

AASHTO PRACTITIONER'S HANDBOOK

13

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DEVELOPING AND IMPLEMENTING A STORMWATER MANAGEMENT PROGRAM IN A TRANSPORTATION AGENCY

State departments of transportation (DOTs) face increasing pressure to reduce pollution in their stormwater discharges. This handbook provides recommendations for developing and implementing an effective stormwater management program to help comply with National Pollutant Discharge Elimination System (NPDES) regulations.

Issues covered in this handbook include:

- Development and implementation of a stormwater management program;
- Clean Water Act (CWA) and the NPDES program;
- State and local stormwater regulations;
- Conducting a Program Effectiveness Assessment (PEA);
- Developing a stormwater management plan (SWMP);
- Public education and outreach;
- Construction site stormwater compliance;
- Integrating Best Management Practices (BMPs) into transportation project delivery;
- Roadway maintenance stormwater practices and NPDES compliance;
- Total Maximum Daily Loads (TMDLs) and other special requirements; and
- Important stormwater management terms.

The Center for Environmental Excellence by AASHTO produces the Practitioners' Handbooks. The handbooks provide practical advice on a range of environmental issues that arise during the planning, development, and operation of transportation projects.

Each handbook is developed by the Center in cooperation with an advisory group that includes representatives of the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), state DOTs, and other agencies as appropriate.

The handbooks are primarily intended for use by program and project managers and others who are responsible for coordinating compliance with a wide range of regulatory requirements. With their needs in mind, each handbook includes:

- A background briefing;
- Key issues to consider; and
- Practical tips for achieving compliance.

In addition, key regulations, guidance materials, and sample documents for each handbook are posted on the Center's web site at <http://environment.transportation.org>



Center for Environmental Excellence by AASHTO



American Association of State Highway and Transportation Officials

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Overview



The purpose of this handbook is to assist transportation agencies in developing and/or implementing a stormwater management program that satisfies the requirements of the Clean Water Act¹ (CWA). For agencies that already have a functioning stormwater management program, this handbook provides useful tips and transportation specific references to assist program implementation.

Throughout this handbook, the terms “stormwater management program” and “stormwater management plan” (SWMP) are used. The term “stormwater management program” refers to the entire program implemented by a transportation agency to comply with their National Pollutant Discharge Elimination System² (NPDES) permit(s) for stormwater discharges. The term “SWMP” refers to a specific document that describes the framework for implementation of the stormwater management program for the agency.

The NPDES program was developed to implement the requirements of the CWA. The 1987 amendments to the CWA required that municipal separate storm sewer systems³ (MS4s), including those owned by transportation agencies (i.e., DOTs and transit agencies), obtain stormwater permits, effectively designating them as “point source” discharges.

The U.S. EPA implemented the NPDES program in two phases depending on the population of the municipality. Transportation agencies are considered a “municipal” permittee even though a population metric does not apply. Accordingly, all transportation agencies are covered by either a Phase I or a Phase II NPDES permit for stormwater discharge. Many transportation agencies are entering into a fourth round of Phase I permits that are issued on a five-year cycle; however, some transportation agencies have entered the permitting system relatively recently under Phase II of the program. The agency may be covered by multiple Phase I or Phase II permits by geographic region, either individually or as a co-permittee with other agencies or municipalities, and the requirements in each permit may vary.

Compliance with stormwater NPDES permits is a requirement under federal law, but a well-designed stormwater management program also benefits a state highway system by supporting sustainability goals and reducing infrastructure costs:

- Use of vegetated conveyances can reduce capital as well as operation and maintenance (O&M) costs.
- Open-graded friction course overlays may improve water quality and safety; future permeable pavement systems could enhance these benefits further.
- Programs such as sweeping and trash pickup provide program benefits for safety and aesthetics, as well as NPDES program compliance.
- Reduction of pesticide use reduces chemical, training, and personnel costs.

Implementation of a stormwater management program will also have substantial environmental benefits. The National Research Council notes that urban runoff is one of the primary sources of pollution in surface waters⁴. Environmental benefits of highway stormwater quality enhancement include:

- Maintenance of beneficial uses of receiving waters;
- Maintenance or improvement of riparian habitat;
- Aesthetic improvements of waterways by reducing trash;

1 Clean Water Act: <http://www.epa.gov/lawsregs/laws/cwa.html>.

2 <http://www.epa.gov/npdes>.

3 <http://www.epa.gov/npdes/stormwater/municipal>.

4 National Research Council. *Urban Stormwater Management in the United States*. October 15, 2008, Washington, DC. pp. 18–20.

- Recharge of local aquifers through increased infiltration; and
- Reduced flood potential in conveyances.

The U.S. National Environmental Policy Act (NEPA) of 1969 declared a national policy to "create and maintain conditions under which [humans] and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."⁵ Stormwater quality programs not only include the environmental benefits noted above, but are also a part of a program for sustainability through water conservation, habitat preservation, and preservation of surface water hydrology.

Stormwater compliance programs may also have implications for the impacts of climate change. U.S. EPA climate models predict that the average temperature at the Earth's surface could increase from 3.2 to 7.2°F above 1990 levels by the end of this century. The temperature increase could cause changes in precipitation patterns.⁶ Highways that incorporate stormwater quality features for conveyance may be better able to adapt to climate change. For example, vegetated channels may be able to convey surface flows while surcharged, with less flooding on adjacent facilities, and they can be modified with less cost compared to underground and open channel systems with rigid linings.

This handbook provides information on the NPDES program and the basic requirements for creating a stormwater management program for a state DOT to comply with federal regulations. The federal regulations require six minimum measures in the development of a stormwater management program. The six minimum measures are shown in Table 1. Many states have additional clean water regulations beyond the requirements described here; however, the basic framework provided will support and be consistent with state-specific requirements. Stormwater regulations are state-specific, and it is important to understand local requirements when developing and implementing an agency stormwater management program. This handbook also provides information to assist in implementing a SWMP if one has already been developed.

TABLE 1. SIX MINIMUM MEASURES WHEN CREATING A STORMWATER MANAGEMENT PROGRAM		
1. Public Education and Outreach	3. Illicit Discharge Detection and Elimination	5. Post Construction Runoff Control
2. Public Participation/Involvement	4. Construction Site Runoff Control	6. Pollution Prevention/Good Housekeeping Practices

5 <http://www.epa.gov/sustainability/basicinfo.htm>.

6 <http://www.epa.gov/climatechange/basicinfo.html>.

Background Briefing

Clean Water Act

The Clean Water Act (formerly the Federal Water Pollution Control Act) was instituted by the U.S. EPA in 1972 to protect the nation's waters. As the primary federal law governing water pollution, the CWA employs a number of regulatory and non-regulatory tools to reduce discharge of pollutants into waters of the United States, thereby ensuring these waters are habitable for plants and wildlife and are safe for human activities. Water protection under the CWA covers point sources, such as industrial, municipal, and some agricultural facilities, but excludes nonpoint sources such as forestry and return flows from agriculture. The CWA uses a water quality approach with technology-based standards to protect receiving water quality.

Federal environmental regulations based on the CWA have evolved to require the control of pollutants from MS4s, construction sites, and industrial activities. Discharges from such sources were brought under the NPDES permit process by the 1987 CWA amendments and the subsequent 1990 promulgation of stormwater regulations by the U.S. EPA.

