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## 1.1 A "How-To" Guide for Addressing Polluted Urban Runoff

This document is a "how-to" guide for addressing an environmental problem that affects every urban community in California: polluted runoff. Polluted runoff threatens the water quality of our oceans and streams and degrades our groundwater supplies. Storm runoff can flush a multitude of toxic chemicals, including oils and pesticides, into sensitive wildlife habitats. Trash and other runoff debris often litter our beaches. Ultimately, the combined effects of polluted urban runoff can have serious negative impacts on a community's economy — it is not simply an environmental health problem.

As a recipient of this guide, you play a key role in addressing polluted runoff in your community. In contrast to more traditional point source pollution problems, polluted runoff presents some distinct management challenges for local government. Polluted runoff comes from thousands of different sources made up of homes, cars, factories, restaurants, and construction sites. Many everyday activities result in polluted runoff — often unbeknownst to the "polluter". Direct regulation of such a wide array of "nonpoint" sources is extremely difficult, if not impossible. In addition, unlike individual factory outfalls, it is difficult to identify, establish or measure the links between these sources and the overall water quality of a community.

Nonetheless, we know the problem of polluted urban runoff is real and requires a new strategy that combines the best of the regulatory approach of traditional environmental management with community-wide education, participation, and outreach; incentive-based and volunteer programs; and practical, cost-effective implementation mechanisms. Everyday pollution activities require everyday solutions, particularly true in an era of dwindling municipal resources.

The widespread nature of the polluted runoff problem requires a comprehensive solution. That is why all citizens and all aspects of your municipality — planning, public works, health and safety, etc. — should work on the solution. Thus, the purpose of this guide is to provide your municipality with a cookbook of sorts with the recipes necessary to put a serious dent in the urban runoff problem in your community in the most cost-effective way. The key ingredients of these recipes are "best management practices" or BMPs — practical ways to initiate a polluted runoff management program without heavy-handed regulatory requirements. In some cases, polluted runoff can be curtailed simply by regular street sweeping or by an outreach program that teaches local businesses how to prevent urban runoff pollutants from entering the environment at all.

While this guide emphasizes BMPs, it is important to realize that new federal and state regulatory requirements will soon address urban runoff in local communi-

ties. Indeed, the U.S. Environmental Protection Agency (EPA) has already placed such requirements on municipalities with populations greater than 100,000. This guide, therefore, also provides you with the best information available from federal, state and local agencies specifically developed in anticipation of new urban runoff management requirements. If you begin using this guide today, you will be ahead of the game when these requirements are formally put in place.

Finally, this guide acknowledges that lasting polluted runoff solutions are best built by local officials, organizations, and community members, who best understand their watersheds, their community's unique features, and, most importantly, their water quality needs and goals. As a result, this guide is not a top-down, regulatory compliance vehicle, but rather a bottom-up "how-to" guide for tailoring a comprehensive urban runoff program (URP) responsive to your community's water quality concerns. With information and practical solutions culled from the best polluted runoff management programs and experts in the field, this guide should be a valuable working tool for your community.

The following pages provide a framework for understanding the problem of polluted urban runoff and why it is essential to act now. More importantly, the pieces of an URP and how these pieces fit together are mapped out to make the potentially overwhelming problem of polluted urban runoff quite manageable. To be sure, after reading this overview, you will realize that your municipality has already taken several steps towards reducing urban runoff pollution.

## 1.2 The Problem

### What is Polluted Urban Runoff and Why is it a Problem?

Runoff from storm events is part of the natural hydrologic process: rainwater that does not infiltrate into the ground flows by the force of gravity into water bodies such as lakes, streams, rivers, and oceans. As runoff heads for receiving waters, naturally vegetated depressions and rills slow the water and filter it for pollutants and sediments. In urban settings, however, natural vegetation and topography have been altered, graded, or paved and storm water is diverted in storm drain pipes. When the drainage pattern of a watershed is so altered, flows increase in concentration and velocity and pick up sediments and pollutants from land surfaces at an increased rate. Storm water that flows through urbanized areas to receiving waters is called "urban runoff."

