MEASURABLE GOALS GUIDANCE FOR PHASE II SMALL MS4s

According to the Storm Water Phase II Rule, small MS4 owners/operators must reduce pollutants in storm water to the maximum extent practicable (MEP) to protect water quality. The regulations specify that compliance with the MEP requirement can be attained by developing a storm water management plan that addresses the six minimum control measures described in the storm water regulations. These six minimum measures are described in detail in a series of fact sheets developed by EPA. One component of the storm water management program is to select measurable goals to evaluate the effectiveness of individual control measures and the storm water management program as a whole.

This guidance[1] is designed to assist small municipal separate storm sewer system (MS4) operators to comply with the measurable goals storm water permitting requirements. The guidance presents an approach for MS4 operators to develop measurable goals as part of their storm water management plan.

Measurable goals allow permitting authorities to assess the effectiveness of storm water controls (know as best management practices or BMPs). These BMPs and measurable goals should be key components of a MS4's storm water management program.

WHAT CAN I FIND UNDER THIS TOPIC?

This guidance is divided into five main parts:

Part 1 - Background and Regulatory Context
Part 2 - Process for Developing Measurable Goals
Part 3 - Examples of BMPs and Associated Measurable Goals
Part 4 - Process for Developing a Storm Water Management Program
Part 5 - Environmental Indicators

Part 1 provides background on the storm water regulations and describes the regulatory context for developing measurable goals.

Part 2 outlines a process for MS4 operators to develop measurable goals to evaluate the removal of pollutants to the MEP and describes the relationship to other EPA requirements. This part includes a step-by-step guidance on how to design and select measurable goals.

Part 3 presents a number of examples of BMPs for each of the minimum control measures with corresponding measurable goals that will assure reduction of pollutants to the MEP.

Part 4 describes guidance on how to develop a storm water management program that includes appropriate BMPs and measurable goals. This part also includes suggestions on how to conduct a

self-audit and develop an action plan for implementation of the requirements set forth in the Phase II Storm Water Rule.

Finally, **Part 5** describes environmental indicators that can be used to document the effectiveness of both individual control measures and the storm water program as a whole.
Additional information on the requirements of the Storm Water Phase II Rule can be found in a series of fact sheets and a compliance assistance guide developed by EPA.

[1]The discussion in this document is intended solely as guidance. The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does not it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA, States, or the regulated community. This guidance does not confer legal rights or impose legal obligations upon any member of the public. While EPA has made every effort to ensure the accuracy of the discussion in this guidance, the obligations of the regulated community are determined by statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling. The general description provided here may not apply to a particular situation based upon the circumstances. Interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation. EPA and other decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this guidance where appropriate. This is a living document and may be revised periodically without public notice. EPA welcomes public input on this document at any time.

PART 1. BACKGROUND AND REGULATORY CONTEXT

REGULATORY REQUIREMENTS AND APPLICABLE STANDARDS

The Storm Water Phase II Final Rule requires you, the operator of a regulated small municipal separate storm sewer system (MS4), to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage because your storm water discharges are considered "point sources" of pollution. MS4s are considered point sources because they discharge storm water into discrete conveyances, including roads with drainage systems and municipal streets. MS4s are publicly owned or operated and are designed or used for collecting or conveying storm water.

According to 40 CFR 122.26(b)(8), "municipal separate storm sewer means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- Designed or used for collecting or conveying storm water;
- Which is not a combined sewer; and
- Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

MS4 Definitions

EPA categorizes MS4s as either "small," "medium," or "large." The Phase I Storm Water Rule covers medium and large MS4s. A medium MS4 is an MS4 located in an incorporated place or county with a population of 100,000–249,999 (according to the 1990 Census). A large MS4 is an MS4 located in an incorporated place or county with a population of at least 250,000.
A small MS4 is one that is not already defined as medium or large. The Phase II Storm Water Rule covers a subset of small MS4s that are called "regulated small MS4s." Regulated small MS4s are automatically designated if they are located in "urbanized areas" (as defined by the Bureau of the Census). Other small MS4s located outside urbanized areas may be designated on a case-by-case basis by the NPDES permitting authority. EPA has published two fact sheets that provide more information about designation of regulated small MS4s and the definition of urbanized areas.

NPDES Permits

NPDES storm water permits are issued by an NPDES permitting authority, which may be a NPDES-authorized State or EPA in non-authorized States. A list of EPA and State storm water contacts is provided on EPA's web site. Once you submit a permit application and permit coverage is obtained, you must satisfy the conditions of the permit and submit periodic reports on the status and effectiveness of the program at reducing pollutants to the MEP.

Requirements for Regulated Small MS4s

As a Phase II regulated small MS4, you are required to submit a permit application and obtain coverage under an NPDES storm water permit. Under the permit, you will be required to develop and implement a storm water management program that includes the 6 minimum control measures, evaluation/assessment and reporting efforts, and recordkeeping, as described below.

You must design a storm water management program that:

- Reduces the discharge of pollutants to the "maximum extent practicable" (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

MEP is a standard that establishes the level of pollutant reductions that MS4 operators must achieve through implementation of a storm water management program. The strategies used to reduce pollutants to the MEP may be different for each small MS4 because of unique local hydrologic, geologic, and water quality concerns in different areas. EPA envisions that permittees will determine what the MEP is on a location-by-location basis and consider such factors as conditions of receiving waters, specific local concerns, and other aspects of a comprehensive watershed plan.

Because so many diverse factors can dictate the specifics of a storm water management program, you should determine appropriate BMPs to satisfy each of the minimum control measures through an evaluative process. The definition of "MEP" should adapt continually to both current conditions and BMP effectiveness, but ultimately, successive iterations of the mix of BMPs and measurable goals should be made to achieve the objective of meeting water quality standards. If, after implementing the minimum control measures, there is still water quality impairment associated with discharges from the MS4, you will need to expand or better tailor your BMPs. NPDES permitting authorities will review the identified BMPs and measurable goals and determine if they are likely to reduce pollutants to the MEP, protect water quality, and satisfy the appropriate water quality requirements of the Clean Water Act. If the permitting authority does not think that you are reducing pollutants to the MEP, they can request that you revise your mix of BMPs and measurable goals.

Storm Water Management Programs

The Phase II Rule defines a storm water management program for a small MS4 as a program composed of six elements that, when implemented together, are expected to reduce pollutants

discharged into receiving waterbodies to the MEP. These six program elements, or minimum control measures, are

- Public Education and Outreach on Storm Water Impacts;
- Public Involvement/Participation;
- Illicit Discharge Detection and Elimination;
- Construction Site Runoff Control;
- Post-Construction Storm Water Management in New Development and Redevelopment;
- Pollution Prevention/Good Housekeeping for Municipal Operations.

For each minimum control measure, you will select and implement BMPs and measurable goals that comprehensively address the specific storm water problems in your area. The process for developing a storm water management program is described in Part 4 of this guidance, and examples of BMPs and measurable goals are presented in Part 3.

Notice of Intent

To apply for coverage under a general permit, you must fill out a Notice of Intent (NOI) application form. You will be asked for the following information:

- Best management practices (BMPs) for each of the six minimum control measures;
- Measurable goals for each of the BMPs (i.e., narrative or numeric standards used to gauge program effectiveness);
- A timeline for implementation of each measure (estimate months and years to implement each measure, including interim milestones and frequency); and
- Specify the individual(s) or group(s) responsible for implementing or coordinating the storm water program.

Deadlines

General Permit Timeline	
Storm Water Phase II Final Rule	December 1999
Draft general permits developed	January–June 2002
Draft NOI available	January–June 2002
Final general permit available	December 2002
NOI Due	March 2003

OPTIONS FOR PERMIT COVERAGE

There are a number of implementation options for regulated small MS4 operators. They include obtaining coverage under a general permit, participating in the implementation of an existing Phase I MS4's storm water program as a co-permittee (including sharing responsibility for program development with a nearby regulated small MS4), or applying for an individual permit. These options are described in detail below. The deadline for applying for permit coverage is March 10, 2003. Check with your state or EPA regional NPDES permitting authority to learn more about permitting in your area.

Option 1. General Permits

(Note: *General permits are drafted by the NPDES permitting authority and describe one set of requirements for all eligible applicants*.)

- Once a general permit is issued, submit a Notice of Intent (NOI) application form to the NPDES permitting authority to apply for permit coverage under the general permit conditions.
- In completing the NOI, you need to include a description of your storm water management program, including best management practices (BMPs) and measurable goals for each of the 6 minimum control measures.
- Although general permits have a set of requirements determined by the permitting authority, they still provide the flexibility to develop an individualized storm water program that addresses the particular characteristics of your water quality problems and the needs of your system.

Option 2. Co-Permittee Option

Other Phase II MS4s:

- Partnering with neighboring Phase II MS4s allows you to capitalize on existing resources in meeting Phase II requirements.
- This option also provides you the opportunity to forge a link between your storm water program and a regional or watershed management plan.
- Check with your State or EPA permitting authority for more information about submitting a joint NOI with one or more small MS4s in your area.

Larger Phase I MS4s:

- Partnering with a Phase I (larger) MS4 offers an attractive option for you because you could participate in an existing storm water management program. This can be accomplished by you and your neighboring MS4 jointly seeking a modification of their Phase I MS4 permit.
- As a limited Phase I co-permittee, you would be responsible for compliance with the permit's conditions that are applicable to your jurisdiction, which would be the applicable

terms of the modified Phase I individual permit rather than the minimum control measures in the Phase II Final Rule.

Option 3. Individual Permits

- You may seek coverage under an individual NPDES permit, which is tailored for an individual MS4.
- Upon submitting the appropriate application(s), the NPDES permitting authority develops a permit for that particular applicant based on the information submitted.
- The draft permit is then published for public comment before being finalized and issued.
- This option may take additional time and involve additional documentation, public notice, and comment than either the general permit or co-permittee options.

PART 2. PROCESS FOR DEVELOPING MEASURABLE GOALS UNDER A GENERAL PERMIT

As the operator of a regulated small MS4, you have the flexibility to select the BMPs and measurable goals for each minimum control measure that are most appropriate for your system and still meet the permit requirements. You must design and implement a comprehensive program (using the minimum measures framework) to reduce pollutants to the MEP, unless you apply for an alternative permit (though any NPDES permit for MS4s must reduce pollutants to the MEP).

Reasons why MS4s may want to tailor their program:

- To address specific water quality problems and pollutants in your area;
- To protect a significant water resource in your area (e.g., a public water supply, cold water fishery, etc.);
- To build upon existing municipal activities;
- To use an existing State or local program to meet one or more of the minimum measure requirements.

