gwinnettcounty
public utilities

stormwater utility



Storm drains lead to streams

Water quality and stormwater runoff have become expensive issues affecting public service, public health, and the environment. Federal and state regulations on stormwater are becoming increasingly restrictive. To meet these challenges, the stormwater program must be upgraded to become a full-fledged partner within the Public Utilities Department and increase the service level for the public. In an effort to find a fair, equitable way to fund stormwater activities, Gwinnett County is implementing a new utility in 2006. The stormwater utility will provide a funding source for addressing customer needs like replacing stormwater pipes, reducing flooding and stream bank erosion, fulfilling regulatory requirements, helping citizens with expensive problems associated with older detention ponds, and reducing pollution carried by stormwater to waterways.

- Stormwater service fees will be based on the square footage of impervious surface (rooftop, driveway, etc.) on each parcel of property
- The fee will be billed in the summer of 2006, along with streetlights and other charges listed on the property tax bill
- Each parcel with more than 100 square feet of impervious area will receive a bill in 2006

Why am I being charged a stormwater service fee?

The County operates and maintains a system of pipes and channels that drain stormwater and protect our homes and businesses from flooding. This system is costly to operate and maintain, and is facing increasing regulatory requirements from the Environmental Protection Agency. The stormwater system has a backlog of needed repairs due to the deterioration and failure of hundreds of miles of pipe. Additionally, the state requires watershed protection for both newer and older developments, enforced through expensive conditions on discharge permits for reclaimed water. The new utility could generate up to $34 million annually to fix these problems.

Drainage system repairs

How much is the stormwater service fee?

The stormwater service fee will be based on the amount of impervious surface area.

Impervious surfaces area is the most equitable way of determining services fees. Studies show that impervious surface and area are the best measures to determine the amount of runoff.

A home with 3,517 square feet of impervious surface would pay:

Year	Amount*
2006	$27.08
2007	$49.59
2008	$70.69
2009 – 2011	$86.52

**Two-thirds of the homes in Gwinnett County have less than 3,517 square feet.*

Is there anything I can do to reduce my stormwater service fee?

The Department of Public Utilities has organized a work group representing citizens, businesses, developers, cities, and environmental groups to develop a credits manual. Credits would partially offset the service fee for parcels that contain eligible best management practices (BMP). A BMP measurably reduces the burden on the public stormwater drainage system. The plan would implement a retroactive credits program in 2007.

For more information:
visit www.gwinnettstormwater.com
Contact us:
e-mail: swservice@gwinnettcounty.com
phone: 678.376.7193

STORMWATER COMMUNICATIONS TOOLKIT
SAMPLE FACT SHEET/FAQs

WHAT HAPPENS BELOW MATTERS ABOVE
<Or>
Clean it Up!
Support (YOUR COMMUNITY)'s Stormwater Pollution Plan

Underneath the streets of [OUR COMMUNITY], our infrastructure is in disrepair. The XX-year-old clay and metal pipes [CONFIRM COMMUNITY BY COMMUNITY] that we rely on to transport our sewage and stormwater runoff are disintegrating, leading to pollution issues that affect our community's health and safety.

Across COMMUNITY and throughout the country, stormwater pollution runoff is a serious issue that the federal government is requiring communities to address.

While we can't see the drainage pipes that support the most basic functioning of our city, we all rely on them. And we all need to pitch in to make sure they're maintained, or face consequences such as SEWAGE WASTE FLOODING INTO OUR RIVERS, CREEKS, AND OUR HOMES.

Stormwater runoff pollution is a straightforward issue with an equally straightforward solution:
1. Support homeowners and businesses in upgrading their properties to reduce pollution by ensuring stormwater is absorbed or captured– and reduce their stormwater bills.
2. Repair and replace outdated pipes and drainage systems.

What is Stormwater pollution? Why is it important now?
When it rains, the water falls on rooftops, streets, sidewalks and parking lots and then flows through our community's stormwater drainage system. Along the way, it picks up all kinds of pollutants like pet waste, fertilizers and pesticides, oil and automotive fluids. Much of the ground in cities and towns is covered in surfaces that do not allow this water to absorb – surfaces like asphalt, cement, and roofing material (also called impervious surfaces) – it then flows into our rivers, streams and lakes. Twenty percent of the pollution affecting critical places like the Chesapeake Bay come from this stormwater runoff.