**Pollutants of Concern Found in Urban Runoff**

- Sediments
- Nutrients (nitrogen, phosphorous, etc.)
- Pathogens (bacteria, viruses, etc.)
- Oxygen-Demanding Substances (plant debris, animal wastes, etc.)
- Petroleum Hydrocarbons (oil, grease, solvents, etc.)
- Heavy Metals (lead, zinc, cadmium, copper, etc.)
- Toxic Pollutants
- Floatables (litter, yard wastes, etc.)
- Synthetic Organics (pesticides, herbicides, polychlorinated biphenyls, etc.)
- Physical Parameters (salinity, elevated temperature, pH)

**Trash and debris that collect in storm drain inlets are carried into the receiving waters by runoff**

Urban runoff is known to carry a wide range of pollutants including nutrients, trash and debris, sediments, heavy metals, pathogens, petroleum hydrocarbons, and synthetic organics such as pesticides. Because urban runoff does not originate from a distinct "point" source (e.g., an industrial discharge pipe), it is also often referred to as nonpoint source pollution. These pollutants in urban runoff could negatively impact the vitality of your municipality on many levels. Urban runoff can alter the physical, chemical, and biological characteristics of water bodies to the detriment of aquatic and terrestrial organisms; can make beaches and rivers unsightly or unsafe for human contact; and can negatively impact beneficial activities and uses including water recreation, commercial fishing, tourism and aquatic habitat. In some cases pollutants of concern may not even be visible to the naked eye.

## How is Urban Runoff Regulated?

California is currently involved in two parallel, complementary approaches to address urban runoff from municipalities: the State's Nonpoint Source (NPS) Pollution Control Program, and the U.S. EPA's National Pollutant Discharge Elimination System (NPDES) Storm Water permit program. The State's NPS Pollution Control Program details how the state will promote the implementation of management measures and BMPs to control and prevent polluted runoff, as required by Section 319 of the federal Clean Water Act (CWA). Because of the diffuse nature of polluted runoff, which originates from multiple sources and has a widespread reach, the State's NPS Pollution Control program has emphasized financial incentives, technical

**Beneficial Uses and Activities Negatively Impacted by Polluted Runoff**

- Aesthetic Enjoyment
- Agricultural Supply
- Aquaculture/Mariculture
- Cold Fresh-water Habitat
- Commercial and Sport Fishing
- Estuarine Habitat
- Fresh-water Replenishment
- Groundwater Recharge
- Industrial Service and Process Supply
- Inland Saline Water Habitat
- Marine Habitat
- Migration of Aquatic Organisms
- Municipal and Domestic Water Supply
- Biological Habitats of Special Significance
- Rare, Threatened, or Endangered Species
- Shellfish Harvesting
- Spawning, Reproduction, and Early Development of Aquatic Organisms
- Warm Fresh-water Habitat
- Water Contact/Noncontact Recreation
- Wildlife Habitat

assistance, and public education, rather than regulatory activities.

Coastal states are also required to develop programs to protect coastal waters from nonpoint source pollution, as mandated by the federal Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. CZARA Section 6217 identifies polluted runoff as a significant factor in coastal water degradation, and requires implementation of management measures and enforceable policies to restore and protect coastal waters.

In lieu of developing a separate NPS program for the coastal zone, California's NPS Pollution Control Program was updated in 2000 to address the requirements of both the CWA section 319 and the CZARA section 6217 on a statewide basis. The California Coastal Commission (CCC), the State Water Resources Control Board (SWRCB), and the nine Regional Water Quality Control Boards (RWQCBs) are the lead State agencies for upgrading the program, although 20 other State agencies also participate. This guide should help you in developing a local urban runoff control program that is consistent with the State's NPS implementation plan.