Once submitted in the permit application, the BMPs and measurable goals that you selected become requirements of your storm water management program. The NPDES permitting authority, however, can review your program and require changes in the mix of chosen BMPs and measurable goals if all or some of them are found to be inconsistent with the provisions of the small MS4 general permit. If you need to revise your suite of BMPs and measurable goals during the permit term, the small MS4 general permit (that your permitting authority issues) will describe how you can do that.

The following information describes steps you can take to select measurable goals appropriate for your program. As you do this, EPA recommends that you seek input from and actively involve both the public and key stakeholders.

WHAT ARE MEASURABLE GOALS?

Measurable goals are described in the Phase II rule as BMP design objectives or goals that quantify the progress of program implementation and the performance of your BMPs. They are objective markers or milestones that you (and the permitting authority) will use to track the progress and effectiveness of your BMPs in reducing pollutants to the MEP. EPA recommends that you develop a program with a variety of short- and long-term goals. At a minimum, your measurable goals should contain descriptions of actions you will take to implement each BMP, what you anticipate to be achieved by each goal, and the frequency and dates for such actions to be taken. Also, EPA recommends that you use your BMPs and measurable goals to help establish a baseline against which future progress at reducing pollutants to the MEP can be measured. For example, information on current water quality conditions, numbers of BMPs

already implemented, and the public's current knowledge/awareness of storm water management would be useful in setting this baseline.

There are a number of different ways you can write your measurable goals. You can consider developing measurable goals based on one or more of the following general categories:

1. *Tracking implementation over time.* Where a BMP is continually implemented over the permit term, a measurable goal can be developed to track how often, or where, this BMP is implemented.
2. *Measuring progress in implementing the BMP*. Some BMPs are developed over time, and a measurable goal can be used to track this progress until BMP implementation is completed.
3. *Tracking total numbers of BMPs implemented*. Measurable goals also can be used to track BMP implementation numerically, e.g., the number of wet detention basins in place or the number of people changing their behavior due to the receipt of educational materials.
4. *Tracking program/BMP effectiveness*. Measurable goals can be developed to evaluate BMP effectiveness, for example, by evaluating a structural BMP's effectiveness at reducing pollutant loadings, or evaluating a public education campaign's effectiveness at reaching and informing the target audience to determine whether it reduces pollutants to the MEP. A measurable goal can also be a BMP design objective or a performance standard.
5. *Tracking environmental improvement*. The ultimate goal of the NPDES storm water program is environmental improvement, which can be a measurable goal. Achievement of environmental improvement can be assessed and documented by ascertaining whether state water quality standards are being met for the receiving waterbody or by tracking trends or improvements in water quality (chemical, physical, and biological) and other indicators, such as the hydrologic or habitat condition of the waterbody or watershed.

EPA strongly recommends that measurable goals include, where appropriate, the following three components:

- The activity, or BMP, to be completed;
- A schedule or date of completion; and
- A quantifiable target to measure progress toward achieving the activity or BMP.

Measurable goals that include these three components and are easy to quantify will allow both you and your permitting authority to assess progress at reducing pollutants to the MEP.

STEPS TO SELECT MEASURABLE GOALS

To help you select measurable goals, EPA recommends that you:

1. *Consider your objective for each minimum measure.* The BMPs that you choose should work toward one or more common objectives related to storm water quality improvement and should reduce pollutants to the MEP. The objectives should be based on what is known about existing pollutant sources and problems in the watershed(s) and what is required by the minimum measure. The objective can be something you can quantify, or it can be a goal or purpose statement.

2. *Review the programs (municipal or other) that are already in place for each minimum measure.* Use the self audit, described in Part 4, as a resource. You should coordinate with other agencies, non-profit groups, citizen groups, etc., to identify existing initiatives that can be used as part of the storm water management program.

3. *Select BMPs that complement each other and work toward meeting each minimum measure.* These BMPs should address the minimum measure objective identified above and meet the regulatory requirements in the minimum measure.

4. *For each BMP, develop expeditious milestones for implementation.* You should include both a timeframe and a quantity to measure, if possible. Consider the following questions:

    - When will you start implementing the BMP?
    - What institutional, funding, and legal issues, if any, do you need to solve before implementation can occur, and when will these issues be solved?
    - How will you keep track of the progress of implementation? (It would be useful for you to develop a spreadsheet or database to track the progress of meeting measurable goals for annual reports.)
    - How can you measure whether this BMP has been a 'success at reducing pollutants to the MEP,' e.g., changes in behavior, number of BMPs implemented, or documented improvements in water quality?

5. *Determine how you will evaluate the effectiveness of each BMP.* Although achievement of water quality standards is the goal of all CWA programs, you may need to use other means to ascertain what effects individual and collective BMPs have on water quality and associated indicators. Instream monitoring, such as physical, chemical, and biological monitoring, is ideal because it allows you to directly measure environmental improvements resulting from management efforts. You can use targeted monitoring to evaluate BMP-specific effectiveness, whereas ambient monitoring can be used to determine overall program effectiveness. Alternatives to monitoring include using programmatic, social, physical, and hydrological indicators. Finally, environmental indicators, described in Part 5, can be used to quantify the effectiveness of BMPs.

6. *Derive measurable goals from the evaluation methods selected in Step 5.* Once you determine how to measure each BMP, you should identify the measurable goals to be achieved in the permit term. Consider intermediate goals that can help establish milestones for success. You should also develop measurable goals that consider operation and maintenance for structural BMPs where ongoing maintenance can be a concern. Ultimately, the evaluation methods that you choose for each BMP should lead to a determination of the environmental benefits of each minimum measure and the overall effectiveness of the storm water management program in reducing pollutants to the MEP.

The Phase II NPDES program encourages you to evolve and refine your program goals throughout the five-year permit term and in subsequent permit cycles. You should consider using BMPs and setting measurable goals that are targeted to address existing water quality problems and prevent new water quality problems. For example, where suspended sediments are the major water quality problem, you may wish to focus more on the construction and post-construction measures and develop a program to address streambank erosion. In cases where information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations should be incorporated into the storm water permit.

PART 3. EXAMPLES OF PHASE II BMPS AND ASSOCIATED MEASURABLE GOALS

OVERVIEW

The following hypothetical examples illustrate how measurable goals could be used to track and document program effectiveness at reducing pollutants to the MEP. EPA does not attempt to develop guidance on measurable goals for every potential BMP. Therefore, these examples represent only selected portions of a Phase II storm water management program and are not intended to serve as examples of comprehensive programs. To aid in the formulation of your measurable goals, EPA has developed a list of measurable parameters to provide you with some ideas about the types of measurements that can be made. This list is not comprehensive and is meant to be a guide only.

The BMP and measurable goal examples described in this section provide links to the Menu of BMPs, which includes detailed fact sheets describing each BMP.

PUBLIC EDUCATION AND OUTREACH ON STORM WATER IMPACTS MINIMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Public education radio campaign on storm water
- **BMP**: Storm water education program for school children
- **BMP**: Storm water education materials for restaurant owners

Public education is a key component to any effective storm water management program.

Hypothetical Case Study: Smalltown, USA, is a California city of 10,000 people that has decided to conduct a general outreach campaign on storm water and to target their program to school children and restaurants. Restaurants have been identified as a significant contributor of oil and grease to both storm drains and sanitary sewers. The City would also like to increase the overall knowledge of the citizens on storm water pollution. The following BMPs and measurable goals are examples of what this City could propose:

Minimum Measure Objective: The City will educate the general public by making 30,000 impressions per year with a storm water quality message via print, local TV access, local radio, or other appropriate media.

BMP: Public education radio campaign on storm water
Measurable Goal: The City will produce and air on local radio a 30-second public service announcement on storm water and what the public can do to prevent storm water impacts. This radio ad will air at least once a week for the first two years of the permit term. The City will conduct a survey at the end of the permit term to ascertain behavioral changes in target audiences.

Justification: Storm water permits in the Los Angeles regional area require approximately 3 impressions for each person per year. Smalltown's goal is to achieve the same level of exposure.

BMP: Storm water education program for school children
Measurable Goal: A minimum of 50 percent of all school children (K-12) will be educated every two years on storm water pollution by providing the School Districts in the jurisdiction of the City with materials, including videos, live presentations, brochures, and other media.
Justification: Educating school children on storm water and water quality practices, including water conservation measures, will help promote better public awareness.

BMP: Storm water education materials for restaurant owners
Measurable Goal: Outreach material on proper storm water management practices for restaurants will be produced within one year. Inspectors from the City's health department will be trained on potential storm water violations and proper practices for restaurants within one year.
Justification: Restaurants have been identified as a significant contributor of oil and grease into both storm and sanitary sewers. This targeted educational campaign will make the restaurant owners aware of proper disposal and recycling practices for oil and grease and inform them of potential fines for illegal dumping into storm or sanitary sewers.

PUBLIC INVOVLEMENT/PARTICIPATION MINIMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Establish a NPDES storm water steering committee
- **BMP**: Hold public meetings to receive input on the proposed program
- **BMP**: Coordination meeting

An involved public will be more likely to support a storm water program both in terms of helping implement the program and paying for it in the long run.

Hypothetical Case Study: Smalltown, USA, has decided to organize a steering committee to help in both the development and implementation of their storm water program. The City has also decided to hold a coordination meeting among key stakeholders every year to discuss how the storm water program is functioning and how it can be improved.

Minimum Measure Objective: Involve stakeholder groups, including local governments, businesses, and citizens, in making decisions about storm water management priorities and programs.

BMP: Establish a NPDES storm water steering committee
Measurable Goal: The NPDES Storm Water Steering committee is established at least 6 months before the NOI is submitted and meets quarterly before and during the permit term. Membership includes representatives from the City, public, industrial and commercial groups, and construction/developer groups.
Justification: Involving stakeholders early on in the storm water management planning process will improve support for programs because the stakeholders will be able to voice their concerns and suggestions before the program is finalized.

BMP: Hold public meetings to receive input on the proposed program
Measurable goal: Three public meetings will be held on the City's proposed storm water management program before it is finalized.
Justification: Public meetings are an excellent way to inform citizens about storm water impacts in addition to gaining support for the proposed storm water management program. Key issues, especially those that directly affect the public, can be described during these meetings to increase awareness about citizen responsibility, costs, and expected benefits.

BMP: Coordination meeting
Measurable Goal: The City will annually hold a coordination meeting involving co-permittees, regulatory agencies, and interested stakeholders to discuss progress of the storm water management program and the next year's activities.
Justification: Coordination with other jurisdictions, regulatory agencies, and citizens helps to identify common goals, such as improving water quality, that are not defined by geographic boundaries. Responsibility for tasks that further these common goals can be divided among these parties to use funding and labor efficiently.

ILLICIT DISCHARGE DETECTION AND ELIMINATION MINMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Storm drain system map
- **BMP**: Identify illicit connections through dry weather screening and targeted video inspection
- **BMP**: Illicit discharge/illegal dumping hotline

Illicit discharges to MS4s are wastes and wastewaters that are not from storm water runoff and are not otherwise authorized by a NPDES permit. These discharges enter the system either through direct connections (wastewater piping connected to storm drains, for example) or through indirect connections (infiltration from leaky wastewater systems, spills, dumping into the storm drain, etc.).