Cities and towns developed systems to convey all of this water – but in many cases, those systems were designed and built more than one hundred years ago.

They're not able to handle our current stormwater runoff, and they're breaking down.

Most of us don't think about the pipes that carry water to and from our houses and businesses, until they break, and then, with a backed-up toilet or no water coming out of our faucets, we have an emergency on our hands.

While stormwater pollution might not feel like an emergency now, there's probably someone in your community who's experienced flooding and associated health hazards associated, someone who knows first-hand what kind of problems we face if we don't update and repair our stormwater systems.

States and local communities have come together to come up with plans to fix our stormwater systems. They're doing it for many reasons:

1) because it's the responsibility of local and state government to look out for our health and safety,
2) because many municipalities face hefty federal fines if the problem is not addressed
3) because it's not fair to put undue burdens on some members of our communities who pay the price of our outdated stormwater pollution systems,
4) because we need a healthy environment in order to thrive, and stormwater pollution threatens that.

How does the solution get funded?

The fairest way to distribute the cost of these improvements is through a stormwater utility. A utility is a fee that's paid by all home owners and business owners. The fee shows up on the XXX bill. For the average homeowner, the cost will be between $XX-$XX/year – less than the amount most of us spend on milk every month.

Nobody likes new fees, but the cost of ignoring stormwater pollution will be much higher for our community — and far less equitable or predictable. Stormwater flooding in basements is a costly health hazard, and streets flooded with untreated water put all of us at risk.

How is this fee different from a tax?

Unlike a tax, a utility is a fee for service. In the same way that we pay water bills for the amount of water we use, or electricity fees for the amount of electricity we use, the stormwater utility fee is based on a property's impact on the community's stormwater system.

What will we get for our money?

Right now, our COMMUNITY's DECISIONMAKING BODY is looking at not only how to repair our stormwater drainage system, but also how to make the behind-the-scenes infrastructure of COMMUNITY be as world-class as the coffee shops, restaurants, and stores that line our streets. (INSERT EXAMPLE OF A SPECIFIC PROJECT THAT YOUR COMMUNITY WILL BE WORKING ON.)

Why now?

If we don't want to face increased flooding in our homes, businesses, and streets; increased pollution in our rivers and streams, and increased fines for inaction, we need to act. The outdated and decaying pipes beneath our feet that we rely on to carry our stormwater are disintegrating and must be replaced. [IF YOUR COMMUNITY COULD BE FINED: And if we don't act, our community could be fined for the pollution we are creating, funneling away local funds we could be using to improve our infrastructure and our community.

What about community members who cannot pay the utility fee?
Insert specifics if there is a hardship program.

Is there any way to reduce the utility fee I'm charged?
Insert any info about credit or incentive programs.

What can you do?
HERE IS WHERE YOU EXPLAIN WHAT YOU'RE ASKING PEOPLE TO DO.
DO YOU WANT THEM TO COME TO AN EVENT IN SUPPORT, SIGN A PETITION, CALL THEIR COUNCIL PERSON?

POSSIBLE SIDE BAR: [insert specific #s from your community]
XXX million gallons:
The amount of polluted stormwater the community produces each year.

$XX fine:
The amount (COMMUNITY) could be fined each day if progress is not made towards cleaning up this pollution

$XX
The amount an average homeowner will pay per month to address the issue

STORMWATER COMMUNICATIONS TOOLKIT
SAMPLE LETTER TO LAWMAKER/COUNCIL MEMBER

Note: It is important that you customize these letters with specifics that will appeal to the recipient. Pull information culled from your responses to the strategic development questionnaire.. It is also important to be concise in your communications- keep your letter one page long.

Date
[Names and titles of signatories: try to include a diverse group of local leaders]

Dear [Lawmaker name],

As you approach a decision on the measure of establishing a stormwater utility for *[your community]* we would like to express our strong support for the proposal. From faith-based leaders to environmental advocates to local business owners and engineers, there is an urgent call to address our *[community]*'s decaying and outdated stormwater system and the threat it poses to our community's health and well-being.