Under the federal stormwater regulations, a transportation agency's properties, facilities, and activities fall under the jurisdiction of NPDES stormwater regulations for two primary reasons:

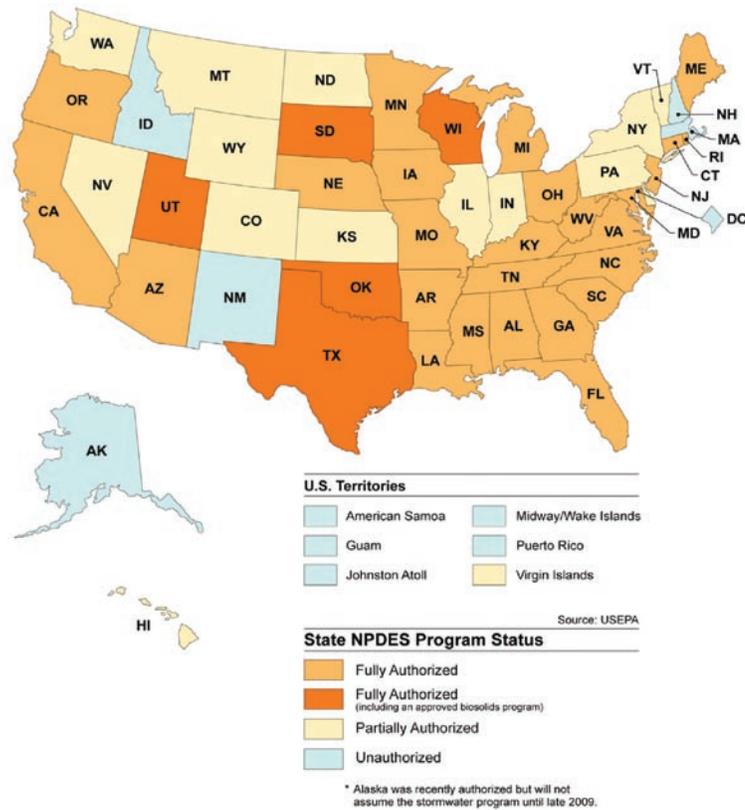
- Highways, highway-related properties, transit facilities, and activities are served by storm drain systems, which are often connected to, and are considered comparable to, urban MS4s covered explicitly in the federal stormwater regulations.
- Construction of highways and transit and related facilities often results in soil disturbance of areas greater than one acre, for which specific requirements are prescribed by the federal stormwater regulations.

The Code of Federal Regulations⁷ (CFR), 40 CFR 122.26(a)(iii) and (iv), requires that NPDES stormwater permits be issued for discharges from large, medium, and designated small MS4s. The regulations define the term "MS4" to mean "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned or operated by a state, city, town, borough, county." Each DOT, as the owner and operator of an MS4, is subject to an NPDES MS4 permit in those areas as specified under federal regulation.

Delegated Authority

Most states are authorized to some degree to implement the NPDES program under "delegated authority" from the U.S. EPA. These states have authority to regulate surface water runoff that may affect receiving water quality. Figure 1 shows the status of states and territories to implement the program.

⁷ Code of Federal Regulations: <http://ecfr.gpoaccess.gov/>.



Source: U.S. EPA

Figure 1. State NPDES Program Status

Environmental Management Systems

There is a continuing emphasis on transportation agencies to practice environmental stewardship in all facets of their operations—from planning through routine maintenance. Environmental stewardship means making decisions and conducting operations in a manner to protect and improve the environment. An Environmental Management System (EMS) directly supports environmental stewardship by providing the means to routinely and consistently consider (not just on a project-by-project basis) environmental effects and requirements in transportation decision-making as well as day-to-day activities. Elements of an EMS have been developed by AASHTO and other government and private-sector organizations. The elements of an EMS are similar to a stormwater management program, and its elements can be integrated into an agency's EMS if one is in place. The AASHTO Practitioner's Handbook #8, "Developing and Implementing an Environmental Management System in a State Department of Transportation"⁸ gives an overview of EMS systems.

8 AASHTO Practitioner's Handbook #8 is available at http://environment.transportation.org/center/products_programs/practitioners_handbooks.aspx.

NPDES Program Requirements

The Clean Water Act amendments of 1987 required the control of pollution in stormwater. The U.S. EPA developed the NPDES permit system (in part) to regulate stormwater quality from publicly owned storm drain systems. The NPDES permit system was implemented in two Phases, I and II, generally for municipalities that serve greater than and less than 100,000 people respectively. Transportation agencies were generally designated as “Phase I” entities and were required to apply for and receive an NPDES permit for stormwater discharges from their storm drain systems; however, some agencies were designated “Phase II” entities.

Phase I stormwater management programs are generally more mature and sophisticated than Phase II programs and may have additional requirements, since they were permitted several years prior to the Phase II programs. Whether the agency operates under a Phase I or Phase II permit is becoming less important, and program requirements between the two phases are proceeding towards parity. Stormwater NPDES permits require the development of a SWMP or similar type of document describing how the permittee will comply with CWA regulations. NPDES permits are reissued every five years. Permitting agencies are expected to notify the public of proposed permits and include a public comment period during the permit reissuance process.

State Regulations

Some states have enacted environmental laws that regulate stormwater. State law cannot preempt federal law unless the state law is more environmentally protective. In addition, state law may regulate waters that are not federally regulated, such as isolated wetlands. It is important to understand state law as it pertains to stormwater quality regulation and make sure that the state’s stormwater management program meets applicable requirements. The U.S. EPA retains authority for the regulation of tribal lands relative to NPDES Permits in most states but there are exceptions, such as the state of Maine, which has NPDES authority over two tribes. A list of state environmental links for further information can be found on the AASHTO website.

Local Regulations

NPDES stormwater permits often require transportation agencies to coordinate with adjacent NPDES permittees (generally municipalities) to enhance their programs’ effectiveness and ensure that stormwater quality approaches are compatible. There is no requirement for transportation agencies to adopt or adhere to local (municipal) water quality standards, but agencies working in partnership with municipalities can leverage program elements and funds to increase program effectiveness compared to independent program implementation. Examples are provided under Practical Tip #1, Public Education and Outreach.

NPDES Program Elements

Stormwater management programs developed to comply with NPDES requirements generally include some combination of the following elements:

- **Management and Organization.** Addresses legal authority (i.e., airspace leases, permit activities in the agency right-of-way), access control, budget, and departmental policy related to stormwater quality management. This element also describes the organizational structure of the agency and the functional structure and responsibilities for stormwater management within the organization.
- **Monitoring and Discharge Characterization Program.** A program consisting of planned activities to assess the quality of stormwater discharging from roads, highways, and other transit facilities. This element also provides information for runoff water quality prioritization and improvement. This includes identifying outfalls and characterizing their discharges.
- **Project Planning and Design.** Best Management Practices (BMPs) and other stormwater management program elements are incorporated into transportation projects during the early planning and design phases of the project.
- **Construction.** This element describes compliance with Stormwater Pollution Prevention Plan (SWPPP) development and approval responsibilities, construction notifications, inspection of construction projects, and any other technical requirements of the state or federal construction general permit.

- **Roadway Maintenance Activities.** These activities include roadway and transit facility maintenance activities that affect stormwater, the BMPs used to prevent and control pollution and routine surveillance and inspection activities to ensure water quality is protected.
- **Facility Operations.** This includes the pollution prevention techniques, maintenance activities, and other SWPPP elements at the agency's maintenance facilities (such as material storage areas and maintenance yards).
- **Non-Departmental Activities.** These activities include stormwater compliance of non-departmental activities, including construction activities by private entities that encroach on the agency's property, third-party facility operations on leased parcels, and other third-party activities.
- **Non-Stormwater Activities/Discharges.** This includes discharges other than stormwater as defined by the NPDES permit including accidental spills, illegal connections, illegal dumping, and authorized discharges.
- **Training.** This element includes the training program and plans for training of staff and contractors.
- **Public Education and Participation.** This comprises the framework and future plans to communicate with, involve in the program, and inform the public about stormwater protection.
- **Location-Specific Activities.** Location-specific activities are undertaken to address regional stormwater requirements including involvement with the implementation of Total Maximum Daily Loads (TMDLs).
- **Program Evaluation.** Evaluations are conducted for compliance with all the stormwater management program requirements, including construction and maintenance field activities.
- **Measurable Objectives.** This includes the objectives, activities, and implementation tasks that are to be performed to achieve stated stormwater management program goals.
- **Reporting.** Transportation agencies report on applicable elements of the SWMP, including the annual report, and possibly work plans, proposed SWMP modifications, and noncompliance incidents.