Hypothetical Case Study: Smalltown, USA, has yet to survey the MS4 to identify problems and illicit connections. To initiate this process, they intend to map the entire system to systematically address potential problem areas, first with a general survey and then with a more detailed inspection. They also plan to enlist the support of the public in identifying illicit discharges or illegal dumping.

Minimum Measure Objectives: Develop a comprehensive map of the storm drain system, establish and carry out procedures to identify and remove illicit discharges, establish legal authority for enforcement actions, and encourage public education and involvement in eliminating illicit discharges.

BMP: Storm drain system map
Measurable Goal: A storm drain system map will be developed in the first year.
Justification: A comprehensive infrastructure map of the MS4 has not yet been created. Once completed, this map will aid the municipality in targeting outfalls with dry weather flows and other suspicious discharges for more in-depth inspection and monitoring and will help coordinate management activities to remove illicit connections and track storm drain system maintenance.

BMP: Identify illicit connections through dry weather screening and targeted video inspection
Measurable Goal: A survey during dry weather of 20% of the storm drain system outfalls per year will be conducted to identify non-storm water flows. Once each year's survey is complete, areas with suspicious discharges will be inspected with video cameras to detect suspected direct connections to the wastewater system and identify areas where wastewater might be leaking into adjacent storm drain pipes.
Justification: The municipality contains many older neighborhoods that will be the initial focus of the illicit discharge identification effort. Deteriorating infrastructure and questionable building codes at the time might have resulted in directly connected and/or leaking wastewater pipes. Targeted video inspection in areas with high nutrient levels, appearance of suds or oily discharges, or dry weather flows will efficiently identify these connections.

BMP: Illicit discharge/illegal dumping hotline
Measurable Goal: A hotline for citizens to report illegal dumping and suspicious discharges will be established in the first year. The hotline will be advertised by placement of one ad in the local newspaper every 6 months and an insert in each homeowner's and business's water utility bills every year.
Justification: This hotline will supplement the municipality's effort to target outfalls for video inspection and will facilitate the cleanup and remediation of dumping sites. Also, advertising the hotline will improve public involvement and will serve as an educational tool to inform the public about the hazards of illicit discharges and illegal dumping.

CONSTRUCTION SITE RUNOFF CONTROL MINIMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Require ESC plans for any land disturbance greater than 5,000 square feet
- **BMP**: Require the use of appropriate perimeter controls on construction sites
- **BMP**: Develop a certification program for contractors

Construction sites can be a significant source of sediment for MS4s, especially when installation and maintenance of erosion and sediment controls are not required or adequately enforced.

Hypothetical Case Study: Smalltown, USA, is experiencing significant new development, and the City plans to establish a regulatory and enforcement mechanism for both erosion and sediment controls at construction sites.

Minimum Measure Objective: Establish a set of minimum erosion and sediment control (ESC) requirements for construction sites that disturb more than 5,000 square feet, including planning, installation, inspection, and maintenance of ESC practices.

BMP: Require ESC plans for any land disturbance greater than 5,000 square feet
Measurable Goal: A draft ordinance and guidance will be prepared within one year. A final ordinance and ESC guidance will be available within two years.
Justification: Small construction sites have been shown to contribute as much sediment as large sites on a per acre basis. Therefore, planning for erosion and sediment control practices and procedures in advance of starting construction is an important step in preventing sediment from entering the MS4.

BMP: Require the use of appropriate perimeter controls on construction sites
Measurable Goal: ESC requirements will be revised to require all construction sites on slopes in excess of 5 percent and in areas where calculations indicate pooling of water behind the structure to use steel-reinforced silt fencing. Additional requirements include proper installation and maintenance of these and other perimeter controls.
Justification: Traditional perimeter controls, such as standard silt fence, have higher failure rates when water pools behind the control. Requiring steel-reinforced silt fence, which is standard silt fence fortified with chain-link fencing and steel stakes, in critical areas will reduce damage to perimeter controls during storm events.

BMP: Develop a certification program for contractors
Measurable Goal: Achieve 80% compliance with ESC requirements by the end of the first permit term.
Justification: Educating contractors about the proper selection, installation, inspection, and maintenance of BMPs will help to ensure compliance with ESC requirements.

POST-CONSTRUCTION STORM WATER MANAGEMENT IN NEW DEVELOPMENT/REDEVELOPMENT MINIMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Reduce directly connected impervious surfaces through the use of low impact development and better site design techniques
- **BMP**: Develop a program for maintenance of structural storm water controls
- **BMP**: Develop and implement a storm water ordinance and guidance or a design manual that include performance standards designed to control runoff impacts

New development and significant redevelopment projects offer a host of opportunities to install structural runoff controls on both the site and regional scales.

Hypothetical Case Study: Smalltown, USA, has substantial existing development and many neighborhoods that are still growing. For existing development, the City plans to use on-lot treatment to handle some storm water by disconnecting impervious surfaces. The City also wants to ensure that existing storm water controls are functioning properly. Growing areas will be targeted by requiring impervious area disconnection and new storm water controls.

Minimum Measure Objective: Reduce the volume and improve the quality of storm water runoff by disconnecting impervious surfaces and installing and maintaining structural storm water controls.

BMP: Reduce directly connected impervious surfaces in new developments and redevelopment projects by requiring that grassed swales or filter strips be installed along roadsides in lieu of curbs and gutters
Measurable Goal: Directly connected impervious road surfaces in new developments and redevelopment areas will be reduced by 30 percent (relative to the traditional scenario in which curbs and gutters are used) over the course of the first permit term.
Justification: Opportunities abound to provide treatment and infiltration of runoff in the right-of-way adjacent to roads. This practice would provide on-lot treatment of storm water, reduce the total volume of storm water being discharged from sites, and increase the time of concentration of the runoff that is generated from road surfaces.

BMP: Develop a program for maintenance of structural storm water controls
Measurable Goals: In the first year, conduct an inventory of structural runoff controls. In year 2, develop a GIS to integrate the location of these controls with schedules for regular inspection and maintenance. Conduct four inspections of each structural control per year and conduct regular maintenance as prescribed for each type of practice.
Justification: There are many structural controls located throughout the municipality that are owned and operated by both public and private entities. Before a comprehensive maintenance plan can be implemented to address all of the practices, a complete list of BMPs and their locations and site conditions needs to be compiled. An inspection and maintenance schedule can be developed to maximize efficiency and minimize labor requirements. The system can be expanded to include other types of MS4 maintenance, including street sweeping, catch basin cleaning, storm drain flushing, etc.

BMP: Develop and implement a storm water ordinance and guidance or a design manual that include performance standards designed to control runoff impacts
Measurable Goal: By year 3 of the permit term, 95% of all building permits will include descriptions and plans regarding storm water control practices and site designs that comply with the criteria and guidance specified or referenced in the municipal code.
Justification: Ordinances are an effective way to establish performance standards for runoff controls. These performance standards might, for example, specify a target for percent removal of annual post-development total suspended solids loadings, require maintenance of annual ground water recharge rates, or limit runoff volumes and rates such that receiving waters are not negatively impacted.

POLLUTION PREVENTION/GOOD HOUSEKEEPING FOR MUNICIPAL OPERATIONS MINIMUM MEASURE

- EPA's Regulatory Requirements
- **BMP**: Training program for grounds maintenance and landscaping crews
- **BMP**: Develop spill prevention and control plans for municipal facilities
- **BMP**: Incorporate the use of road salt alternatives for roadway deicing

Effective storm water management programs should start with municipal employees. Municipal crews can be educated about the impacts of their work on storm water quality to prevent pollution from municipal operations. Also, municipal crews can set a good example for citizens.

Hypothetical Case Study: Smalltown, USA, hopes to reduce the amount of pollutants generated by municipal operations that accumulate on ground surfaces and are transported by runoff to receiving waters. Because the appearance of algal blooms during spring and summer indicates a nutrient problem, the City plans to target municipal lawn and garden activities and spill prevention to reduce the amount of chemicals entering the MS4 through improper storage, use, and handling practices. They also intend to reduce the amount of salt applied to roads during winter road maintenance operations.

Minimum Measure Objective: Reduce the amount of nutrients entering receiving waters through education of municipal employees about lawn care activities, spill prevention and control, and vehicle washing.

BMP: Training program for grounds maintenance and landscaping crews
Measurable Goals: In the first year, develop a pollution prevention workshop for all municipal employees responsible for grounds maintenance and landscaping at public facilities. Once per year, hold an additional workshop for new employees and crew managers. Achieve a 40% reduction in fertilizer and pesticide use and a 25% reduction in water use after 3 years.
Justification: Grounds maintenance and landscaping crews use substantial quantities of water and artificial chemicals, the combination of which has led to elevated levels of nutrients and toxics in receiving waters. The workshop will emphasize the benefits of recycling organic material; reducing the use and planning the timing of application of chemicals and water; selecting native vegetation to reduce water, nutrient, and maintenance demand; and achieving cost savings through reduced labor and material inputs.

BMP: Develop spill prevention and control plans for municipal facilities
Measurable Goals: Develop plans describing spill prevention and control procedures by the end of Year 1. Conduct annual spill prevention and response training sessions for all municipal employees. Distribute educational materials, e.g., posters and pamphlets, to each municipal facility by the end of Year 2.
Justification: Municipal employees do not receive formal training in spill prevention and containment practices, but in recent years several spills have resulted in hazardous chemicals reaching the storm drain system due to improper handling and containment procedures. The poster, which will be posted in chemical storage and use areas, will describe materials and

techniques that should be used to contain a spill as well as preventative measures that can reduce the likelihood of spills.

BMP: Incorporate the use of road salt alternatives for roadway deicing
Measurable Goals: During the 1st year, reduce the amount of road salt applied to roadways by 50% through the use of less-toxic alternatives, such as liquid calcium magnesium acetate (CMA).
Justification: CMA is just as effective as road salt at deicing, but it appears to be much less harmful to the environment and is less corrosive.

PART 4. PROCESS FOR DEVELOPING A STORM WATER MANAGEMENT PROGRAM

INTRODUCTION

Most traditional approaches to storm water management focus on efficiently collecting and conveying storm water off-site. Such an approach may increase downstream property damage and necessitates expensive public works, such as enlarging and reinforcing channels or swales to provide an adequate outfall from the site and/or downstream channel stabilization projects.

More recent approaches to storm water management seek to retain natural features of drainage systems by providing on-site storm water quantity reduction that also improves storm water quality. This approach views storm water as a resource that can be used to

- Recharge groundwater from areas of sites that are made impervious;
- Supply fresh water to surface water bodies both directly and as an enhancement to base flow;
- Increase recreational opportunities including hunting, swimming, fishing, and boating; and
- In some cases, augment drinking water supplies.