Urban point source pollution is addressed by the NPDES permit program of the Clean Water Act. Although urban nonpoint sources contribute to stormwater runoff, runoff may be channeled into a storm drain and ultimately become a point source. Therefore, stormwater is regulated as a point source under the NPDES permit program. In 1990, the EPA established Phase I of the NPDES Storm Water program mandated by the CWA Section 402 (p). The Phase I Storm Water program requires NPDES permits for storm water discharges from (1) medium and large municipal separate storm sewer systems (MS4s), generally serving populations greater than 100,000, (2) specific industrial activities, and (3) construction activities disturbing 5 or more acres of land. In California, the NPDES program is administered by the SWRCB, and the nine RWQCBs.

The SWRCB has issued a statewide General Permit for all industrial and construction-related stormwater discharges that require a NPDES Storm Water Phase I permit. The General Permit requires operators to develop and implement a Storm Water Pollution Prevention Plan (SWPPP) incorporating appropriate BMPs. Municipalities, however, must obtain an individual NPDES Storm Water permit for their entire storm drain system. Municipal Phase I Storm Water permits require implementation of structural and nonstructural control measures to reduce pollutant loads from industrial, commercial, and residential areas. In California, the RWQCBs required Phase I permits for many municipalities serving ur-

**Sights such as this are common in urban areas**

banized areas with populations that were less than the specified 100,000.

Phase II of the NPDES Storm Water program expands the coverage to include all municipalities within designated urbanized areas, as well as designated small municipalities outside of urbanized areas (generally those with a population of at least 10,000 and/or a population density of at least 1,000 persons per square mile). The program will also expand to include construction sites that disturb between 1 and 5 acres. Final Phase II regulations were established by the EPA in 1999 (Federal Register Vol. 64, No. 235, Dec. 8, 1999); these regulations require Phase II storm water permits by March 10, 2003. Appendix 1A lists California municipalities designated by the EPA as automatically or potentially regulated under Phase II; additional municipalities may also be designated by California's RWQCBs. Establishing an URP according to this guide will, in all likelihood, help your community comply with the upcoming NPDES Phase II program.

**The health of your community depends on clean water**

While different legal authorities may apply to different situations, the goals of the NPDES and the NPS/CZARA programs are complementary. Many of the techniques and practices used to control urban runoff are equally applicable to both programs, even though the programs do not work identically. EPA's NPDES Phase II regulations indicate that an urban area covered by an NPDES Storm Water Permit (Phase I or Phase II) will be excluded from explicit CZARA requirements, provided the permit addresses the polluted storm water/urban runoff management measures and enforceable policies identified in the State NPS Plan. The bottom line is that the State's current and developing approaches to addressing urban runoff are and will be consistent with both the NPDES and the NPS/CZARA programs. This guide is intended to help your community establish an URP that is consistent with both programs as well.

## Why Should You do Something About Polluted Runoff in Your Community?

Clean water is crucial to the continued vitality of your community. Whether for recreational purposes, commercial fishing, habitat preservation, or community aesthetics, your community deserves — and demands — clean water. As summarized above, polluted urban runoff is a widespread water quality threat. If left unchecked, it WILL negatively impact your community through resource impacts, public health impacts, economic impacts, or more likely a combination of all, given the interwoven nature of beneficial waterbody uses. It may even have a domino effect where,

for example, polluted ocean waters drive off tourists, which in turn hurts local merchants, which in turn undermines the local economy. In short, water quality is an important part of a healthy community. Protecting your community's water quality should be pursued because it's the right thing to do. It's what the Model Urban Runoff Program (MURP) calls the water quality ethic.