The U.S. EPA supports public and private organizations joining forces to create multi-jurisdictional partnerships to focus on surface water pollution on a watershed basis. Objectives of the watershed approach are restoration, maintenance, and protection of water resources in the United States. Transportation agency stormwater management programs may include an element to develop partnerships with other agencies in common watersheds.

Program Effectiveness Assessment

Assessment of the stormwater management program effectiveness is generally done on an annual basis for each of the NPDES program elements. The U.S. EPA does not have strict guidelines for effectiveness assessment but promotes the incorporation of measurable goals to assess implementation progress and effectiveness. The California Stormwater Quality Association (CASQA) has developed a formalized method of stormwater management program effectiveness assessment. A collection of tools is applied to each program element using a tiered assessment framework that promotes evaluation on progressively higher "outcome" levels as the stormwater management program matures. This results in an adaptive assessment method that can be used to continually improve program performance.

The effectiveness assessment measures the programmatic and/or environmental impacts of the stormwater management program, and it is conducted to determine if the various programs and/or activities are resulting in the desired outcomes. The assessment identifies the outcome level(s) achieved, the outcomes level(s) that may be achieved in the future, and beneficial program modifications.

As illustrated in Figure 2, CASQA defines six outcome levels for the effectiveness assessment. The outcome levels help to categorize and describe the desired results or goals of the program. The ultimate goal of the stormwater management program is the protection and improvement of water quality, which is measured with outcome Levels 5 and 6. In general, Levels 1, 2, 3, and 4 can be considered Implementation Outcomes, and Levels 5 and 6 can be considered Water Quality Outcomes.



Figure 2. Program Effectiveness Assessment⁹

The outcome levels assist in categorizing and gauging the performance of the stormwater management program. Important points to consider about effectiveness assessments include:

- The ability of a stormwater management program to assess an outcome level tends to become progressively more difficult as one moves up the pyramid (e.g., Level 4 is more difficult to assess than Level 2). This is primarily because the upper levels of the pyramid assess the impact of the program on water quality, which requires a much more robust dataset over an extended period.
- Levels 1 through 3 are typically assessed using program management data, whereas Levels 4 through 6 are assessed using physical and/or water quality monitoring data. Levels 1 through 3 are more appropriate for program elements such as management and organization, training, public participation, and education.
- Each major NPDES program element (e.g., illicit discharge identification and elimination, public education, etc.) can be assessed at one or more outcome levels based on the data and information available.
- Outcome Levels 5 and 6 are used to assess the effectiveness of the overall stormwater management program; however, it is difficult to correlate the implementation of the program to changes that may be observed in runoff or receiving water quality. Therefore, these types of assessments are conducted less frequently, and they require a more robust dataset than Outcome Levels 1–4. The stormwater contribution of highways and transit related facilities within a given watershed is difficult to assess and instead may need to be evaluated in the context of other stormwater contributions within the watershed.

Stormwater Management Plan

A Stormwater Management Plan (SWMP) describes the DOT’s program and addresses stormwater pollution control related to DOT activities, including planning, design, construction, and operation and maintenance of roadways and facilities. For municipal-type discharges, the SWMP provisions control pollutants to the maximum extent practicable (MEP) as required by the CWA. MEP is generally considered to be based on factors such as technical feasibility and related costs to achieve measurable environmental benefits. The SWMP is designed to include an iterative process of use, evaluation, and modification/retrofitting of BMPs to provide continuing progress toward protecting water quality and achieving compliance with receiving water standards. It is good practice to prepare the SWMP in collaboration with the U.S. EPA and/or the state regulatory agency.

⁹ California Stormwater Quality Association, 2007.

As required by the CWA, for construction activities, the SWMP requires implementation of BMPs to reduce or eliminate toxic pollutants using Best Available Technology Economically Achievable (BAT) and implementation of BMPs to reduce or eliminate conventional pollutants using Best Conventional Pollutant Control Technology (BCT). This generally refers to a suite of BMPs that have been found through experience to be effective in controlling construction site runoff water quality.

The SWMP addresses responsibilities within the agency for implementing stormwater management procedures and practices including the six minimum measures, monitoring, program evaluation, and reporting activities. The SWMP may include other procedures for regional, local, or site-specific concerns. The SWMP addresses discharges resulting from stormwater (i.e., those discharges originating from precipitation events, including snowmelt). In addition, the SWMP addresses certain discharges that meet the definition of “non-stormwater discharges,” including illicit discharges, authorized non-stormwater discharges, and emergency response activities.

SWMP requirements apply to discharges exiting the site via BMPs and stormwater conveyances, including catch basins and drain inlets, curbs, gutters, ditches, channels, and storm drains within the agency’s system. The SWMP may apply to discharges consisting of stormwater and non-stormwater resulting from the following:

- Maintenance and operation of state-owned highways, freeways, rails, and roads;
- Maintenance facilities;
- Other facilities with activities that have the potential for discharging pollutants;
- Permanent discharges from subsurface dewatering;
- Temporary dewatering; and
- Construction activities.

The SWMP addresses discharges that originate within the agency right-of-way and are carried through municipal stormwater conveyance systems and flow into surface water bodies in the state. These surface water bodies include creeks, rivers, reservoirs, lakes, wetlands, lagoons, estuaries, bays, tributaries, and the ocean.

Key Issues to Consider

Program Framework

- Is there a stormwater management program in place that covers at least each of the six minimum measures?
- Have the jurisdictions with stormwater management programs affecting transportation facilities been identified to facilitate coordination?
- Is there a clear understanding of state and federal stormwater requirements applicable to transportation?
- Has a SWMP been developed?
- Has an analysis been performed to ensure there is adequate legal authority to implement the program?
- Has a management structure been developed to assign program responsibilities and delegation of authority?
- Are basic policies in place?

Program Resources and Funding

- Has a program fiscal analysis been prepared?
- Has an annual stormwater management program budget been prepared?
- Has a staffing analysis been prepared?
- Is there adequate staff with the proper training to implement the program, and are experienced consultants available to assist?
- Are there new requirements or changes in the NPDES permit or TMDLs that will require additional resources?
- Are there state and federal funding sources for transportation stormwater management programs available (such as grants)?

Program Implementation

- Are project stormwater requirements or considerations included in planning, project development, maintenance, and operations? Are there established water quality assessment guidelines?
- Is there a program for collaboration with other MS4s?
- Are there established BMP identification and selection procedures?
- Are highway occupancy permit activities or other third-party encroachments included?
- Has a staff training program been developed and implemented?
- Has an inventory of current practices been taken that could be used for stormwater management program credit?
- Is there regular, ongoing communication with upper management and across agency divisions to communicate stormwater management program requirements?

Program Operation and Maintenance

- Have maintenance protocols been developed for items such as inspection and maintenance of treatment BMPs, slope stabilization, storm drain system maintenance, and street sweeping?
- Have pollution prevention plans been developed for facilities such as maintenance yards?
- Have vegetation management programs been developed?
- Is a monitoring and reporting system in place to track operation and maintenance of treatment BMPs that have been constructed?