Properly managed storm water also can help to minimize or avoid problems with erosion, flooding, and damage to natural drainage features such as streams, wetlands, and lakes, as well as provide wildlife habitat in these natural features.

The objective of the Phase II program is for Phase II municipalities to develop effective, site-specific storm water management programs that reduce the discharge of pollutants from MS4s to the MEP. EPA has chosen this flexible regulatory approach because the nature of discharges from MS4s varies from region to region. You, as the operator of a small MS4, should consider incorporating the following elements into your storm water management program:

- Governmental coordination;
- Legal authority and comprehensive planning;
- Funding and staffing;
- Public education and participation; and
- BMP selection.

PROGRAM COMPONENTS

Governmental Coordination

Intragovernmental coordination of the municipal agencies and departments having purview over storm water-related issues is fundamental to a successful storm water management program. You should consider designating a "lead agency" within your municipality to facilitate the coordination of the various storm water pollution control activities. Intergovernmental

coordination is also important, especially when a number of small MS4s are partnering together to implement the minimum measures.

Legal Authority and Comprehensive Planning

Municipalities can use the legal authority of new and existing programs and ordinances, zoning rules, and the site plan review process to ensure that water quality concerns are addressed in new development and redevelopment. Municipalities should consider developing a comprehensive plan that incorporates both location-specific and watershed-wide goals. Also, both long- and short-term planning should be conducted to prevent or mitigate the impacts of cumulative loadings throughout the watershed. Assessing the impacts of cumulative loadings using indicators, trend data, and other means is an essential part of this process.

Many jurisdictions have ongoing programs and activities that are related, to some degree, to storm water quality. Existing programs, state and local codes, and local ordinances should be reviewed to determine if requirements should be revised or strengthened. When no program or ordinance exists to address a specific storm water issue, one should be developed. Examples include programs that address flooding, combined sewer overflows, infiltration and inflow (a contributor to sanitary sewer overflows), and erosion and sediment control. You should consider how these programs could be linked, expanded, or otherwise augmented to achieve additional storm water quality enhancement and other measurable environmental benefits.

Because development almost always increases impervious surfaces (a good measure of land use intensity), recent development will, in most cases, lead to increased discharges of pollutants from MS4s. Urbanization causes fundamental modifications to the hydrological cycle, typically resulting in an increase in the volume of storm water discharges and associated pollutant loadings. Chemical, physical, and thermal changes associated with new development can adversely affect receiving waters.

It is important to integrate storm water management program elements with your community's land development process, including redevelopment. Therefore, you should have a working knowledge of the role that the site plan review and land use planning processed play in your municipality.

The site plan review process is typically the final stage of municipal review that occurs before development takes place. Water-related codes and ordinances, such as erosion and sediment controls, storm water management, and prevention and removal of illicit connections, should be implemented through the site planning process and verified through the review process. Site plan review is often the only regulatory process of this type that a land developer must go through if the land use is compatible with the zoning for that land (or if there is no zoning).

Land use planning is an additional process that precedes (but does not replace) the site plan review process. The planning process typically involves the setting of land use goals and objectives for various parts of a municipality into a plan document or onto a plan map. These plans are usually termed Comprehensive Land Use Plans, Master Plans, or Comprehensive Zoning Plans. In many instances, land has already been zoned for a certain category of land use.

Such categorization may have resulted in a zoning category being designated based on the existing land use at the time the zoning process commenced, which in most areas occurred in the early part of the Twentieth Century.

In contrast, planning has generally evolved over the past 50 years, and in many cases far more recently than that. Where the planned land use (e.g., planned zoning category) is different than the existing zoning, a land developer may desire to have the zoning category changed to the planned category. This process is referred to as rezoning and can be one of the most important decision-making functions of local government officials. It is also the process by which some municipalities have required public facility improvements and other infrastructure improvements from land developers through the development process. Storm water controls may be implemented by developers wishing to rezone (and develop) property.

For example, specific planned land use designations are usually identified on a parcel-specific basis as a zoning category. These categories may be limited to only one possible land use or may provide for a range of land use opportunities that often depend on a series of policy-based criteria. A common example of this is a higher range of residential density available to a developer that provides low- or moderately priced housing units as part of the development. Just as these types of land use decisions must be made early in the development process, so should provisions for storm water quality management planning.

Regulated small Phase II MS4s will vary greatly in their stages of land use planning because of different state laws and regional requirements. If you have recently updated your land use plan, there is a good chance that water quality issues will have been incorporated into the process. In other instances, there may be no mention of a policy (or more specific criteria) to include water quality in guiding land use decisions. Still other municipalities may not even have comprehensive land use planning. You should consider incorporation of policies regarding storm water quality your land use (planning and zoning) process by developing or strengthening ordinances. In summary, you should rely on existing land development requirements, consider strengthening or developing new storm water codes and ordinances, and use the site plan review process to ensure that appropriate storm water codes and ordinances are implemented.

Funding and Staffing

The development and implementation of an effective storm water management program ultimately depends on adequate resources being made available for personnel and equipment. Therefore, your program should identify the resources that your municipality is committing to implement each program component. You should clearly establish program position descriptions and funding sources for administrative and field personnel to implement the program. You should try to identify the projected funding needs and sources accurately to allow the longest possible lead time for arranging program financing. You should also provide a schedule indicating changes in staffing and equipment if you propose phased implementation.

Public Education and Participation

You should be sure to provide adequate public education and ample opportunities for public participation in all aspects of your program. The goals of the education and public involvement program must be defined under the proposed storm water management program. Generally, the public should be involved as early as possible when considering major technical and policy issues of the development and implementation phases of the management program. Program element milestones should be included for public participation, particularly in the program development phase. In some cases the public involvement may simply be to receive information. Public participation can also be used to focus on education and awareness of major technical and policy issues in the implementation phase.

If time is available, conflict and confusion can often be minimized if the public involvement and education program includes a schedule for initial public contact and education and milestones for involvement throughout the development and implementation phase. Public education programs are expected to target specific audiences, including those regulated or affected by the program, such as developers, building contractors, and industrial operators, and those that can assist with program implementation (e.g., volunteers and citizens).

BMP Selection

You should propose a municipal storm water management program that address activities and schedules for implementation of each of the 6 minimum measures identified in the regulations. Your emphasis should be on program components that reflect site-specific characteristics of the municipality (e.g., population density, land use and age of communities, soil type, and topography), the municipal storm sewer system, and the receiving waters. Implementation priorities can be set to target the sources of specific pollution problems from certain land uses or target the problems resulting from the land use activities of a specific geographic area.

It is important that you identify schedule for implementing various program components as part of the program itself so that expectations about the impact that the management program will be realistic. Continued support for any program will depend on meeting scheduled milestones and attaining results. Questions that should be considered when developing priorities include:

- What are the pollutant loadings from the source(s) that the program component addresses and could the program component reduce the pollutants in the discharges?
- Can existing municipal functions be modified to address water quality concerns and are municipal lands or rights-of-way available for retrofits?
- What is the current population of the municipality, and what is known about development patterns, projected growth rates, and demographics?
- What are the physical characteristics of the watershed and receiving waters?
- What are the climatic conditions, soil types, and watershed delineation criteria?
- Are the pollutants reduced to the MEP?

When preparing your application for coverage under a NPDES permit, you should describe the proposed structural and source control measures to reduce pollutants from commercial and residential areas to the MEP. Common examples of potentially major sources of pollutants include commercial and retail parking lots, gasoline/service stations, and establishments with drive-through windows and other high-intensity vehicular uses. You should describe how the control measures address the interaction between pollutant sources and physical attributes, such as existing and planned land uses, soil types, and topography, from your MS4 into your receiving waters.

Structural controls include infiltration devices, detention and retention basins, vegetated swales, water quality inlets, screens and filters, channel stabilization, riparian habitat enhancement efforts, and wetland restoration projects. You should be aware that CWA Section 404 permits might be required for certain types of structural controls (i.e., projects that discharge dredged or fill materials to waters of the United States, including wetlands). Also, some projects might require State permits that address water quality and quantity issues.

You are encouraged use appropriate guidelines and performance standards for identifying and implementing specific structural controls for the construction site and post-construction minimum measures. Your program should describe the criteria to be used to establish that a particular structural control is warranted and the circumstances under which the control will be required. New structural controls and proposed retrofits should be discussed separately because the opportunities for control selection are often quite different.

You should conduct an evaluation of major existing structural controls and municipally owned sites and rights-of-way where new controls can be installed. An inventory will allow you to develop a better picture of the capacity to reduce pollutants to the MEP of current and potential storm water quality and quantity controls and will facilitate both long- and short-term storm water master planning.

EPA recommends that you also follow a set of pre-established priorities for selecting, siting, and installing structural controls and implementing source control measures during the development process. EPA and the Center for Watershed Protection provided guidance in the form of a "Manual Builder" for this purpose. This tool is available on the Stormwater Manager's Resource Center web site. The process should begin at the initial planning and zoning stages and continue throughout the development and redevelopment processes.

Certain structural control measures are effective but may not be able to be implemented in previously developed areas due to unavailability of land; examples are:

- First flush diversion systems;
- Detention/infiltration basins;
- Retention basins;
- Extended detention basins;
- Infiltration trenches;
- Porous pavement;

- Grass swales; and
- Swirl concentrators.

The following nonstructural practices should be considered when land is limited or unavailable:

- Erosion control;
- Stream bank management techniques;
- Street cleaning operations;
- Vegetation/lawn maintenance controls;
- Debris removal;
- Road salt application management; and
- Public outreach, education, and awareness.

Operation and Maintenance

Proper maintenance plays a vital role in ensuring the proper operation of both structural and source controls. For example, reducing the frequency of inspections and cleanout of a structure may initially reduce program costs, but the effectiveness of the BMP can be diminished, which creates the need for additional controls and results in a deterioration in water quality, which has a cost associated with it. In addition, the perception that a given storm water control BMP does not work (even though the reason is lack of maintenance) can be very damaging to a fledgling program as it seeks to establish its support base.

The section of your storm water management program that describes your management practices should include a description of the maintenance activities and a maintenance schedule for structural controls.

Oftentimes the effectiveness of structural storm water controls, especially detention and retention basins and infiltration devices, is limited by lack of maintenance. Other structures that require regular maintenance are catch basins and drainage channels. You can develop a schedule of regular maintenance of structural controls and infrastructure (e.g., removing sediment from retention ponds every five years, cleaning catch basins annually, removal of litter from channels twice a year) as part of your storm water management program. You can use maintenance logs to track activities and develop a matrix of tasks, such as inspection, repair, replacement, and cleanout, on a timeline. GANT charts or other critical path analyses are readily available and are recommended as ways that you can organize a maintenance program and schedule.
In some cases, regularly scheduled maintenance might not be appropriate; rather, periodic inspections can be used to determine when maintenance is needed. If maintenance is to be based on the results of inspections or if maintenance is scheduled infrequently, you should provide an inspection schedule and identify the municipal department(s) responsible for the maintenance program. Because maintenance issues are critical to successful program implementation, measurable goals for maintenance should be considered throughout the term of the permit.