A stormwater utility creates an equitable solution to the problem posed by the current state of our stormwater system. If ignored, our decaying stormwater system places an undue burden on the unfortunate citizens and small business owners who suffer the random and unexpected flooding and ensuing health and environmental concerns.

The current proposals that you are considering *[insert language here about the specific benefits of the proposal in your community].* The reasonable fees proposed, (less for an average family than what they spend every year on milk) *[Confirm on a community-by-community basis. Select a comparison relevant to your locality]* do a fair job of distributing the costs across our community in an equitable and low-cost manner. Additionally, because the proposed utility offers incentives to reduce impervious surfaces, our community will benefit.

We rely on you, [Insert decision makers's title, (or our civic leaders)], to proactively manage our [community]'s needs so as to ensure a vibrant, healthy, thriving community, and we appreciate your efforts to do so.

Sincerely,
[Signatures]

THINK PICKING UP SPIKE'S POOP IS GROSS?

TRY SWIMMING IN IT.

THINK AGAIN.
THINK BLUE.

When you leave dog poop on the ground – or throw it down a storm drain – the rain carries Spike's mess into storm drains and straight to our rivers, lakes, and ponds making them unsafe for swimming.

Help keep our waters blue...pick up afteryour dog and throw the waste in the trash.

www.ThinkBlueMA.org

THINK MORE IS BETTER?

TELL THAT TO THE FISH.

When you fertilize too much, right before heavy rains, or onto pavement, it can flow into rivers, lakes and ponds, harming plants and animals.

Help keep our waters blue...use less fertilizer, use it at the right time, and keep it on your lawn.

THINK AGAIN.
THINK BLUE.

www.ThinkBlueMA.org

MAPC 50 YEARS
METROPOLITAN AREA PLANNING COUNCIL
SMART GROWTH AND REGIONAL COLLABORATION

The purpose of this workbook is to help municpalities analyze preliminary budgets and study different fee structures in preparation of a long-term stormwater financing mechanism. The worksheets included provide primary variables that municipalities will need to consider in order to adequately assess their current needs, and to illustrate the fundimental and operative principles of a drainage fee/utility under their own unique circumstances.

It is strongly recommended that users read through the spreadhseet thoroughly, paying attendtion to cell notes (designated by red triangles in the corner of certain cells) before modifying or appending any part of the worksheet.

Please be advised that this workbook is not intended to be, nor does it claim to be, a comprehensive budgetary or accounting tool. MAPC does not guarentee the acuracy of its output. The user has the right to employ the tool as needed and is encouraged to change or add parameters as they see fit. The user assumes responsibility for the accuracy of calculations. Use of this tool includes an acceptance of thesre teerms and conditions.

Please help MAPC improve this tool by providing any feedback or suggestions about the tool's design and functionality.

Questions/Feedback; Contact Julie Conroy, AICP, MAPC Senior Environmental Planner, jconroy@mapc.org, 617-933-0749.

Stormwater Financing Workbook

Initial Inputs/Contacts

City / Town Name:

Contact Information:	Name	Phone	Email
Town Administrator / Mayor			
Planning Director			
Department of Public Works Director			
Conservation Agent			
Health Agent			

Town Stats:

Total Residential Population
Total Commercial Population
Gross Municipal Taxation Revenue (FY__)
Municipal Net Operating Income (FY__)

Reason For Implementing Drainage Fee:

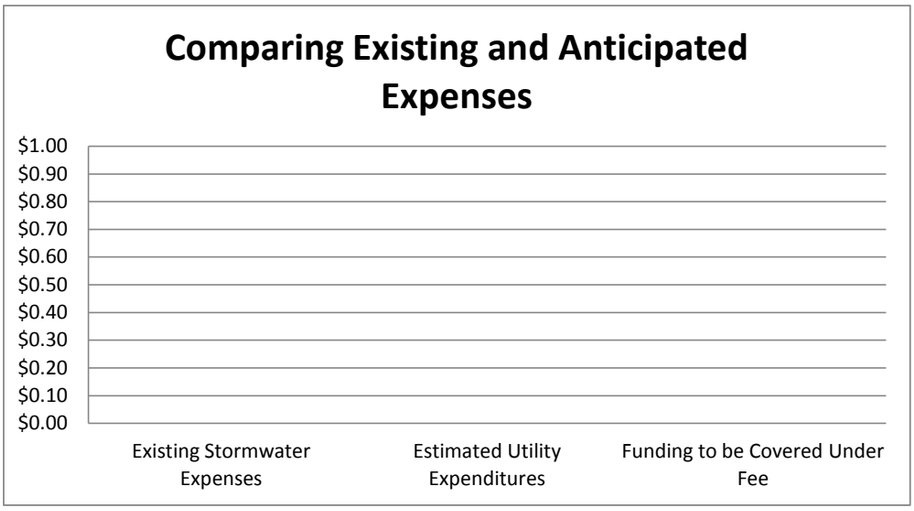
Description of Past or Current Efforts at Funding Stormwater Management:

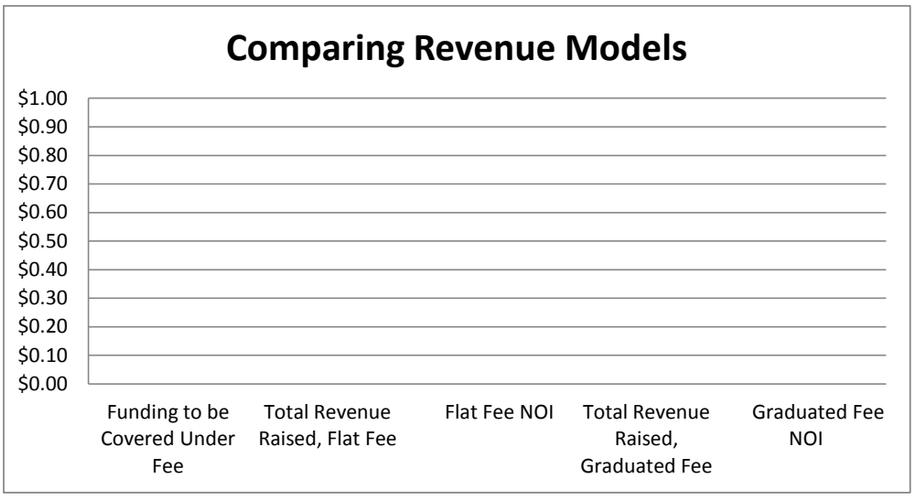
Stormwater Financing Workbook

Workbook Summary

This page presents users with a concise summary of each of the main budgetary items under analysis. The page is for verification only, no data will be input on this page.

Existing Stormwater Expenses	$0.00
Estimated Utility Expenditures	$0.00
Funding to be Covered Under Fee	$0.00
Total Revenue Raised, Flat Fee	#DIV/0!
Flat Fee NOI	#DIV/0!
Total Revenue Raised, Graduated Fee	#DIV/0!
Graduated Fee NOI	#DIV/0!
Total Estimated Utility Credits	$0.00