In addition to your commitment to the water quality ethic, the new regulatory reality is that your municipality will be required (by NPDES Phase II and/or CZARA Section 6217) to implement a program that addresses polluted runoff and reduces the discharge of pollutants in storm water runoff. Many municipalities currently lacking formal urban runoff programs (URPs) will be required to develop them with the next few years. Will each municipality need to develop a new URP from scratch to ensure regulatory compliance? No. Your municipality is likely already instituting elements of such a formal URP that your "new" URP will build upon. The key is to ensure that your URP covers the basic regulatory requirements and that it translates into water quality improvements. In short, your community needs clean urban water runoff and will soon be required to make sure it is clean, which is where this guide comes in.

## 1.3 The Solution

This MURP is an off-the-shelf guidebook for small municipalities looking to develop their own URPs. The MURP will help you to develop, finance, implement, and enforce a comprehensive program for managing runoff and improving water quality in your municipality. In addition, every effort has been made to ensure that if you develop an URP as described in this guide, you will be well on your way to compliance with upcoming NPDES Phase II regulations and the CZARA Section 6217 Implementation Plan.

### Implementing Best Management Practices

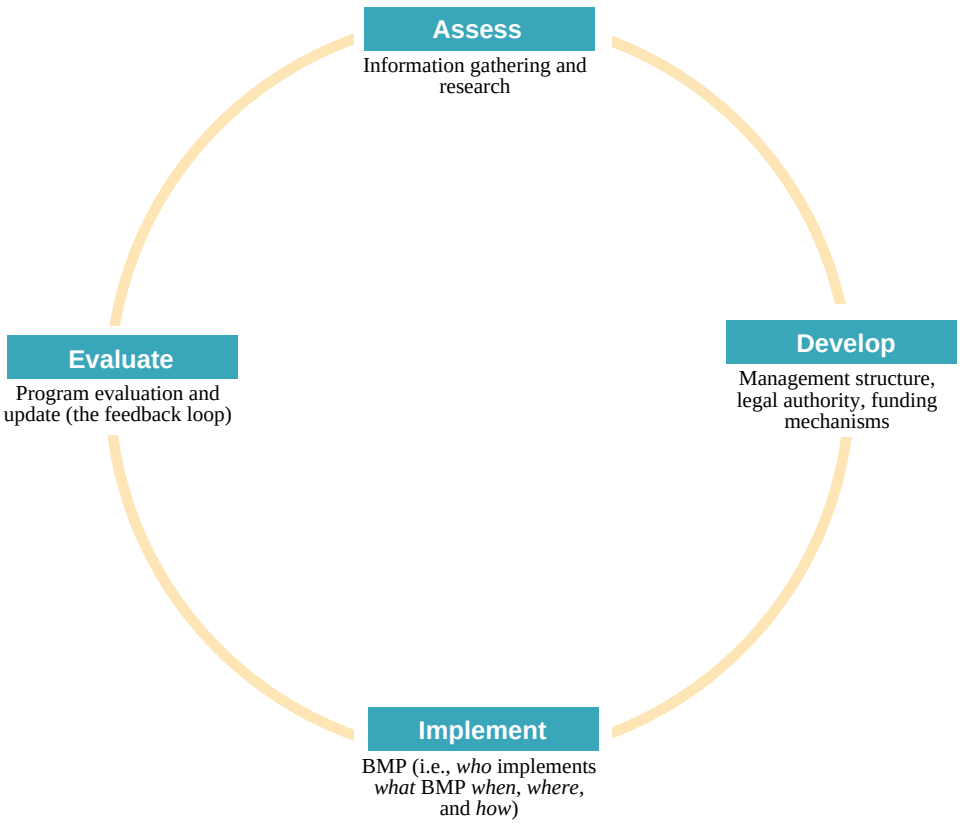
The foundation of your URP should consist of BMPs selected to fit local conditions and water quality problems. The term BMPs may sound formal, but in reality BMPs are common sense methods for controlling, preventing, reducing, or removing pollutants in urban runoff. Street sweeping, for example, is an effective BMP. Source control BMPs are intended to prevent or minimize the introduction of pollutants into runoff. Dry cleanup of gas station fueling areas is an example of a source control BMP. Treat-

**A silt fence can help keep sediment out of storm drains and creeks**

ment BMPs, on the other hand, are designed to remove the pollutants from storm water runoff. A silt fence that effectively filters sediment from water is a good example of a treatment BMP. Considered together, the BMPs you select should form a comprehensive programmatic framework that reduces storm water pollution to the maximum extent practicable.