Compliance Pitfalls

- Are third-party activities in the right-of-way and air space leases included in the program?
- Does the program comply with the state or federal construction general permit (for stormwater)?
- Is an annual program report prepared that includes measurable objectives?
- Has a partnership been developed with state or federal regulators, and do they regularly attend agency meetings?
- Does upper level management understand the program and requirements?
- Is there a quality assurance/quality control (QA/QC) program in place for construction site and maintenance facility stormwater compliance?
- Is there competent in-house legal or contract legal staff with knowledge of stormwater and related regulations, especially CWA expertise?
- Are stormwater requirements included in Request for Proposals (RFPs) and contracts for construction projects? Such requirements could include inspection and maintenance requirements and penalties to ensure compliance (i.e., delayed or reduced payment).

BMP Retrofit

- Is there an established policy for retrofit of treatment BMPs?
- Are 303(d) listed waterbodies throughout the state being tracked and commented on in the listing process?
- Has a procedure been developed to compute the lifecycle cost of BMPs?

Practical Tips

This portion of the handbook provides practical tips for transportation agencies on implementing a stormwater management program. Subjects include the minimum expectations of the U.S. EPA and descriptions of how to address them using the structure of the six minimum measures introduced in the Overview. Since most states are authorized by the U.S. EPA to administer their own NPDES permit program, there is substantial variability in the precise expectations of each state's regulatory entity. For specific information, consult with the permitting authority.

In addition, stormwater permitting for transportation agencies is not consistent. Agencies may hold either Phase I or Phase II statewide permits. Stormwater management may be required on all projects statewide or just in urban areas. Some agencies are permitted by district or region, with each district possibly having unique requirements. Many agencies are co-permittees with local jurisdictions and have a lower level of responsibility for administering the permit. An agency may also be covered under multiple NPDES permits either alone, or as a co-permittee with other agencies or municipalities. Consequently, each agency needs to consider their specific situation regarding the level of implementation for the measures described below.

1 | Public Education and Outreach

The U.S. EPA believes that an informed and knowledgeable community is crucial to the success of a stormwater management program. Support for the program is improved as the public gains a better understanding of the reasons why it is needed. Compliance with the program is improved as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

Management Practices for Public Education

The most prominent area of public education is related to littering and illegal dumping along roadsides. Educating the public that these activities are illegal and detrimental to water quality helps to reduce their occurrence. The education activities can involve many types of media, including the preparation of brochures, fact sheets, television and radio ads, and websites that describe the impacts of these activities on water quality, what can be done to prevent and eliminate the activity, and the extra financial burden placed on taxpayers to clean up the roadside. Internet links to transportation agency outreach programs are included on the AASHTO website.

Public education and outreach can be made more effective by:

- Coordinating the outreach program with other permittees in the area. An anti-litter campaign will be far more effective if advertising is coordinated and the same message is used. Cigarette butts are a major component of trash along highways; programs may focus on this fact for increased effect.
- Repeating the message through various media (e.g., print, radio, television, internet, outdoor signage, etc.).
- Targeting the message to the intended audience. Identify the demographic in each region and tailor the message accordingly.
- Focusing on water quality needs by watershed.
- Assessing program effectiveness using the program effectiveness assessment tools.

2 | Public Participation and Involvement

The U.S. EPA encourages giving the public opportunities to play an active role in both the development and implementation of the stormwater management program. An active and involved community is crucial to the success of a stormwater management program, because it allows for:

- **Broader public support and improved program.** Citizens who participate in the development and decision-making process gain a stake in the program and therefore may be less likely to raise legal challenges to the program and more likely to take an active role in its implementation. In addition, incorporating the public's ideas will lead to a better program since obstacles will be acknowledged early on in the process and solutions can be found.
- **Shorter implementation schedules and improved program.** Disagreements and obstacles will be acknowledged early on in the process so that solutions can be found.
- **A broader base of expertise and economic benefits.** The community can be a valuable, and free, intellectual resource. Also important is providing an education and outreach program for staff, consultants, and contractors.

Management Practices for Public Participation

A variety of practices could be incorporated into a public participation and involvement program, for example:

- **“Adopt-a-Highway”.** These programs encourage individuals or groups to help remove litter and debris along road-sides and report illegal dumping.
- **Public meetings, workshops, and citizen panels.** These bring people and communities together to discuss various viewpoints and provide input concerning appropriate stormwater management policies and BMPs.

Public participation and involvement can be enhanced by:

- Identification of, and inclusion of all stakeholders early in the development of public documents such as the SWMP;
- Using professional facilitation at public meetings;
- Open communication with environmental non-governmental agencies (NGOs); and
- Providing feedback following public comment.

3 | Illicit Connection/Illegal Discharge (IC/ID)

Discharges from storm drains often include wastes and wastewater from non-stormwater sources. Illegal discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the storm drain system from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Although illicit system connections are a greater problem with municipal permit holders because of the more extensive and interconnected storm drain system, transportation agencies may encounter some of these problems as well.

Management Practices for IC/ID

Prepare a storm sewer system map showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls. The storm sewer system map is meant to demonstrate a basic awareness of the intake and discharge areas of the system. It determines the extent of discharged dry weather flows, their possible sources, and the particular waterbodies they may be affecting.

Develop a plan to detect and address non-stormwater discharges, including illegal dumping, into the storm drain system. The plan to detect and address illegal discharges is the central component of this minimum control measure. The plan is dependent upon several factors, including the available resources, size of staff, and degree and character of its illegal discharges. The four recommended steps of a plan are outlined below:

1. Locate problem areas;
2. Find the source;
3. Remove or correct illicit connections; and
4. Document actions taken.

IC/ID programs for transportation agencies are substantially different than those for municipalities, since there are relatively few opportunities for cross connections between storm drain and sewer systems, and because access to the right-of-way is generally controlled. Consequently, it may be appropriate for transportation agency IC/ID programs to focus on:

- **Illegal dumping.** Identify dumping “hotspots” and post signage, restrict access, and increase patrols.
- **Dry weather flow.** Dry weather flow is prohibited in many NPDES permits. Eliminate irrigation excess, and seal storm drain system pipe joints that receive ground water.
- **Training of personnel.** Instruct maintenance staff to inspect for water from concrete saws, surfactants from paving operations, grind dust, and material collected from sweepers and to not dispose of them in storm drains or waterways.
- **Homeless populations.** Homeless encampments can be a significant source of gross solids (trash) as well as cause sanitation quality problems. Eliminating or moving encampments from within the right-of-way will minimize gross solids from these sources.

Some of the most common examples of illegal discharges are non-stormwater activities that occur in highway maintenance yards that result in discharges to the storm drain system. The most prominent of these is the washing of agency vehicles and equipment in areas where the water drains to the storm drain system rather than to the sanitary sewer. Washing vehicles in covered areas so that wastewater drains to the sanitary sewer while excluding rainfall helps avoid this problem.

4 | Construction Site Water Quality

The U.S. EPA expects transportation agencies to develop, implement, and enforce a program to reduce pollutants in stormwater runoff from construction activities. Construction runoff from highway activities can present many special challenges due to the linear nature of the projects, which result in numerous discharge locations at crossings of watershed drainages. In addition, the site constraints of working within a limited right-of-way can make implementation of many types of common sediment control measures challenging. Transportation agencies are required to:

- Have procedures for site plan review of construction plans that consider potential water quality impacts;
- Have procedures for site inspection and enforcement of erosion and sediment control measures;
- Have sanctions to ensure compliance by contractors (established in the construction contract documents); and
- Determine the appropriate BMPs for mitigating the impacts of construction site runoff.