Stormwater Financing Workbook

Expenditure Plan

Stormwater Expenditures	Description	Estimated Costs ($)
General Maintentance & Operations, (DPW)	Routine cleaning, general maintenance and day to day service operations	$0.00
Stormwater Cleaning & Treatment, (Contractual)	Costs of privately contracted facility to treat stormwater runoff.	$0.00
NPDES Compliance	Includes annual reporting and private consulting services.	$0.00
Service Requests	Reporting and Responding to notices, complaints and reported damage	$0.00
Master Planning for Stormwater	Develop a CIP based on Phosphorous Control Plan and Infrastructure Needs.	$0.00
MS4 Stormwater Permit Administration	Review of permits annually by consultants paid for by the developer(s)	$0.00
Illicit Discharge Detection and Elimination	Assume 10% of outfalls have illicit discharge. Estimate cost to identify source at appx. $1200 per hit. Removal costs should be the owner's responsibility.	$0.00
Erosion/Sediment Control Inspections	Estimate a 50% increase in workload due to additional maintenance and construction	$0.00
Catchbasin Inventory Plan	Field crews to inspect, record and clean catchbasins on a regular schedule. Two to Four times per year is recommended.	$0.00
Septic, Inflow and Infilitration Program	Cost of coordination between board of health and stormwater program.	$0.00
Pesticide, Herbicide and Fertilizer Program	Implement fertilizer optimization program. Assume coordination with multiple depts.	$0.00
Spill Cleanup Program	Develop a priority response program based on high accident areas, significant pollutant potential and proximity to receiving waters.	$0.00
Groundwater and Drinking Water Program	Technical review memo of drinking water quantity and quality in priority areas. Conculsions of reports to be considered in the improvement of the system.	$0.00
Drainage Monitoring	Schematic mapping of water drainage system with field verification of performance	$0.00
Sewer Monitoring	Sewer Infrastructure mapping. Assume coordination with mulitple departments.	$0.00
Code Development and Zoning Support Services	Review and update ESC, SW, IDDE as needed, report on local regulations affecting impervious areas and report on feasibility of green practices and other green techniques	$0.00
Hazard Mitigation and Flood Insurance Updates	Allowance for high hazard analysis by private consultant for specific areas of concern identified during the permitting process.	$0.00
Waterfowl & Pet Waste Management Programs	Install waterfowl education signs at congregation areas and implement waterfowl deterrants. Install pet waste stations in strategic locations.	$0.00
Street Cleaning	Increase effort, fuel, supplies,& disposal to Sweep streets.	$0.00
Stream Restoration/Stabilization	Complete at least one stream restoration project every set number of years.	$0.00

Ditch and Channel Maintenance	Assume cost of removal is borne by owner or sewer dept.,cost of illicit discharge removal infrastructure improvements.	$0.00
Stormwater Total		**$0.00**

Administrative Expenses		
Utility Fee Implementation Costs	Capital expenses associated with establishing HR to manage the new program.	$0
Billing Costs	Costs associated with preparing and distributing invoices.	$0
Administrative Fees	General office operations and overhead.	$0
Utility Fee Credits	Costs for adminstering and deducting expenses for properties that meet set compliance standards to reduce runoff.	$0
Collection Fees, Delinquencies	Costs for processing receivables with contingencies for late or non-payments.	$0
Legal Support Services	Legal Review of Regulatory changes every set number of years	$0
Inter-Municipal Coordination	Adjacent municipalities to meet every set number of years to review and coordinate programs	$0
Emergency Coordination	Meet twice a year to review and coordinate programs.	$0
NPDES Public Education Programs	Distribute at least two messages to residents, commercial, industrial, and construction constituencies and measure and report message effectiveness.	$0
NPDES Public Engagement Programs	Host public forums, regularly update websites and host regular workshops	$0
Certified Phosphorous Program	Recordkeeping, data tracking and correspondence with regulated entities for updating program progress under "Water Quality."	$0
Grants Prgram	Staff efforts to apply for and administer grants received for stormwater programs; assume one permit every two years.	$0
Administrative Total		**$0**

Subtotal	**$0**

Existing Expenditure	**$0**

Funding to be Covered Under Fee	**$0**

NOTE: Currently most of the Stormwater Expenditures listed above are funded by sales and property taxes in most towns. If these activities are funded in the future by a stormwater utility fee, then sales and property taxes currently funding these activities would be available to fund other needs. This difference is indexed above.

Stormwater Financing Workbook

Revenue Plan Analysis

Funding to be Covered Under Fee	$0.00

Flat Fee Structure

Property Classification	**Number of Parcels in Town**	**Annual Total p/Property**	**Monthly Fee p/Property**
Residential	0.00	#DIV/0!	#DIV/0!
Non-Residential	0	#DIV/0!	#DIV/0!

Total Billable Properties	0.00
Equal Allocation Across Property Types, p/yr.	#DIV/0!
Equal Allocation Across Property Types, p/Mo.	#DIV/0!

Total Revenue Raised	**#DIV/0!**

Net Operating Income under Flat Fee Structure ($)	**#DIV/0!**

Δ Raised Revenue and Funding Gap	#DIV/0!

Δ Raised Revenue and NOI	#DIV/0!