STORM WATER MANAGEMENT PROGRAM IMPLEMENTATION

The following information was taken, in part, from Storm Water Phase II Workshops sponsored by the American Public Works Association (APWA) in 2001 and from APWA's manual *Designing and Implementing an Effective Storm Water Management Program* (AWPA, 2000). This guidance is intended to assist Phase II cities with understanding, organizing, and developing their storm water management program in compliance with the Phase II requirements. Two major steps are necessary: a self analysis to help the Phase II city collect information and assess information, and an action plan to form goals and set a schedule for development of a Phase II storm water management plan.

Self Analysis

You should conduct a comprehensive self analysis to help you gain a better understanding of your current situation with respect to complying with the Storm Water Phase II Rule. The self analysis should consist, at a minimum, of the following components:

1. *Understand the storm water regulations and your storm water responsibilities*. EPA has developed a series of fact sheets to help explain the Phase II Rule, as well as the *Compliance Assistance Guide* and the *Menu of BMPs*. First you should obtain a copy of the Phase II Rule and your state's Phase II permits when they become available. Before you undertake the process to develop a Phase II program, you should have a clear understanding of what you're required to do. Begin by asking yourself the following questions:

    - Am I in an urbanized area as designated by the 1990 Census?
    - Could I be included in an urbanized area as designated by the 2000 Census (final information to be released in Spring/Summer 2002).
    - If I'm not in an urbanized area, is my population greater than 10,000 people (potential designation by the permitting authority)?
    - Does my city government own or operate a facility with industrial activity as defined by EPA's storm water regulations (e.g., wastewater treatment plants, vehicle maintenance facilities, etc.)?
    - Does my city government own or operate construction activity that disturbs greater than one acre?
    - Do I understand what the storm water regulations require (the development of a storm water management program that includes the six minimum measures and measurable goals)?
    - Do I understand the deadlines and when I am required to submit a permit application?

2. *Understand how your city currently manages its storm water runoff.* Make an assessment of your city's storm water management and conveyance system. Get copies of maps, inventories, or other assessments of the physical infrastructure in place. Begin by asking yourself the following questions:

- Do you have an inventory of storm water inlets, pipes, ditches, and open channels?
- Do you know how many outfalls your city discharges to and where they are located?
- Do you know if someone else is discharging storm water into your system?
- Do you know the major pollutant sources in your city (industrial, commercial, residential)?
- What types of flood control or water quality practices are currently in place in your city?

3. *Know the condition of your receiving waters.* Storm water programs should be designed to address the specific needs of the community and water resources they are intended to protect. If you haven't done so already, collect information on your city's receiving waters and what pollutants and sources are impacting those waters. You should also know the various uses of your receiving waters so you can design a program to protect those uses. Begin by asking yourself the following questions:

    - Do you know the names and locations of the waters that receive a discharge from your MS4?
    - Do you know the character and quality of these waters?
    - Are any of these waters listed as impaired on your State's 303(d) list?
    - What are the pollutants impacting these waters?
    - Do you know the designated uses of these waters?

4. *Assess your current programs and practices to determine what needs to be changed.* The Phase II program provides an opportunity to identify and change programs and practices that are or could be impacting water quality. Begin by asking yourself the following questions:

    - What are your current practices that contribute to water quality problems?
    - What are your current practices that will help meet NPDES storm water requirements?
        - Do you have an existing educational program on water quality?
        - Do you have an erosion and sediment control program established?
        - Do you have procedures to address illegal dumping and spills?
    - What legal authority do you already have and legal authority will you need to develop?

5. *Identify stakeholders who can help you develop and implement your storm water program.* These can include people who are impacted by city ordinances, concerned citizens, and groups who would be expected to pay for storm water management (as part of a storm water utility, for example). Begin by asking yourself the following questions:

    - Are there other Phase II communities in your area willing to cooperate with you?
    - Is there a Phase I city in your area with which you can work?

- Are there groups or associations, such as environmental, industry, or community associations, that can help you?

6. *Determine the overall objectives for your storm water program.* These objectives could include improving water quality, decreasing flooding, increasing citizen awareness and cooperation, and increasing funding. You should develop an objective for each of the six minimum control measures to help guide you in selecting and targeting BMPs and measurable goals. Your storm water management plan should be designed with these goals in mind.

Action Plan

Your next step will be to develop an action plan to help you determine what to do and when. An action plan is a tool to help guide you as you develop your storm water management program, and is not required under the EPA regulations. The first step in developing an action plan is to complete the self analysis previously described.

1. *Assemble your team.* This will include stakeholders and city departments that may have a role in storm water management.

2. *Develop a time schedule.* This would ideally identify the date your permit application is due, probably March 10, 2003, and work backwards from there. You should set interim milestones to assess your progress. Key dates could be included for public comment and review, local authority approval, stakeholder meetings, and acquiring funding. Your time schedule should also accommodate a storm water management program plan approval process. Your storm water management plan will probably need to be approved by local authorities, regulatory authorities, and stakeholders.

3. *Determine your strategy for compliance.* What does a good program look like? Try to determine what type of program your city managers want and what type of program you can realistically develop. Begin by asking yourself the following questions:

    - What benefits do you want to achieve?
    - What is your tolerance for risk? The Phase II program includes a lot of flexibility, but inherent in that flexibility is uncertainty. You will need to balance your tolerance for risk in developing a storm water management plan.
    - What is the best program approach for you? For example, you can develop a minimal program that meet legal requirements, an aggressive proactive program, a "the best we can afford program," or a "the best that the city council will approve" program.
    - What is realistically achievable? You should determine your financial resources and limitations by asking the following questions:
        - What is realistic given your current program and legal constraints?
        - What is realistic in terms of your receiving water quality?

- What goals should I set? Setting clear goals for your storm water program will help you set clear measurable goals and document your program's success to regulators and the public.

4. *Network with other local governments.* Talk to other cities in your area to find out what they're doing. Consider establishing regular meetings with these cities to share information, and, if your goals are compatible, consider partnering with some of these cities to share resources or join as co-permittees. If there is a Phase I community nearby, investigate what they've been doing and consider working with some of their ideas and using materials they have already developed.

5. *Determine the main elements of your program.* Using the information from your self-analysis and the items above, start to formulate the major elements of your program. Identify how you will address each of the six minimum control measures. First, identify the BMPs and measurable goals that will be used to implement the six minimum measures. Second, identify practices that will require on-going operation and maintenance. Finally, plan for developing and maintaining public support through education and outreach.

6. *Establish an implementation plan.* This plan will describe how would will develop your Phase II storm water management program, including public participation components. The following are factors you should consider when implementing your storm water management program:

   - Determine program funding and staff requirements. Assess whether you will do the work in-house or contract it out.
   - Develop your institutional framework. Identify a lead city department or agency. Develop MOUs, if necessary, and consider designating or establishing a regional group, such as a council of governments, to help coordinate activities.
   - Identify your permitting approach. Will you choose a general permit or an individual permit? Will you join as a co-permittee with another city?
   - Assign an individual or group to be responsible for submitting the permit application, developing annual reports, etc.

PART 5. ENVIRONMENTAL INDICATORS FOR STORM WATER PROGRAMS

Although you are required to develop measurable goals for each BMP, identifying overarching goals for your entire storm water management program is also useful. Establishing objectives for each of the minimum measures can help put each program component into perspective within the framework of your overall program. One way to evaluate program success at either the minimum measure- or overall program-level is through the use of environmental indicators.

Useful indicators are often indirect or surrogate measurements where the presence of the indicator points to a likelihood that the program area was successful. Indicators can be a cost-effective method of assessing the effectiveness of a program because direct measurements sometimes can be too costly or time-consuming to be practical.

A well-known example is the use of fecal coliform bacteria as an indicator of the presence of human pathogens in drinking water. This indicator dates back more than 100 years and is still in widespread use for the protection of public health from waterborne, disease-causing organisms.

Environmental indicators are measurable features which alone or in combination provide managerially and scientifically useful evidence of ecosystem quality, or reliable evidence of trends in quality. (Intergovernmental Task Force on Monitoring Water Quality, 1995)

Environmental indicators are relatively easy-to-measure surrogates that can be used to demonstrate the actual health of the environment based on the implementation of various programs or individual program elements. Some indicators are more useful than others in providing assessments of individual program areas or insight into overall program success. EPA has developed a hierarchy of indicators to illustrate this issue, which is shown below.

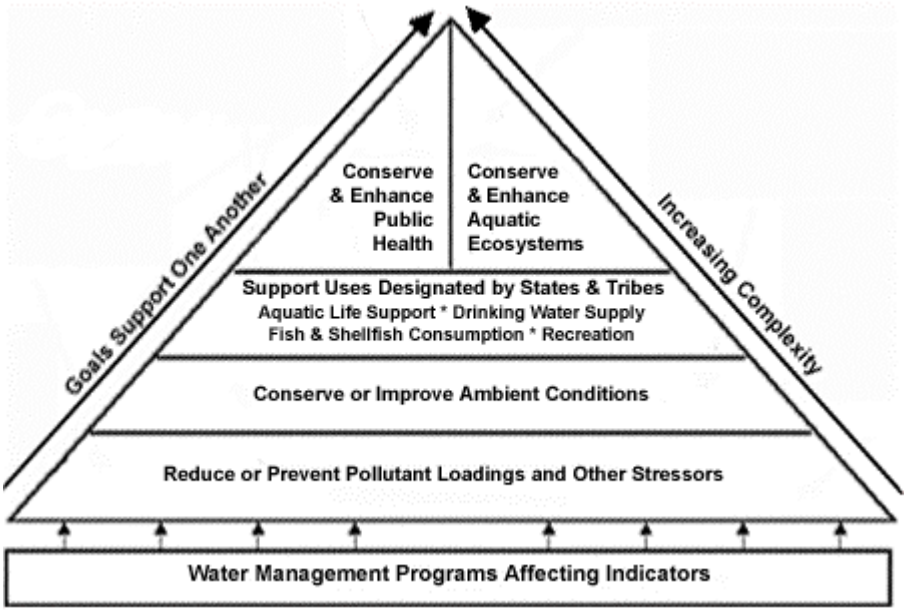

Figure 1. Environmental Indicators Pyramid (USEPA, 1998).