Suggested BMPs (i.e., the program actions/activities) are presented below.

Construction Stormwater Practices and Compliance

The Federal Highway Administration (FHWA) has adopted the AASHTO Highway Drainage Guidelines, Volume III, “Erosion and Sediment Control in Highway Construction,” 1992, as guidelines to be followed on all construction projects funded under title 23, United States Code. These guidelines do not preempt any requirements made by or under state law if such requirements are more stringent. According to these guidelines, federal aid funds shall not be used in erosion and sediment control actions made necessary because of contractor oversight, carelessness, or failure to implement sufficient control measures. Suggested construction site pollutant, erosion, and sediment controls include:

- **Permanent erosion and sediment control measures and practices.** These are preferably established and implemented at the earliest practicable time consistent with good construction and management practices.
- **Temporary erosion and sediment control measures and practices.** These are preferably coordinated with permanent measures to assure economical, effective, and continuous control throughout construction.
- **Pollutants used during highway construction or operation and material from sediment traps.** Stockpiles are protected and are typically not disposed of in a manner that makes them susceptible to being washed into any watercourse by runoff or high water. This avoids pollutants from being deposited or disposed of in watercourses.

A particular concern related to the materials used in highway construction is the proper handling and disposal of concrete and cement. Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal help to minimize or eliminate discharges into watercourses. Washout can be a pollutant when discharged into streets, storm drains, drainage ditches, or watercourses.

Most transportation agency construction will be provided by private contractors, so a comprehensive training program for contractor's staff is essential. Linear infrastructure construction varies greatly from other land development improvement, since the work area is constrained and the improvement may cross many small streams and watersheds. It is helpful to have the contractor training programs developed specifically for linear infrastructure and be considered a requirement prior to a contractor being eligible to bid on jobs. Stormwater requirements may also be included in requests for proposals (RFPs) and contracts for construction projects so that expectations for controlling pollution are known immediately.

5 | Post-Construction Water Quality

Some of the largest differences in stormwater practices of transportation agencies are related to the management of post-construction stormwater quality. Some state transportation agencies, such as Washington State DOT (WSDOT), Maryland State Highway Administration (SHA), and California DOT (Caltrans), require the implementation of approved stormwater treatment systems on all new projects where feasible. An emerging issue is hydromodification—the change in downstream hydrology due to the addition of impervious surfaces and the attendant change in channel geomorphology. Issues that transportation agencies normally encounter when attempting to reduce the environmental impacts of highways include:

- The need to characterize the pollutants in their discharges;
- Identification of practices that can reduce their discharge and pollutants in their discharge;
- Planning and design of highways to minimize their impact;
- Minimizing the effects of maintenance activities; and
- Minimizing the impacts of facilities operation.

Monitoring and Discharge Characterization, Typical Pollutants

Transportation agencies are frequently required by regulatory agencies to identify the types and quantities of pollutants in stormwater discharged from their facilities. The knowledge gained from the monitoring activities can help transportation agencies prioritize their water quality efforts to best reduce any potential environmental impact. Many of the pollutants in runoff are derived from vehicles; however, the agency, as the operator of the storm drain system, is responsible for their management. The typical pollutants of concern in highway runoff include:

- Suspended solids;
- Dissolved and total metals (typically copper, lead, and zinc);
- Nutrients (various species of nitrogen and phosphorus); and
- Trash.

Best Management Practices

Practices to reduce the discharge of pollutants in stormwater include both structural and non-structural measures. Structural BMPs are facilities or devices engineered and built to capture and treat stormwater runoff (also called “treatment” BMPs), while non-structural BMPs include a variety of non-constructed measures or activities to reduce the generation of pollutants from highways and related facilities. A transportation agency may develop an approval process for BMPs that are shown to be effective for the constituents of concern in its runoff, and compatible with its facility operations and maintenance practices. This approval process could also apply to construction site BMPs. The selection of structural BMPs for highways is different from that for municipal systems since there is generally less right-of-way, and maintenance access is more difficult. Controls that can operate passively and where deferred maintenance is not a problem are preferred.

• *Structural Best Management Practices*

- **Stormwater Retention/Detention BMPs.** Retention or detention BMPs control stormwater by gathering runoff in wet ponds, dry basins, or multi-chamber catch basins and slowly releasing it to receiving waters or drainage systems. These practices can be designed to both control stormwater volume and settle out particulates (i.e., separate them from the water by causing them to sink to the bottom) for pollutant removal.
- **Infiltration BMPs.** Infiltration BMPs are designed to facilitate the percolation of runoff through the soil to ground water, thereby resulting in reduced stormwater runoff quantity, flows, and mobilization of pollutants. Examples include infiltration basins/trenches, dry wells, and porous pavement.
- **Vegetated BMPs.** Vegetated BMPs are landscaping features that, with optimal design and good soil conditions, remove pollutants and facilitate percolation of runoff, thereby maintaining natural site hydrology, promoting healthier habitats and increasing aesthetic appeal. Examples include grassy swales, filter strips, artificial wetlands, and rain gardens.

The International Stormwater BMP Database¹⁰ identifies BMPs that are effective in removing constituents of concern from stormwater runoff. Other good reference publications for treatment control design and application include National Cooperative Highway Research Program (NCHRP) Report 565, Evaluation of Best Management Practices for Highway Runoff Control: FHWA Publication, Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring; and FHWA Publication No. FHWA-PD-96-032, Evaluation and Management of Highway Runoff Water Quality.

• *Non-Structural Practices*

The structural management practices for highways described previously are designed to reduce pollutant loadings to the environment by holding and treating the highway runoff generated by precipitation. Non-structural management practices, on the other hand, are designed to achieve source control and can be used to augment on-site structural or other runoff management facilities. Most of the non-structural practices for managing highway runoff pollution are applicable to virtually all highway situations, even if a specific runoff problem has not been identified. The following management practices for highway runoff are intended to reduce the volume of particulates available for transport by runoff or to filter and settle out suspended solids. Although the practices described do not represent the complete universe of highway management practices, they are among those commonly implemented on roadways across the United States.

- **Implement street sweeping.** Curb systems act as traps for particulates and other pollutants. If they are properly maintained via regular vacuum street sweeping, then they are less likely to become sources of pollutants.
- **Consider alternatives to curbs.** As a design alternative, eliminating curbs from roads and highways allows runoff to be filtered through vegetated shoulders or medians and infiltrate to the ground. Where curbs are necessary for traffic control, guardrails, or other reasons, curb breaks can be incorporated to disconnect the impervious surface and direct runoff to pervious areas. This may not be feasible for streets with high traffic volume and/or on street parking demand. The structural integrity of the pavement can be maintained by “hardening” the interface between the swale and the pavement with grass pavers, geo-synthetics, or a flush concrete strip along the pavement edge. Maintenance requirements (man-hours) for grass channels are generally comparable to those of curb and gutter systems and involve turf mowing, debris removal, and periodic inspections.
- **Control litter and debris on roadsides.** Roadside litter control practices that have traditionally been implemented to address health and aesthetic concerns can also improve runoff quality by limiting trash in runoff conveyance and treatment systems and receiving water bodies. An effective litter and debris control program could include the following controls:
 - Conducting regular trash and debris removal and disposal, especially in high traffic areas;
 - Educating the public using various forms of media, including signs along roads and at rest areas, print and broadcast public service announcements (radio, TV, and publications), and distributing educational materials at local events;
 - Working with local law enforcement and the highway patrol to enforce littering and illegal dumping laws;

¹⁰ <http://www.bmpdatabase.org/>.