A wealth of information about BMPs is available. The real test lies in selecting control measures that address problems specific to your municipality and your watershed, effectively implementing those practices, and monitoring their success. In other words, effective BMP implementation requires a comprehensive program. Developing your comprehensive URP requires you to:

- ✓ Assess. You need to assess the polluted runoff problem in your jurisdiction and watershed, as well as your existing polluted runoff management efforts, so that your program is tailored to your needs. This step involves information gathering and research to identify resources, problems, opportunities, and priorities for implementing BMPs.
- ✓ Develop. You must develop effective urban runoff control policies and create an efficient, adequately funded program within the existing administrative structure of your agency. This step involves developing legal authority, funding, and management structures to ensure long-term program sufficiency, accountability, and enforcement of BMPs. This step also involves educating your community about the problem as a means to promote public participation in identifying the solution.



- ✓ Implement. You must carry out the BMPs to address your urban runoff problems. This step is the heart of your URP, as it details who implements what BMPs, when, where, and how.
- ✓ Evaluate. You must evaluate the success of your program to remain accountable, and to maintain and improve its effectiveness. Program evaluation and updating allow your URP to adapt to new information, new problems, new BMPs, and other changing circumstances.

These four components form the conceptual framework for your URP.

## How to Begin

As you develop your URP, keep in mind that the conceptual framework does not necessarily represent a sequence of events but rather a set of activities that must be completed in order for your URP to be effective. As your program evolves over time and you learn more about the problem of urban runoff in your town, each component informs the others.

The first step in the development of your URP is to investigate the existing urban runoff framework in your municipality, which means conducting both an institutional and a resource-based analysis of your current urban runoff climate. Institutionally, you need to know the existing players, policies, programs, fiscal resources, authorities, and management structures. Likely your community already has elements of an URP, and part of the development process is recognizing, coordinating, and building upon these existing efforts. In fact, as you develop your municipality's URP, a parallel track is reaching out to other municipalities within the larger watershed to coordinate water pollution prevention efforts regionally. Watersheds provide the fundamental resource unit for managing polluted runoff since runoff within a watershed flows to a common outlet. Banding together in a larger watershed management plan can help to coordinate BMP implementation, pool resources, and most of all, better protect beneficial uses.

As a complement to the institutional assessment, you will also need to assess the current state of your water resources. This assessment involves identifying and prioritizing watershed resources, problems, and opportunities for improving water quality and the management of urban runoff within your jurisdictional boundaries. The idea here is to identify priority areas of concern based upon watershed and water quality conditions and issues. This portion of your assessment helps you to determine where your URP should be focused and why. The institutional and resource assessments are covered in detail in the Assessment chapter of this guide (Chapter 2).

The next step in the development of your URP is to establish a program management structure. Part of this structure may fall out of your preliminary institutional assessment, part may be influenced by the type of program that you want to implement, and part may be impacted by public participation — all subject to change. Remember that the process is not linear and that the idea here is to establish a

general framework for your URP so that you can begin your program. Subsequent events are likely to impact these arrangements. Overall program management is covered in detail in the Program Development chapter of this guide (Chapter 3).

After performing a preliminary assessment and establishing a general management structure, the concurrent and overlapping third step in the process is to develop your program elements. For implementing BMPs, this step is the heart of your URP, and this guide is primarily a vehicle for providing guidance on this topic (Chapter 4).