The indicators at the base of the pyramid are more general and might be most useful for limited statements about specific program areas, such as establishing a relationship between the use of BMPs and loadings reductions. As one advances to higher levels on the pyramid, the environmental indicators reflecting improvements in instream biota could be linked to overall program success.

In a similar fashion, the indicators shown on the lower boxes of Figure 2 reflect administrative or programmatic measurements while actual indicators of environmental change are encompassed by the upper boxes. Both figures depict the hierarchy of indicators where administrative or programmatic indicators are relatively easy to determine but are generally not as useful as the environmental indicators.

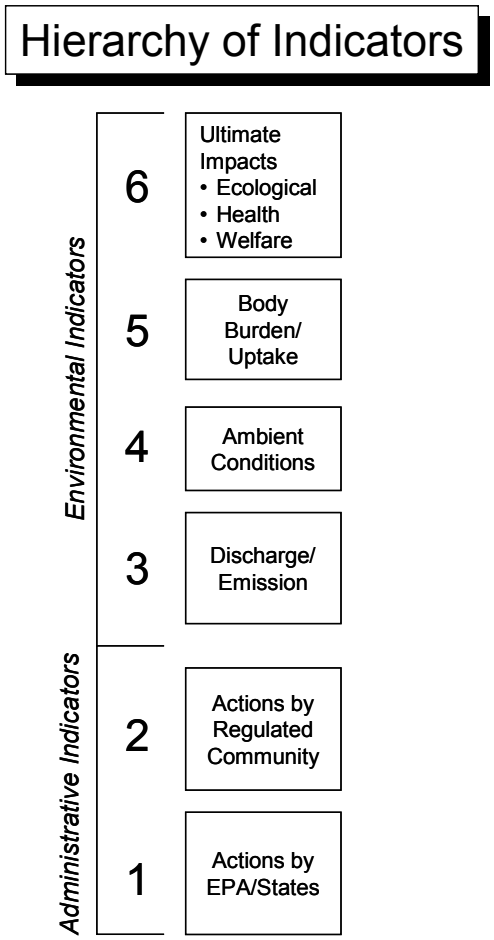

Figure 2. Hierarchy of Environmental Indicators (USEPA, 1998).

Table 1 presents environmental indicators that have been developed specifically for assessing storm water programs (Claytor and Brown, 1996). Note that some of the water quality indicators, physical and hydrological indicators, and biological indicators (indicators 1 through 16) can be integrated into an overall assessment of your program and used as a basis for the long term evaluation of program success. Indicators 17 through 26 correspond more closely to the administrative and programmatic indicators as well as the practice-specific indicators for which you are establishing measurable goals.

Table 1. Storm Water Indicators

Category	#	Indicator Name
Water Quality Indicators	1	Water quality pollutant constituent monitoring
	2	Toxicity testing
	3	Loadings
	4	Exceedance frequencies of water quality standards
	5	Sediment contamination
	6	Human health criteria
Physical and Hydrological Indicators	7	Stream widening/downcutting
	8	Physical habitat monitoring
	9	Impacted dry weather flows
	10	Increased flooding frequency
	11	Stream temperature monitoring
Biological Indicators	12	Fish assemblage
	13	Macroinvertebrate assemblage
	14	Single species indicator
	15	Composite indicator
	16	Other biological indicators
Social Indicators	17	Public attitude surveys
	18	Industrial/commercial pollution prevention
	19	Public involvement and monitoring
	20	User perception
Programmatic Indicators	21	Number of illicit connections identified/corrected
	22	Number of BMPs installed, inspected, maintained
	23	Permitting and compliance
	24	Growth and development
Site Indicators	25	BMP performance monitoring
	26	Industrial site compliance monitoring

LIST OF MEASURABLE PARAMETERS

- Public Outreach and Education on Storm Water Impacts
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Storm Water Runoff Control
- Post Construction Storm Water Runoff Control in New Development and Redevelopment
- Pollution Prevention/Good Housekeeping for Municipal Operations

PUBLIC OUTREACH AND EDUCATION ON STORM WATER IMPACTS

CLASSROOM EDUCATION ON STORM WATER

• The number of educational materials distributed to schools.
• The number of classes, schools, or students that participate in municipal-sponsored storm water workshops or activities.
• The number of workshops held for teachers on storm water education.
• The number of certificates or other rewards given out for classes/students who participate in storm water education.
• The number of students receiving storm water education as a regular part of the school curriculum.
• The number of students receiving storm water education as part of after-school programs.

EDUCATION/OUTREACH FOR COMMERCIAL ACTIVITIES

• The number of educational materials that were distributed to business owners and operators.
• The number of certified businesses that participated in training for a "green certification" program.
• The number of businesses trained under a training program.

EDUCATIONAL DISPLAYS, PAMPHLETS, BOOKLETS, AND UTILITY STUFFERS

• List compiled of target audiences and possible activities for each.
• The number of materials created and distributed.
• The number of events attended with displays.
• The number of people at an event who saw the display (guest book) or took a pamphlet/booklet.

LAWN AND GARDEN ACTIVITIES

• The number of partnerships established with local lawn care businesses.
• The number of partnerships established with lawn care suppliers/retail stores.
• The number of municipal employees trained in proper lawn care practices.
• The number of homeowners that attend training workshops for lawn/garden care BMPs.
• A survey of homeowners about their lawn care behavior before and after message is delivered.
• Fertilizer and pesticide residues in runoff.
• The number of requests for soil testing.

LOW IMPACT DEVELOPMENT

• The number of meetings held to educate citizens and developers about low impact development.
• The percentage of land use codes reviewed to ensure consistency with low impact development principles and practices.
• The number of new site plans that incorporate low impact development principles & practices.
• The number of municipal-owned facilities that are retrofitted with low impact development practices.

PET WASTE MANAGEMENT

• Whether or not a pet waste ordinance was developed.
• The number of "clean up after your pet" signs posted in parks and neighborhoods.
• The number of dog-walking designated areas in parks.
• Nutrient and bacteria levels in runoff.
• The number of citations given under an enforcement program.
• The number of posters/brochures put up in pet supply stores.
• The number of educational materials given out to pet owners.

POLLUTION PREVENTION FOR BUSINESSES

• [See Education/Outreach for Commercial Activities]

PROMOTIONAL GIVEAWAYS

• The number of items given out.
• The number of events attended (to give out items).
• The number of partnerships with radio and TV stations for promotions.

PROPER DISPOSAL OF HOUSEHOLD HAZARDOUS WASTES

• The pounds of household hazardous waste collected on amnesty days.
• The number of pickup days per year.
• The number of educational materials distributed to homeowners.
• The number of partnerships established with businesses.
• The number of curbside pickup days.
• Toxic chemical levels in receiving waters.

STORM WATER EDUCATIONAL MATERIALS

• (See Educational Displays, Pamphlets, Booklets, and Utility Stuffers)

TAILORING OUTREACH PROGRAMS TO MINORITY AND DISADVANTAGED COMMUNITIES AND CHILDREN

• The number of brochures/posters created in non-English languages.
• The number of partnerships established with minority organizations.
• Attendance at workshops or public meetings held in low-income or minority neighborhoods.
• The number of educational materials distributed to low-income neighborhoods.

TRASH MANAGEMENT

• The mass of trash removed from conveyance systems and receiving waters during cleanup campaigns.

• The number of structural trash controls installed.
• Floatables in receiving waters.
• Track the number of additional trash bins installed and signage posted.
• Whether or not a litter ordinance was established.

USING THE MEDIA

• The number of public service announcements made on radio and TV.
• The number of storm-water-related press releases.
• The number of storm-water-related articles published.

WATER CONSERVATION PRACTICES FOR HOMEOWNERS

• The number of partnerships established with local water utilities.
• The number of water conservation utility inserts that are distributed with utility bills.
• A survey of homeowners about their water conservation behavior before and after the message is delivered.

PUBLIC INVOLVEMENT/PARTICIPATION

ADOPT-A-STREAM PROGRAMS

- Track the number of participants in Adopt-A-Stream programs.
- Water quality at Adopt-A-Stream sites.
- The quantity of trash and debris removed by Adopt-A-Stream volunteers.

ATTITUDE SURVEYS

- The number of citizens solicited to complete surveys.
- The number of completed surveys.
- A survey of citizens gauging change in attitude/behavior after storm water education activities are held.

COMMUNITY HOTLINES

- The number of hotlines established to handle storm-water-related concerns.
- The number of calls received by hotlines.
- The number of problems/incidents remedied as a result of hotline calls.

REFORESTATION PROGRAMS

- The number of volunteer tree planters.
- The number of trees planted.
- The number of acres planted with trees.

STAKEHOLDER MEETINGS

- The number of meetings held.
- The number of attendees.
- The number of actions taken as a result of stakeholder meetings.

STORM DRAIN STENCILING

- The number or proportion of drains stenciled.
- The number of stenciling volunteers.
- The number of drains stenciled.
- Changes in water quality at outfalls of stenciled areas.

STREAM CLEANUP AND MONITORING

- The number of stream cleanups.
- The number of cleanup participants.
- The quantity of waste collected as a result of cleanup efforts.
- The number of stream miles cleaned.
- Water quality at the stream cleanup sites.

VOLUNTEER MONITORING

- The number of volunteers participating in monitoring programs.
- The frequency of monitoring in the watershed.
- The number of volunteer monitoring stations established in the watershed.
- The number of volunteer monitoring training sessions held.

• The number of actions that were taken as a result of the monitoring data collected by volunteers.

WATERSHED ORGANIZATION

• Whether or not a watershed organization was established.
• The number of participants in the watershed organization.
• The number of actions taken as a result of the watershed organization.

WETLAND PLANTINGS

• The acres of land planted.
• The number of volunteers that participated in planting.
• The number of planting events held.

ILLICIT DISCHARGE DETECTION AND ELIMINATION

FAILING SEPTIC SYSTEMS

- The number of regular maintenance and inspection reminders issued to tank owners.
- The number of partnerships formed with private pumping companies.
- Whether or not an inventory of tanks and when they were last serviced was completed.
- The number of field tests and screening conducted.
- The number of post construction inspections conducted to insure proper installation.
- The number of scheduled pump-outs and routine maintenance work conducted.

IDENTIFYING ILLICIT CONNECTIONS

- Inventory conducted and sites prioritized for inspection.
- The number of field tests conducted in high-risk areas.
- Whether or not an ordinance was developed to allow entrance into private buildings for the purpose of conducting tests.
- The number of illicit connections reported by business employees.
- The number of survey responses indicating a possible illicit connection.
- The number of illicit connections found.
- The number of illicit connections repaired/replaced.
- Whether or not an ordinance was developed for mandatory inspections of new buildings.
- The number of new buildings inspected.

ILLEGAL DUMPING

- The number of flyers, posters, or other public education tools distributed.
- The number of illegal dumps reported by citizens.
- The number of penalties enforced upon the participants of illegal dumps.
- Whether or not an inventory of the prime areas for illegal dumping was completed.
- The number of rewards distributed to citizens who reported an illegal dump.
- The number of illegal dump clean-ups completed.