- Sealing cracks and applying pothole surface treatments that minimize the loosening of aggregate and road base debris by tires; and
 - Sponsoring Adopt-a-Highway or Adopt-a-Road programs. Many state highway administrations or transportation agencies sponsor Adopt-a-Highway programs that allow businesses and community groups to conduct litter removal and beautification activities on state-owned roads.
- **Manage pesticide use.** Over-application of pesticides may cause excess chemicals to leach to ground waters or flow into surface waters. Pesticides have the same toxic effect on aquatic plants and organisms as they do on the terrestrial plants and organisms to which they were applied. Practices such as applying according to label instructions, applying at the proper time (i.e., not immediately before a rain event), applying only the types and amounts necessary, and considering the environmental conditions and hazards at the site are important ways to prevent pesticides from entering water bodies.
 - **Reduce fertilizer use.** Improper application of fertilizers along roadsides can result in excess nutrients being transported to surface waters or leaching to ground water.

Integration

Potential environmental impacts of stormwater runoff can be mitigated with sound planning procedures. The Council on Environmental Quality¹¹ (CEQ) specifically requires exploring “all reasonable alternatives” when preparing an Environmental Impact Statement (EIS). Many projects will not involve an EIS process but will instead be prepared based on a categorical exclusion. It is important to integrate stormwater quality requirements into the project delivery process as early as possible for maximum success. For example, it is beneficial to select a preferred route that minimizes stream crossings, avoids wetlands, considers impacts on endangered species, and avoids areas that would present difficulties in establishing an effective erosion and sediment control program during construction. In addition, endangered species may have special requirements for water quality. The U.S. Fish and Wildlife Service provides a biological opinion through Section 7 consultation of the Endangered Species Act. It is suggested that the Section 7 consultation, if required, be initiated as early in the project development process as possible. It is helpful to develop water quality assessment guidelines (WQAG) to provide a consistent basis to assess the project impact on receiving waters during the initial environmental assessment for the project. Formal WQAG will ensure that environmental planning staff are aware of potential stormwater quality impacts and will create appropriate mitigation measures for the project.

Stormwater mitigation, if required, may need additional right-of-way for construction of structural practices, and those practices generally requires maintenance and operation in the post construction project phase. Tracking stormwater mitigation requirements in the agency’s EMS (if available) can be a significant benefit.

Roadway Maintenance Stormwater Practices and Compliance

A variety of maintenance practices to reduce the discharge of pollutants in stormwater has been discussed previously under the heading of “Non-Structural Practices;” however, two particular maintenance activities deserve special attention: winter road maintenance and bridge maintenance. Detailed information on these topics can be found in the U.S. EPA’s National Management Measures to Control Nonpoint Source Pollution from Urban Areas¹².

6 | Pollution Prevention and Good Housekeeping

The operation of highway maintenance yards can lead to the discharge of pollutants in stormwater runoff as well as through non-stormwater discharges. Important considerations for these facilities are:

11 CEQ coordinates federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives. <http://www.whitehouse.gov/administration/eop/ceq/>.

12 National Management Measures to Control Nonpoint Source Pollution from Urban Areas: <http://www.epa.gov/owow/nps/urbanmm/index.html>.

- Develop and implement an operation and maintenance program with the ultimate goal of preventing or reducing pollutant runoff from maintenance yard operations into the storm drain system.
- Include employee training on how to incorporate pollution prevention/good housekeeping techniques into operations such as fleet and building maintenance. To minimize duplication of effort and conserve resources, transportation agencies can use training materials that are available from U.S. EPA, their state, or other relevant organizations.
- Develop an effective spill response and control program that includes spill prevention measures, spill response procedures, spill cleanup procedures, reporting, and training.
- Clean vehicles and equipment in areas where the runoff is not discharged to the storm drain system.
- Repair vehicles and equipment indoors whenever feasible to eliminate the potential for cleaning fluids or spills to enter the storm drain system. Perform outdoor repairs only during dry weather.
- Minimize the exposure to rain and runoff of materials stored onsite by keeping them inside or covering the outside storage areas with a roof, building a berm around storage areas, or using covered dumpsters for waste storage.
- Use alternative, less toxic products when available.

7 | Special and Other Requirements

Total Maximum Daily Loads

The Clean Water Act requires states to determine the existing and potential beneficial uses of waters in each state and to evaluate whether their current water quality supports these uses. When the water quality will not support the designated beneficial uses, a TMDL is developed that apportions the maximum amount of a pollutant that the water body can safely assimilate to all dischargers in the watershed, including transportation agencies. Under § 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. Such waters are excessively polluted or otherwise degraded to the point that they cannot meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters.

Some of the more common types of pollutants for which TMDLs are developed include:

- | | |
|--|---------------------------|
| ■ Sediment | ■ Dissolved oxygen |
| ■ Pathogens (e.g., bacteria, E. coli) | ■ Temperature |
| ■ Suspended solids | ■ pH (acidity/alkalinity) |
| ■ Metals (e.g., copper, lead, and zinc) | ■ Organochlorines |
| ■ Nutrients (e.g., nitrogen, phosphorus) | ■ Mercury |
| ■ Trash | ■ Salts |

Water Quality Assessment and Total Maximum Daily Loads Information (ATTAINS)¹³ provides information reported by the states to U.S. EPA about conditions in their surface waters. This information is required every two years under CWA § 305(b) and § 303(d). Figure 3 shows 303(d) listed water bodies across the United States.

13 <http://www.epa.gov/waters/ir/index.html>.