Because the MURP is a model document, a full array of runoff management measures is presented. You should choose those controls and elements that are applicable to your community's concerns. However, while the document is structured to allow you to tailor a program to your needs, the MURP also defines minimum program elements.

All municipalities should begin with at least the minimum program elements. The minimum program elements recommended by the MURP are the "minimum control measures" required in the NPDES Phase II regulations:

- ✓ Public education and outreach
- ✓ Public involvement and participation
- ✓ Illicit discharge detection and elimination
- ✓ Pollution prevention and good housekeeping in municipal operations
- ✓ Construction site urban runoff control
- ✓ Post-construction runoff management in new development and redevelopment

These Phase II requirements (Sections 4.1 through 4.6) form the minimum URP. Within each of these Phase II-required control measures (or control programs), MURP further recommends minimum strategies for BMP implementation. Thus, the minimum URP would involve implementing BMPs within each of the six Phase II-required control measures above.

Note that NPDES Phase II regulations do not target any specific land-use categories other than activities falling under the scope of municipal operations. Industrial land uses that are considered significant sources of pollutants are already addressed under the Phase I regulations (i.e., required to control pollutants under a General Permit). With respect to general commercial establishments and residential sources, the regulations emphasize education and outreach as the method to achieve pollutant reduction. However, if you determine that commercial or industrial facilities in your town are significant sources that need to be controlled more rigorously, this guide also presents control programs to help you do that (Sections 4.7-4.8). Please note that these additional programs are only the tip of the iceberg and that any number of individual control programs are available from the sources listed in this guide should you decide to tailor your URP accordingly. The range of URP controls are presented in detail in the Implementation section of this guide.

### The Feedback Loop

The culmination of the initial development process, and the first step in the iterative improvement process, is to evaluate and improve your URP's performance. Is water quality improving? Is your program functioning? Are you doing too much? Too little? The evaluation step in the URP conceptual framework allows you to take stock of your program and adjust it accordingly. While often conceived as a reporting requirement, evaluation is more aptly described as a daily process. Overall program appraisal and updating are covered in detail in the Evaluation chapter of this guide (Chapter 5).

## 1.4 MURP Manual Organization

Structurally, the MURP consists of this overview, the main document, and appendices of supplementary information. This overview chapter acts as both a general issue and program summary as well as a guide that shows how each of the individual components relate to the larger program.

The main document itself is further divided into four main chapters: Assessment, Program Development, Implementation, and Evaluation. Each of these chapters has a corresponding appendix with additional information. For example, Chapter 3, Program Development, corresponds to Appendices 3A through 3E, which consist of additional program management tools such as a model urban runoff ordinance and model general plan language.

The relationship of the appendices to the main document is particularly important in terms of Implementation (Chapter 4). Chapter 4 describes the individual control programs and how each of these control programs can, and should, be a part of your URP. However, the actual BMPs (and any other appropriate tools) for each of these programs are contained in corresponding Appendix 4. For example, Section 4.4 describes a Municipal Operations Pollution Prevention Program that is supplemented by a BMP guide for municipal operations (Appendix 4J), as well as a variety of other materials relevant to the program (e.g., a model corporation yard Storm Water Pollution Prevention Plan, Appendix 4L). See the document layout on the next page for a visual cue to the guide.

### Go to It!

This MURP guide is easy to follow and examples, references, and contacts are provided. While some of the information in this guide is general and can be used by a small municipality anywhere in the U.S., this guide has been designed primarily for users in California. In fact, the MURP was developed and tested by two small municipalities — the City of Monterey and the City of Santa Cruz. As you make your way through the guide, you will find examples of how these two cities adapted the MURP to their local conditions. Much is to be gained from develop-

ing an URP as described in this guide, including regulatory compliance with NPDES Phase II and consistency with CZARA Section 6217. However, the most important product for the citizens of your community is cleaner water and its many resulting beneficial uses. Go to it!

## MURP Manual Organization