INDUSTRIAL/BUSINESS CONNECTIONS

- The number of dry weather tests completed.
- The number of high-risk connections prioritized.
- The number of codes developed to prohibit connections.
- The number of illicit connections reported by business employees.
- The number of survey responses indicating a possible illicit connection.
- The number of illicit connections found.
- The number of illicit connections repaired/replaced.
- The number of new buildings inspected.
- Whether or not an ordinance was developed for mandatory inspections of new buildings.

RECREATIONAL SEWAGE

- Whether or not an inventory of high-risk areas was completed.
- The number of pump-out stations installed.
- The amount of waste water that pump-out stations collect.
- The number of no-discharge areas created.
- The number of new signs added to remind citizens of dumping policies and alternatives.

- The number of enforced cases of recreational dumping.
- The number of citizen complaints made reporting illegal action.
- The change in water quality at marinas.

SANITARY SEWER OVERFLOWS

- The frequency of routine maintenance and cleaning activities.
- The number of overflows reported.
- The number of overflow causes that were identified during inspections.
- The number of sites repaired.
- The number of rainfall gauges installed.
- Whether or not an ordinance was developed to prohibit new and illicit connections.

WASTEWATER CONNECTIONS TO THE STORM DRAIN SYSTEM

- The number of rerouted connections.
- The number of dry weather monitoring activities performed.
- Whether or not an inventory and prioritization of potential connection sites was completed.
- The number of field tests conducted in high-risk areas.
- The number of unwarranted connections reported.
- The number of unwarranted connections found.
- The number of unwarranted connections repaired/replaced.
- Whether or not an ordinance was developed for mandatory inspections of new buildings.
- The number of new buildings inspected.
- Changes in water quality at re-routed outfalls and high risk areas.

CONSTRUCTION SITE STORM WATER RUNOFF CONTROL

BMP INSPECTION AND MAINTENANCE

• The frequency of inspection and maintenance of BMPs.
• The number of failed storm water BMPs.
• The number of BMPs reported to be in need of repair.
• Whether or not an inventory of inspection and maintenance activities was created and is regularly maintained.

BRUSH BARRIER

• The number of brush barriers installed.
• The number of construction sites with brush barriers.
• The amount of sediment collected brush barriers.
• The frequency of inspection and maintenance of brush barrier installations.
• Suspended solids levels at the site outfall.

CHECK DAMS

• The number of check dams installed.
• The number of construction sites that have check dams.
• The reduction in runoff quantity.
• The frequency of inspection and maintenance of check dam installations.
• The amount of sediment collected.
• Suspended solids levels at the site outfall.

CHEMICAL STABILIZATION

• The number of personnel trained to apply chemicals.
• Suspended solids levels at the site outfall.
• The frequency of chemical reapplication.
• The number of construction sites that use chemical stabilization.

CONSTRUCTION ENTRANCES

• The frequency of inspection and maintenance of construction entrances.
• The amount of sediment collected at construction entrances.
• Suspended solids levels at the site outfall.
• Whether or not an ordinance was developed that requires special construction entrances.

CONSTRUCTION REVIEWER

• The number of trained inspectors.
• Whether or not an ordinance was developed requiring that sites be inspected.
• The number of inadequate sites/plans reported by inspectors.
• The number of non-compliant permits reported.

CONSTRUCTION SEQUENCING

• Whether or not an ordinance was developed that requires construction sequencing.
• The number of construction sites that practice sequencing.
• Suspended solids levels at the site outfall.

CONTRACTOR CERTIFICATION AND INSPECTOR TRAINING

- The number of certified contractors.
- The number of training and certification programs offered.
- Whether or not an ordinance requiring certification was developed.
- Whether or not an incentives program for certified contractors and inspectors was developed.
- The number of certified inspectors.
- The number of sites inspected.
- Changes in water quality at inspected sites.

DUST CONTROL

- Suspended solids levels at the site outfall or in nearby receiving waters.

FILTER BERMS

- The number of filter berms installed.
- The number of construction sites with filter berms.
- The frequency of inspection and maintenance of filter berms.
- Suspended solids levels at the site outfall.

GENERAL CONSTRUCTION SITE WASTE MANAGEMENT

- Whether or not an ordinance was developed to ensure that all regulations are followed for material storage, disposal, etc.
- Water quality at the site outfall.
- The frequency of inspection and maintenance activities.

GEOTEXTILES

- The number of geotextile installations at construction sites.
- The number of construction sites that use geotextiles.
- The frequency of inspection and maintenance of geotextile installations.
- Suspended solids levels at the site outfall.

GRADIENT TERRACES

- The number of gradient terrace installations at construction sites.
- The number of construction sites that use gradient terraces.
- The frequency of inspection and maintenance of gradient terraces.
- Suspended solids levels at the site outfall.

GRASS-LINED CHANNELS

- The number of grass-lined channels installed.
- The number of construction sites that use grass-lined channels.
- The frequency of inspection and maintenance of grass-lined channels.
- The reduction in runoff quantity.
- Water quality at the site outfall.

LAND GRADING

- The number of construction sites that use better land grading practices.
- Suspended solids levels at the site outfall.

MODEL ORDINANCES

- Whether or not an ordinance was developed to address construction site runoff control.
- The number of enforcement actions taken.
- The number of stop work orders given.
- The number of bonding requirements set.

MULCHING

- The amount of exposed soils protected with mulch.
- The number of construction sites that use mulching.
- Suspended solids levels at the site outfall.

PERMANENT DIVERSIONS

- The number of permanent diversions installed.
- The number of construction sites that use permanent diversions.
- The amount of runoff reduced.
- The frequency of inspection and maintenance of permanent diversions.
- Water quality at the site outfall.

PERMANENT SEEDING

- The amount of seeded area.
- The number of construction sites that use permanent seeding.
- The frequency of inspection and maintenance of seeded areas.
- Suspended solids levels at the site outfall.

PRESERVING NATURAL VEGETATION

- The amount of naturally vegetated land area preserved.
- The number of construction sites that preserve natural vegetation.
- Whether or not an ordinance was developed that requires that some natural vegetation be preserved at construction sites.
- Water quality at the site outfall.

RIPRAP

- The number of riprap installations.
- The number of construction sites that use riprap.
- Suspended solids levels at the site outfall.
- The frequency of inspection and maintenance of riprap installations.
- The reduction in runoff velocity.

SEDIMENT FILTERS AND SEDIMENT CHAMBERS

- The number of sediment filters and chambers installed.
- The number of construction sites that use sediment filters and chambers.
- The frequency of inspection and maintenance of sediment filters and chambers.
- Water quality at the site outfall.
- The acreage of disturbed land that drains to sediment filters and chambers.
- The amount of sediment collected in filters and chambers.

SEDIMENT TRAPS
• The number of sediment traps installed.
• The number of construction sites that use sediment traps.
• The amount of sediment collected in sediment traps.
• Suspended solids levels at the site outfall.
• The frequency of inspection and maintenance of sediment traps.

SEDIMENT BASINS AND ROCK DAMS
• The number of sediment basins and rock dams installed.
• The number of construction sites that use sediment basins and rock dams.
• The amount of sediment collected in sediment basins.
• Suspended solids levels at the site outfall.
• The frequency of inspection and maintenance of sediment basins and rock dams.

SILT FENCE
• The amount of silt fence installed.
• The number of construction sites that use silt fences.
• The amount of sediment collected by silt fences.
• The frequency of inspection and maintenance of silt fences.
• Suspended solids levels at the site outfall.

SODDING
• The amount of disturbed land protected by sod installations.
• The number of construction sites that use sodding.
• The frequency of inspection and maintenance of sod installations.
• Suspended solids levels at the site outfall.

SOIL ROUGHENING
• The amount of disturbed land protected by soil roughening.
• The number of construction sites that use soil roughening.
• Suspended solids levels at the site outfall.

SOIL RETENTION
• The number of soil retaining structures installed.
• The number of construction sites with soil retaining structures.
• Suspended solids levels at the site outfall.
• The frequency of inspections to ensure that no erosion is occurring.

SPILL PREVENTION AND CONTROL PLAN
• The number of reported spills.
• Whether or not an ordinance for storage of high-risk chemicals was developed.
• The number of personnel trained in spill response.

STORM DRAIN INLET PROTECTION
• The number of storm drain inlets protected.
• The number of construction sites that use storm drain inlet protection.
• The amount of sediment collected.

• Suspended solids levels at the site outfall.
• The frequency of inspection and maintenance of storm drain inlets.

TEMPORARY DIVERSION DIKES

• The number of temporary diversion dikes installed.
• The number of construction sites that use temporary diversion dikes.
• The reduction in runoff quantity at the site outfall.
• Suspended solids levels at the site outfall.
• The amount of sediment collected by temporary diversion dikes outfall.

TEMPORARY SLOPE DRAIN

• The number of temporary slope drains installed.
• The number of construction sites that have temporary slope drains.
• Suspended solids levels at the site outfall.
• The frequency of inspection and maintenance of temporary slope drains.

TEMPORARY STREAM CROSSINGS

• The number of temporary stream crossings installed.
• The frequency of inspection and maintenance of temporary stream crossings.
• Suspended solids levels at the site.

VEGETATED BUFFER

• The number of vegetated buffers installed.
• The number of construction sites with vegetated buffers.
• Changes in water quality of runoff leaving buffer areas.
• The reduction in runoff quantity.
• The frequency of inspection and maintenance of vegetated buffers.

VEHICLE MAINTENANCE AND WASHING AREAS

• Water quality at the site outfall.
• Whether or not construction vehicles are regularly inspected.
• The number of vehicle wash areas on-site.
• The number of construction sites with designated vehicle maintenance and washing areas.

WIND FENCES AND SAND FENCES

• The number of fences installed.
• The number of construction sites that use fences.
• The frequency of inspection and maintenance of wind and sand fences.
• Suspended solids levels at the site outfall.

POST CONSTRUCTION STORM WATER RUNOFF CONTROL IN NEW DEVELOPMENT / REDEVELOPMENT

ALTERNATIVE TURNAROUNDS

• The reduction in impervious cover.
• The number of turnarounds modified.
• Whether or not development codes were changed to allow alternative turnarounds.
• The reduction in runoff quantity.
• Changes in the physical characteristics of streams downstream from modified areas.

ALTERNATIVE PAVERS

• Whether or not development codes were changed to allow for alternative pavers.
• The amount of new alternative paver installations added or replaced.
• The number of new development sites that use alternative pavers.
• The reduction in runoff quantity.
• Changes in the physical characteristics of streams downstream from areas with alternative paver installations.

ALUM INJECTION

• Whether or not an inventory of sites where alum injection was used was completed.
• Changes in water quality.
• Changes in biological populations.