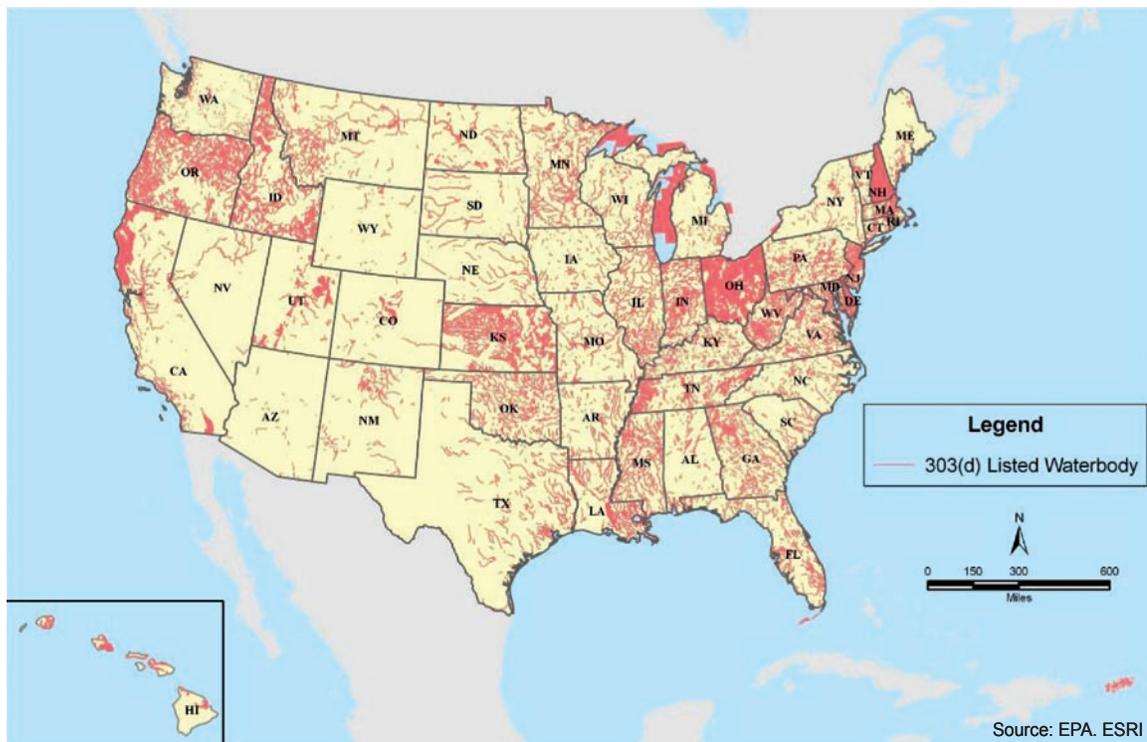


Figure 3. 303(d) Listed Water Bodies

In many cases, Transportation agencies are minor contributors to a problem; however, implementation of structural runoff treatment systems may still be required to meet an assigned load allocation. The water quality allocations for discharges from facilities may be stricter than those commonly achieved by many stormwater treatment controls. Consequently, it is important for transportation agencies to take an active role in the TMDL development process to ensure that they are treated equitably and that requirements that would be infeasible to implement in a spaced-constrained linear system are not adopted.

A basic checklist for the TMDL process includes:

- Identify activities required under the agency's stormwater permit.
- Track the 305(b) report for the agency's state, which is the state's water quality assessment and constitutes a potential "watch list" for waterbodies that may become listed as impaired (303(d) listed).
- If a water body into which the agency's facilities discharge becomes listed, determine if the agency's discharge contains the constituent of concern, and in what concentration.
- Participate in the 303(d) listing process and provide the regulatory agency with data regarding the quality of the agency's discharge for the constituent of concern.
- Participate in the development of the implementation plan. Avoid plans that set arbitrary or non-technical reduction goals. An assessment of the water quality standard may be appropriate.
- Avoid implementation plans that do not allocate loads to each NPDES permit holder or stakeholder. It is important to have a quantified load allocation. Some implementation plans leave it up to the dischargers to develop load allocations.
- Develop guidelines for structural BMP retrofit. BMP retrofit will most likely be required to meet assigned TMDL load allocations. A BMP retrofit policy to establish cost guidelines for items such as right-of-way acquisition, utility relocation, and storm drain system redesign is important.

Program Development

It is recommended that a formal SWMP designed to address the previously described six minimum measures be developed. The plan may:

- Identify activities required under the agency's stormwater permit.
- Identify specific activities to address each of the six minimum measures.
- Include measures necessary to comply with location specific requirements, such as TMDLs.
- Identify agency approved BMPs.
- Describe the organizational structure and identify the office or staff person(s) responsible for implementing each portion of the plan.
- Identify measurable objectives to provide benchmarks for plan implementation.
- Identify a system to track the level of effort in each area to include in an annual report to the regulatory agency.
- Include reporting requirements.

Developing the SWMP in consultation with the various divisions within the agency is highly recommended to ensure that the requirements have an "owner" and are compatible with existing work practices. Similarly, the SWMP can also be developed in consultation with the regulatory agency to streamline approval. Regulatory agencies are not always familiar with the unique requirements of linear infrastructure and transportation. The plan development process with a regulatory agency may also need to include information regarding project planning, design, construction, and operation.

Failure to develop and implement a SWMP can lead to violations of the CWA, fines, lawsuits, and substantial delays in project implementation. The CWA authorizes fines of up to \$27,500 per violation per day of any provision in a general NPDES permit. Further, § 505 of the CWA also provides for citizen lawsuit authority, which can include injunctive relief, civil penalties, and reimbursement of attorney and legal fees.

Documentation and Recordkeeping

Most stormwater permits require the submission of an annual report documenting the activities undertaken by the agency during the past fiscal or calendar year to reduce the discharge of pollutants to receiving waters. It is therefore helpful to keep detailed records describing all the activities that were conducted during the year to improve water quality, as well as activities that impacted water quality, and any improvements that were made from the previous year. Examples include:

- Number of miles of roadway swept and amount of material collected;
- Amount of litter and debris removed from roadsides;
- Number of employee training sessions conducted, as well as the number of attendees and polled information about whether the sessions were useful to the staff;
- Changes in maintenance activities that reduced their impact on the environment; and
- Lists of structural and non-structural management practices implemented.

The use of a database to collect information needed for the annual report on a "real-time" basis is highly recommended. Basic program information will be needed from each of the divisions within the agency. Annual reports are generally due within about six months from the termination of the reporting period. Planning is important, as obtaining information on short notice can be a challenge. If annual report data is entered into a database throughout the year as it is collected, staff preparing the annual report can query the database for most of the necessary information. The information collected for the annual report can be used to help the agency focus its efforts and update the SWMP to make its future actions more successful.

Appendix A

Glossary

Beneficial Uses

The resources, services, and qualities of state waters that may be protected against quality degradation. These include but are not limited to domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

Best Available Technology Economically Achievable (BAT)

A term derived from § 301(b) of the federal CWA, BAT refers to BMPs or other procedures used to reduce toxic and non-conventional pollutants in discharges from construction sites. Toxic pollutants are those defined in § 307(a) (l) of the CWA and include heavy metals and man-made organic chemicals. Non-conventional pollutants are those pollutants not included in the definition of conventional and toxic pollutants. Non-conventional pollutants include ammonia, chloride, toxicity, nitrogen, etc.

Best Conventional Pollutant Control Technology (BCT)

A term derived from § 301(b) of the federal CWA, BCT refers to BMPs intended to control conventional pollutants in discharges (applicable to construction site stormwater runoff). Conventional pollutants include biochemical oxygen demand, total suspended solids, oil and grease, fecal coliform, and pH.

Best Management Practices (BMP)

Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices (including structural controls) to prevent or reduce pollution.

Code of Federal Regulations (CFR)

The document that codifies all rules of the executive departments and agencies of the federal government. It is divided into 50 volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists the environmental regulations.

Construction

Clearing, grading, excavating, etc. that result in soil disturbance.

Discharge

Stormwater runoff or dry weather flow. When used without qualification includes a discharge(s) of a pollutant(s).

Encroachment

Occupancy of project right-of-way by non-project structures or objects of any kind or character; also, activities of other parties within the operating right-of-way.

Facility

A building or structure other than road surfaces, support structures (bridges), or adjacent right-of-way; for example, maintenance station, storage yard, weigh station, laboratory, and bridge tender.

Illegal Connection (IC)

Any man-made connections to a storm sewer system made by others without permission. Illegal connections are a subset of "Illicit Discharges."

Illicit Discharge (ID)

Unauthorized discharges, including accidental spills, illegal connections, and illegal dumping.

Illegal Dumping

Discarding or disposal of trash and other wastes in non-designated areas; may contribute to stormwater pollution.

Infiltration

The downward entry of water into the surface of the soil.

Inlet

A drainage structure that collects surface runoff and conveys it to an underground storm drain system.

ISO 14001:2004

Specifies requirements set by the International Organization for Standardization for an environmental management system to enable an organization to develop and implement a policy and objectives that account for legal and other requirements to which the organization subscribes, and information about significant environmental aspects. Applies to any organization that wishes to establish, implement, maintain, and improve an environmental management system, to assure itself of conformity with its stated environmental policy, and to demonstrate conformity with ISO 14001:2004.

Maintenance Activities

Cleaning and repair of roadways, appurtenances, and related facilities. Also includes activities that may require clearing, grading, or excavation to maintain original line and grade, hydraulic capacity, or original purpose of the facility.