Graduated Fee Structure

Property Classification	**Number of Parcels in Town**	**ERU Equivalent**	**Annual Drainage Fee p/parcel**	**Annual Total**
Residential				
Detached Single Family	0	1.00	#DIV/0!	#DIV/0!
Detached Multi-Family, (e.g. Duplex, Triplex etc.)	0	#DIV/0!	#DIV/0!	#DIV/0!
Multi-Family	0	#DIV/0!	#DIV/0!	#DIV/0!
Non-Residential				
Commercial	0	#DIV/0!	#DIV/0!	#DIV/0!
Industrial	0	#DIV/0!	#DIV/0!	#DIV/0!
Total Revenue Raised				**#DIV/0!**

Net Operating Income under a Graduated Fee Structure ($)	**#DIV/0!**

Δ Raised Revenue and NOI	#DIV/0!

Δ Raised Revenue and Funding Gap	#DIV/0!

Δ NOI Between Fee Structures	#DIV/0!

Stormwater Financing Workbook

Existing Stormwater Expenses

Service	Description	Existing Budget ($)
Debt Servicing	This is the annual amount paid on any bonds that were sold to finance stormwater improvement projects.	$0.00
Capital Improvements	This is the amount of money required to initiate any new physical improvements to town sewer systems for either improvement or expansion.	$0.00
Maintenance & Operations	This cost includes the cost of labor, material and equipment for City crews to perform OM&R for the storm sewer system. Storm sewer related tasks completed by City crews generally include cleaning inlets, responding to street and viaduct flooding, and repairing storm sewer inlets and manhole frames.	$0.00
Storm Sewer Cleaning	This work is competitively bid each year and is completed by privately contracted firms. Typically these services include cleaning and televising the pipes in the City's Storm Sewer system.	$0.00
Erosion Control, Grading & Permitting	This is a self-supporting activity where the fees charged for the permits equal the City's cost to review and issue the permits. Erosion control, grading, and drainage permits are issued whenever new construction exceeds municipal standards for surface disruption by construction.	$0.00
NPDES Compliance	Cities are required to have a NPDES permit for there storm sewer system. To obtain the 5-year NPDES permit, the City has to list activities it planned to complete each year in the six main areas that are referred to by IEPA as minimum control measures.	$0.00
Service Requests	This stormwater expenditure funds City staff time to help property owners find solutions to drainage problems on their property.	$0.00
Hazardous Treatment	The goal of this program is to connect overflow sump pump discharge to the City's storm sewer system. The City typically pays for all right-of-way costs associated with this connection while the property owner pays for all costs on their property. This cost allocation should only reflect the City's expenses for the connection.	$0.00
Sustainability Provisions	These costs should include any moneies raised or put aside for improvements in sewer systems that increase efficicency or that reduce runoff from properties. Additionally any incentives in the forms of credits or deductions for property owners who actively work to reduce runoff should be factored into this figure.	$0.00
Total		**$0.00**

Stormwater Financing Workbook

ERU Calculations

Funding to be Covered Under Fee	$0.00

Table 1: Determing the Residential Metric

Land Use Classification	Number of Parcels	Total Impervious Surface (sf)	Average Impervious Surface Area (sf)	ERU Equivalent
Residential				
Detached Single Family	0	0.00	#DIV/0!	**1**

Table 2: Determining Non-Single Family Property Metrics

Land Use Classification	Number of Parcels	Impervious Surface Area (sf)	Average Impervious Surface Area per/Parcel	ERU Equivalent	Total ERUs Equivalents
Residential					
Detached Multi-Family, (e.g. Duplex, Triplex etc.)	0	0.00	#DIV/0!	#DIV/0!	#DIV/0!
Multi-Family	0	0.00	#DIV/0!	#DIV/0!	#DIV/0!
Non-Residential					
Commercial	0	0.00	#DIV/0!	#DIV/0!	#DIV/0!
Industrial	0	0.00	#DIV/0!	#DIV/0!	#DIV/0!
			Grand Total ERU Equivalents		*#DIV/0!*

Subtotals	
Total Impervious Area	0.00
Total Stormwater Units	#DIV/0!

ERU Value p/parcel/p/yr
#DIV/0!