BIORETENTION

• The reduction in impervious cover.
• The reduction in runoff quantity.
• Changes in runoff water quality (nutrients, sediments, metals, organics, etc.).
• The number of new bioretention cells installed (both commercial and residential).
• The number of acres that are drained by bioretention cells.

BMP INSPECTION AND MAINTENANCE

• The frequency of inspection and maintenance activities.
• The number of problems that were identified and remedied.
• The change in the proportion of BMPs that are well-maintained as a result of inspection and maintenance.
• Whether or not an inventory of BMPs requiring maintenance was completed and is regularly updated.
• Changes in water quality of effluent from BMPs.

BUFFER ZONES

• Whether or not development codes were changed to require buffer zones.
• The acreage of land conserved as buffers.
• The acreage of land converted to buffers.
• Changes in water quality of runoff leaving buffer areas.
• Changes in the physical characteristics of streams downstream from areas with buffer zones.
• The frequency of inspections and maintenance activities in buffer zones.
• The acreage that drains to buffer zones.

CATCH BASIN
• Whether or not an inventory of catch basins was completed.
• The number of catch basins retrofitted with filtering devices.
• The quantity of sediment removed from catch basins.

CONSERVATION EASEMENTS
• The acreage of land conserved under easements.
• Whether or not an inventory of lands that could be conserved with conservation easements was completed.

DRY EXTENDED DETENTION PONDS
• The reduction in runoff quantity.
• Changes in water quality of effluent from the dry pond outlet.
• The number of new dry ponds installed.
• The acreage of land drained by dry ponds.

ELIMINATING CURBS AND GUTTERS
• Whether or not development codes were changed.
• The reduction in runoff quantity.
• The number of new developments without curbs and gutters.
• The number of curb cuts made in existing developments.
• The number of miles of gutterless streets.

GRASSED SWALES
• The number of new grassed swales installed.
• The miles of streets with grassed swales.
• The reduction in runoff quantity.
• The reduction in runoff velocity.
• Changes in water quality of runoff from areas with grassed swales.
• The number of acres drained by grassed swales.

GRASSED FILTER STRIP
• The number of new grassed filter strips installed.
• The miles of streets with grassed filter strips.
• The reduction in runoff quantity.
• The reduction in runoff velocity.
• Changes in water quality of runoff from areas with grassed filter strips.
• The number of acres drained by grassed filter strips.

GREEN PARKING
• Whether or not development codes were changed to allow green parking.
• The number of new green parking lots installed.
• The reduction in runoff quantity.
• The number of impervious acres served by green parking lots.
• The number of impervious lots converted to green lots.

IN-LINE STORAGE
• The reduction in peak flow of runoff.
• The number of basins retrofitted with flow regulators.
• The acreage drained by in-line storage systems.

INFILTRATION BASIN
• The reduction in runoff quantity.
• Changes in water quality.
• The number of new infiltration basins installed.
• The acreage drained by infiltration basins.

INFILTRATION TRENCH
• The reduction in runoff quantity.
• Changes in water quality.
• The number of new infiltration trenches installed.
• The acreage drained by infiltration trenches.

INFRASTRUCTURE PLANNING
• Whether or not development codes were modified.
• The number of new developments using storm water BMPs.
• The reduction in impervious surface area and infrastructure.

MANUFACTURED PRODUCTS FOR STORM WATER INLETS
• Whether or not an inventory of areas where installation of manufactured products would be appropriate was completed.
• Whether or not a review was conducted to identify which products would be best for each inlet.
• The number of manufactured products installed in storm water inlets.
• Changes in water quality.

NARROWER RESIDENTIAL STREETS
• Whether or not development codes were modified.
• The reduction in impervious surface area.
• The number of new developments that use narrow streets.
• The number of miles of narrow streets.

ON-LOT TREATMENT
• The reduction in runoff quantity.
• The reduction in runoff peak flow.
• The number of lots that use on-lot treatment.
• The acreage of impervious surfaces that drain to on-lot treatment BMPs.
• The number of manufactured products sold to store runoff on-site (i.e., rainbarrels).
• Changes in water quality downstream from areas that use on-lot treatment.

OPEN SPACE DESIGN
• Whether or not development codes were modified to accommodate open space developments.
• The number of new developments that use open space design principles.
• The number of acres of open space preserved with open space design.

ORDINANCES FOR POSTCONSTRUCTION RUNOFF

- Whether or not an ordinance was developed to address post-construction runoff.
- The projected amount of impervious cover reduced under the new ordinance.
- The number of enforcement actions that occur as a result of the new ordinance.

POROUS PAVEMENT

- Whether or not development codes were modified to allow for porous pavement.
- The amount of new porous pavement added or replaced.
- The number of new development sites that use porous pavement.
- The reduction in runoff quantity.
- Changes in the physical characteristics of streams downstream from areas with porous pavement installations.

SAND AND ORGANIC FILTERS

- Changes in water quality.
- The reduction in runoff quantity.
- The number of new sand and organic filters installed.
- The acreage of impervious surface that drains to sand and organic filters.

STORM WATER WETLAND

- Changes in water quality.
- The reduction in runoff quantity.
- The number of storm water wetlands created.
- The acreage of impervious surface that drains to storm water wetlands.

URBAN FORESTRY

- Whether or not development codes were modified to promote urban forestry.
- Whether or not an ordinance was developed to promote urban forestry.
- The number of trees planted as a result of urban forestry initiatives.
- The acreage of treed land.
- The reduction in runoff quantity.
- Changes in water quality.
- The acreage of forest habitat created.
- Aesthetic and shade benefits.

WET PONDS

- Changes in water quality.
- The reduction in runoff quantity.
- The number of wet ponds installed.
- The acreage of impervious surface that drains to wet ponds.

ZONING

• Whether or not development codes were modified.
• The amount of open space protected with new zoning codes.
• The projected number of new storm water treatment areas expected under the new zoning codes.
• The projected number of upgrades to existing storm water facilities expected as a result of changes in expected development density.

POLLUTION PREVENTION/GOOD HOUSEKEEPING FOR MUNICIPAL OPERATIONS

ALTERNATIVE PRODUCTS

• The number of educational materials distributed.
• The number of consumers surveyed who have increased their use of alternative products.

ALTERNATIVE DISCHARGE OPTIONS FOR CHLORINATED WATER

• Whether or not an ordinance was developed to prevent direct discharge of chlorinated water.
• The number of pool owners informed of the options for discharging chlorinated water.
• Chlorine levels in receiving waters.
• The number of enforcement actions pertaining to pool water discharges.

AUTOMOBILE MAINTENANCE

• The number of employees trained in preventing pollution from automobile maintenance activities.
• The number of sites rewarded as being a "clean site" under a rewards program.
• The number of spills reported.
• The number of educational materials distributed at garages, auto shops, and other automobile-related businesses.

HAZARDOUS MATERIALS STORAGE

• The number of regularly inspected storage units.
• The number of employees trained in hazardous material storage and maintenance.
• The total number of storage facilities equipped to store hazardous materials.
• The level of toxic pollutants in receiving waters.
• The number of materials distributed educating citizens on home storage of hazardous materials.

ILLEGAL DUMPING CONTROL

• Whether or not areas where illegal dumping is common were identified.
• The number of "no dumping" signs posted.
• The number of educational materials distributed.
• The number of reports of illegal dumping received.
• The number of dump sites cleaned up.
• The number of sites improved to eliminate them as target dumping spots.
• The number of enforcement actions pertaining to illegal dumping.
• Whether or not a partnership with the community was established to promote reporting and to educate citizens.

LANDSCAPING AND LAWN CARE

• The number of stores/gardens participating in education program.
• The number of people trained in safe landscaping, lawn care, and pest management techniques.
• The number of classes/seminars offered in landscaping and lawn care.
• The number of educational materials distributed.
• Whether or not a survey of lawn and landscaping methods used by the community was conducted.

MATERIALS MANAGEMENT
- The number of facilities storing hazardous materials.
- The frequency of inspection and maintenance visits to storage facilities.
- The number of personnel trained in hazardous material handling and storage.
- The amount of waste generated by municipal operations.
- Whether or not an inventory of hazardous materials was created for each storage facility.

PARKING LOT AND STREET CLEANING
- Whether or not roads and parking lots were inventoried and prioritized for cleaning.
- The number of scheduled road cleanings.
- The suspended solids levels in runoff.
- The pounds of debris collected from street sweeping.

PEST CONTROL
- The number of businesses participating in education at the point of purchase.
- The number of municipal employees trained in integrated pest management.
- Pesticide levels in runoff and receiving waters.
- The number of educational materials distributed.

PET WASTE COLLECTION
- The number of dog parks.
- The number of signs posted stating regulations.
- The number of educational materials distributed.
- The number of "pooper-scooper" stations installed.
- Whether or not an ordinance was created to address pet waste.

ROAD SALT APPLICATION AND STORAGE
- The number of storage facilities included in a regular inspection and maintenance program.
- The number storage facilities repaired.
- The number of employees trained in road salt application.
- The quantity of salt applied to roadways.
- The quantity of alternative products used.
- The water quality at outfalls near downstream of storage facilities.

ROADWAY AND BRIDGE MAINTENANCE
- Whether or not a current list of roadway and bridge construction is maintained.
- The quantity of debris removed from construction sites.
- The number of employees trained in pollution prevention techniques.
- The amount of deicing salts used.
- The number of catch basins at constructions sites that are cleaned regularly.

SEPTIC SYSTEMS CONTROLS
- The number and location of septic systems.
- The number of systems that are inspected and maintained regularly.
- The number of reminder and educational flyers distributed.

• The number of people trained in inspection and installation of septic systems.
• The number of failed septic systems.

SPILL RESPONSE AND PREVENTION

• Whether or not an inventory of municipal facilities at risk for spills was created.
• The number of leak detection devices installed at municipal facilities.
• The number of preventative maintenance procedures performed on tanks, valves, pumps, pipes, and other equipment.
• Whether or not a spill response plan was developed for municipal facilities.
• The number of personnel trained in spill response.
• The number of regularly inspected high-risk facilities.
• The number of educational materials distributed to municipal employees.

STORM DRAIN SYSTEM CLEANING

• Whether or not areas with high pollutant loadings were inventoried and prioritized for cleaning.
• The length of storm drain pipe cleaned regularly.
• The number of outfalls cleaned regularly.
• The amount of trash, sediment, and other pollutants removed during cleaning.
• Water quality at storm drain system outfalls.

USED OIL RECYCLING

• The number of gallons of used oil collected from municipal operations.
• The number of recycling facilities that collect oil from municipal operations.
• The number of educational materials distributed to municipal employees.

VEHICLE WASHING

• The number of educational materials distributed to municipal employees.
• The number of designated municipal vehicle washing areas.