Municipal Separate Storm Sewer System (MS4)

The regulatory definition of an MS4 [40 CFR 122.26(b)(8)] is

“a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created to 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 § 208 of the Clean Water Act that discharges into waters of the United States. (ii) Designed or used for collecting or conveying stormwater; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.”

In practical terms, operators of MS4s can include municipalities and local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities. The Stormwater Phase II Rule added federal systems, such as military bases and correctional facilities, by including them in the definition of small MS4s. [U.S. EPA]

Nonpoint Source

A diffuse pollution source (i.e., generally without a single point of origin or not introduced into a receiving stream from a specific outlet).

Non-Stormwater Discharge

Any discharge to a storm drain system or receiving water that is not composed entirely of stormwater.

Outfall

A location where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels, or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States. [40 CFR §122.26(b)(9)]

pH

A measure of a solution's acidity or alkalinity.

Point Source

Any discernible, confined, and discrete conveyance or collection system from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff. [40 CFR 122.2 and 122.3]

Pollutant

Dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water. This term does not mean (A) “sewage from vessels” within the meaning of § 1322 of this title [CWA]; or (B) water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil or gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state in which the well is located, and if such state determines that such injection or disposal will not result in the degradation of ground or surface water resources [40 CFR 122.2]; any addition of any pollutant to waters of the United States from any point source; or any addition of any pollutant to waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft. [From CFR 122.2]

Pollution Prevention

Identifying areas, processes, and activities, which create excessive waste products or pollutants in order to reduce or prevent the release of pollutants through alteration or eliminating a process. Such activities are consistent with the Pollution Prevention Act of 1990.

Program Evaluation

Refers to a variety of activities and processes through which the DOT will obtain information relevant to its implementation of and compliance with the stormwater management program so that the need for and/or opportunities for revising or refining its program can be identified.

Publicly Owned Treatment Works (POTW)

A treatment works, as defined by § 212 of the CWA, that is owned by the state or municipality. This definition includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes, and other conveyances only if they convey wastewater to a POTW treatment plant [40 CFR 403.3]. Privately owned treatment works, Federally owned treatment works, and other treatment plants not owned by municipalities are not considered POTWs. [U.S. EPA]

Runoff

Precipitation, snowmelt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions.

Sediment

Organic or inorganic material that is carried by or is suspended in water and that settles out to form deposits in the storm drain system or receiving waters.

Site

The land or water area where any facility or activity is physically located or conducted, including adjacent land used in connection with the facility or activity.

Source Control

Generally, a range of actions (e.g., removal, treatment in place, containment, etc.) designed to protect the environment by eliminating or minimizing exposure or migration of significant contamination. Sometimes referred to as "Pollution Prevention," although Pollution Prevention is typically a broader term that encompasses "Source Control." For stormwater, Source Control involves minimizing the generation of excessive runoff and/or pollution of stormwater at or near its source. Source Control techniques can be categorized into:

- Non-Structural Source Control: Techniques that aim to change human behavior to reduce the amount of pollutants that enter stormwater systems; and
- Structural Source Control: Techniques that aim to reduce the quantity and improve the quality of stormwater at or near its source by using infrastructure or natural physical resources, such as vegetated swales. "Structural Source Controls" differ from the more conventional, structural "end-of-pipe" treatment techniques.

Spill

The sudden release of a potential pollutant from containment to the environment that requires cleanup because of its potential risk to the environment or public health.

Stormwater

Water runoff resulting from precipitation, including snowmelt, into natural drainages and man-made drainage conveyances.

Total Maximum Daily Load (TMDL)

A written, quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific water body and pollutant. Generally establishes an allocation of pollutant loading applicable to the discharge sources of the pollutant being targeted.

Toxic Pollutants

Those pollutants defined in the federal regulations at 40 CFR 401.15 (pursuant to § 307(a) (1) of the CWA). These pollutants are toxic to aquatic organisms or humans and include copper, lead, zinc, other metals, and many synthetic organic compounds, including pesticides and other constituents sometimes found in wastewater.

Treatment

The application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media adsorption, biodegradation, biological uptake, chemical oxidation, and ultraviolet (UV) radiation.

Treatment BMP

Any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media adsorption, or any other physical, biological, or chemical process.

United States Environmental Protection Agency (U.S. EPA)

The federal agency with primary or oversight responsibility for implementing federal environmental statutes, including the CWA.

Water Quality Standards

Define water quality goals of a water body by designating uses (“beneficial uses”) of the water and by setting objectives necessary to protect these beneficial uses. The objectives may be narrative or numeric. The beneficial uses include such things as cold freshwater habitat, domestic (drinking water) supply, and water contact recreation. The standards also include antidegradation requirements. Antidegradation is addressed through the establishment of requirements to “maintain existing or higher quality water.” Water quality standards are adopted by the state and approved by the U.S. EPA.

Waters of the United States

All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide. Waters of the United States include all interstate waters and intrastate lakes, rivers, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds. [40 CFR 122.2] [U.S. EPA]

Watershed

The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream, estuary, or lake.

Wetland

Those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support vegetation typically adapted for life in saturated soil conditions. Generally includes playa lakes, swamps, marshes, bogs, mudflats, natural ponds, and similar areas.

Appendix B

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CTAP	Center Technical Assistance Program
CWA	Clean Water Act
DOT	(State) Department of Transportation
EIS	Environmental Impact Statement
EPA	(United States) Environmental Protection Agency
EMS	Environmental Management System
FHWA	Federal Highway Administration
IC/ID	Illicit Connection/Illegal Discharge
ISO	International Organization for Standardization
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NEL	Numeric Effluent Limitation
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
RFP	Request for Proposal
SWMP	Stormwater Management Plan ¹⁴
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
WQAG	Water Quality Assessment Guidelines

14 SWMP can also be used to refer to a Stormwater Management Program. However, for clarity, this handbook uses the acronym only in reference to a Stormwater Management Plan.

References

Statutes, regulations, and guidance documents cited in this handbook, along with additional materials and sample documents, are available on the Center for Environmental Excellence by AASHTO web site: <http://environment.transportation.org>.

The Center for Environmental Excellence's Technical Experts are available to provide strategic environmental and focused environmental management technical advice. For more information on the Center Technical Assistance Program (CTAP), please visit: http://environment.transportation.org/center/tech_experts.

ADDITIONAL RESOURCES

PRACTITIONER'S HANDBOOKS AVAILABLE FROM THE CENTER FOR ENVIRONMENTAL EXCELLENCE BY AASHTO:

- 01 Maintaining a Project File and Preparing an Administrative Record for a NEPA Study
- 02 Responding to Comments on an Environmental Impact Statement
- 03 Managing the NEPA Process for Toll Lanes and Toll Roads
- 04 Tracking Compliance with Environmental Commitments/Use of Environmental Monitors
- 05 Utilizing Community Advisory Committees for NEPA Studies
- 06 Consulting Under Section 106 of the National Historic Preservation Act
- 07 Defining the Purpose and Need and Determining the Range of Alternatives for Transportation Projects
- 08 Developing and Implementing an Environmental Management System in a State Department of Transportation
- 09 Using the SAFETEA-LU Environmental Review Process (23 U.S.C. § 139)
- 10 Using the Transportation Planning Process to Support the NEPA Process
- 11 Complying with Section 4(f) of the U.S. DOT Act
- 12 Assessing Indirect Effects and Cumulative Impacts Under NEPA
- 13 Developing and Implementing a Stormwater Management Program in a Transportation Agency

For additional Practitioner's Handbooks, please visit the Center for Environmental Excellence by AASHTO web site at: <http://environment.transportation.org>

Comments on the Practitioner's Handbooks may be submitted to:
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