Stormwater Financing Workbook

Credit and Incentive Plan

1.0 Credit Item Tabulation

Credit/Incentive Item	Examples	Total Residential Quantiy	Total Non-Residential Quantity
Rain Barrel		0	0
Rain Garden		0	0
Rate Reduction	Detention Basins	0	0
Volume Reduction	Green Roofs, Cisterns, Permeable Materials	0	0
Water Quality	Bioswales, Rain Gardens etc.	0	0
NPDES		0	0
Private Detention Maintenance		0	0
Direct Discharge		-	0
Education		-	0

2.0 Credit and Incentive Plan

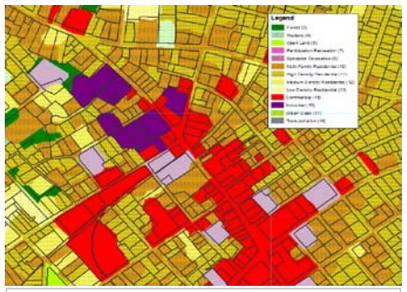
Credit/Incentive Item	Residential Properties	Quantity	Total Reimbursable Expenses	Total	Non-Residential Properties	Quantity	Total Reimbursable Expenses	Total
Rain Barrel	$0.00	0	-	$0.00	$0.00	0	-	$0.00
Rain Garden	$0.00	0	-	$0.00	$0.00	0	-	$0.00
Rate Reduction	$0.00	0	-	$0.00	0.00%	0	$0.00	$0.00
Volume Reduction	$0.00	0	-	$0.00	0.00%	0	$0.00	$0.00
Water Quality	$0.00	0	-	$0.00	$0.00	0	-	$0.00
NPDES	-		-		0.00%	0	$0.00	$0.00
Private Detention Maintenance	0%	0	$0.00	$0.00	0.00%	0	$0.00	$0.00
Direct Discharge	-	-	-	-	0.00%	0	$0.00	$0.00
Education	-	-	-	-	$0.00	0	-	$0.00
Total Residential Credit/Incentive Expenses ($)	$0.00							
Total Non-Residential Credit/Incentive Expenses ($)	$0.00							
Total Credit/Incentive Liability ($)	$0.00							

NOTE: The goals for this plan are primarliy two-fold. Any Additional Credit or Incentive Programs or items should be appended to this list and indexed accordingly.
- To encourage property owners to incorporate sustainable stormwater management practices into their properties' landscape and building construction.
- To make it easy for property owners of all types to understand stormwater utilites and participate in efforts to curb runoff.

Stormwater Financing Workbook

Impervious Surface Areas

Example of parcel data that does not



Land Use Map based on 2005 MA DEP GIS data

Orthophoto (aerial photo) of a neighborhood

MassGIS impervious surface cover for the same neighborhood.

This analysis is likely to involve two processes, each with a set of associated actions, and is best accomplished using GIS. The analysis is described using a detached single family residential property in a municipality to determine the ERU. However, the single family home could be replaced by another predominant residential land use type in a municipality (e.g., two- or three-family housing units).

The first of the two processes assumes that parcel data does not include public rights of way (e.g., roadways – Figure X) so that parcels only include structures and private improvements to the land. With this assumption in mind, the first process is aimed at linking the parcels with other necessary pieces of data detailed below.

Associate parcel data with property classifications that will be for the fee categories (e.g., single family, multi-family parcel, industrial parcel)

Associate parcel data with assessor's data (e.g., ownership, land area, address, etc.)

Link contiguous parcels that have the same property classification, share a structure or structures and have joint ownership (e.g., shopping center that is under common ownership but that is comprised of multiple contiguous parcels).

By linking this information, the parcels contain the data that will be needed to determine impervious surface based on property classifications, property ownership and the fee categories.

The second process is aimed at analyzing the parcels for impervious cover and then extrapolating that information in order to develop the ERU. This includes:

Performing a Zonal Analysis in which the percent of impervious coverage (e.g., land covered by buildings, parking, and driveways) is calculated for each parcel in the municipality.

Use the resulting percent impervious for each parcel to calculate the land area (e.g., square footage, acreage, etc.) that is impervious.

After calculating the area of impervious coverage for each parcel, develop a subset of parcels that includes the single family residential parcels based on the land use classifications.

Determine the average impervious surface area for the subset of single family residential parcels. The result is the impervious coverage for the ERU.