

Dominguez Gap Wetlands Project

PHOTO: L.A. COUNTY FLOOD CONTROL DISTRICT



Discussion: Low Impact Development

The County of Los Angeles’ Integrated Watershed-Based Approach to Complex Urban Runoff and Stormwater Management

MARK PESTRELLA

With thousands of permitted, as well as nonpoint source, discharges into the receiving waters of the County of Los Angeles (County), improving the water quality of the region’s coastal watersheds is a significant undertaking. To help public and private entities address the challenge of managing urban runoff and stormwater in such a complex environment, the County has taken an integrated, watershed-based management approach.

Background

Coastal watersheds in the County cover approximately 3,100 square miles (Figure 1). Portions of the rivers, lakes, creeks, streams, beaches, and coastal waters of these watersheds have been impacted by toxins and health-threatening pollutants at levels well above established public health standards.

Some of these toxins and pollutants come from the untreated water that flows off rooftops, pavement, streets, and parking lots directly into our waterways, bays, and beaches. Runoff contains numerous pollutants, including industrial solvents, paints, bacteria, oxygen-choking pesticides and fertilizers, motor oil, trash, and even toxic heavy metals such as lead, mercury, chromium, and arsenic. This is called nonpoint source pollution because the contaminants come from many different sources. These pollutants often cause an impairment of beneficial uses of water bodies such as recreation areas and aquatic wildlife habitats. To protect such uses, water quality standards have been established for each beneficial use. Further, Total Maximum Daily Loads (TMDLs) are used to define

the maximum allowable amount of pollutants introduced into water bodies while still meeting such water quality standards.

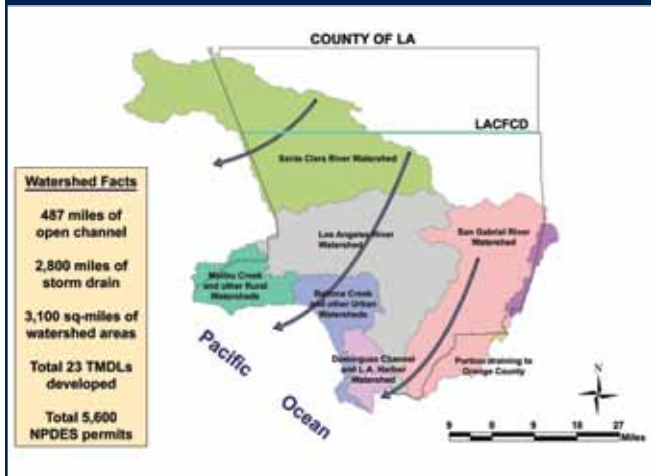
To date, water bodies within the County have been prescribed 23 TMDLs, including trash, metals, toxic pollutants, bacteria, nutrients, and chlorides. It is expected that approximately 30 additional TMDLs will be established in the next few years. Typical sources identified in the TMDLs for most of the County’s watersheds are from nonpoint sources including aerial deposition, natural sources (forests and birds), and urban runoff.

Integrated, Watershed-Based Approach to Current Challenges

Urban runoff discharges occur through thousands of miles of stormwater conveyance systems under the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System Permit. It should be noted that, in addition to the discharges permitted by

Low Impact Development

Figure 1. Illustration and Facts of Los Angeles County's Coastal Watersheds



the Municipal Separate Storm Sewer System, a variety of other types of discharges occur every day under 5,600 active NPDES permits issued by state regulatory agencies. Consequently, it is nearly impossible to demonstrate the water quality improvement effect as a result of individual management actions toward water quality standards at the receiving waters. At any given time, the deterioration of water quality could be attributed to any one of the 5,600 separate permitted discharge activities.

To overcome these challenges, an integrated, watershed-based approach is needed to address the water quality of the County's watersheds. In the integrated, watershed-based approach, collective impact of a variety of pollutant sources from point to nonpoint is evaluated and thereby comprehensive, long-term strategies for overall water-quality improvement of the entire watershed can be planned. These strategies include: (1) plan for the entire watershed rather than local areas alone; (2) address multiple pollutants rather than an individual source; (3) develop multi-benefit BMPs rather than single purposed ones. To help achieve these goals, the County has initiated the Low Impact Development Ordinance and Watershed Management Modeling System. Details of these programs are discussed as follows.

Establishment of the Low-Impact Development Ordinance

The County has adopted the Low-Impact Development (LID) Ordinance to implement the watershed-based approach effectively and thereby mitigate widely scattered pollutant sources that have resulted from increased urbanization of the County's unincorporated areas.

The County's LID Ordinance took effect on January 1, 2009 and required that all new development and redevelopment projects incorporate LID features into their designs. The goal of this requirement is to prevent pollutants of concern associated with development from impacting local water bodies and to mitigate hydromodification impacts to natural streams. In order to facilitate the implementation of the LID Ordinance, the County produced the County of Los Angeles' Low-Impact Development Standards Manual (January 2009) to guide developers in their effort to

integrate LID features into their projects and to meet the LID Ordinance requirements, which specify infiltration or storage and reuse of excess runoff, or implementation of other listed LID features such as rain barrels and permeable pavements. It is estimated that 150 properties were conditioned to implement LID features prior to obtaining building permit approval in the first year of the ordinance.

Development of the Watershed Management Modeling System

As an effective stormwater management tool implementing the integrated, watershed-based approach, the Los Angeles County Flood Control District is developing the Watershed Management Modeling System (WMMS) for all of the County's coastal watersheds. This has been a cooperative effort with the United States Environmental Protection Agency (EPA). The EPA has provided technical expertise with a Best Management Practice (BMP) simulation system and watershed models that were previously created as part of existing TMDL development. A Technical Advisory Committee was formed to provide critical input in the system development. The Technical Advisory Committee consisted of watershed committee representatives, state and federal regulators, researchers, and nongovernmental organization representatives.

The WMMS simulates hydrologic and multi-pollutant transport processes in a watershed while evaluating the benefits and costs of different BMP options, with the goal of ultimately identifying a combination of the most cost-effective BMP solutions to a specific management objective, such as TMDL compliance. Built on an extensive body of relevant studies in the Los Angeles region and the state-of-the-art optimization techniques, the WMMS provides a unique framework where municipalities or watershed planners can evaluate alternative stormwater BMPs. See Figure 2 for a graphic representation of the WMMS and its optimization system.

Figure 2. Illustration of Watershed Management Modeling System's Main Structure

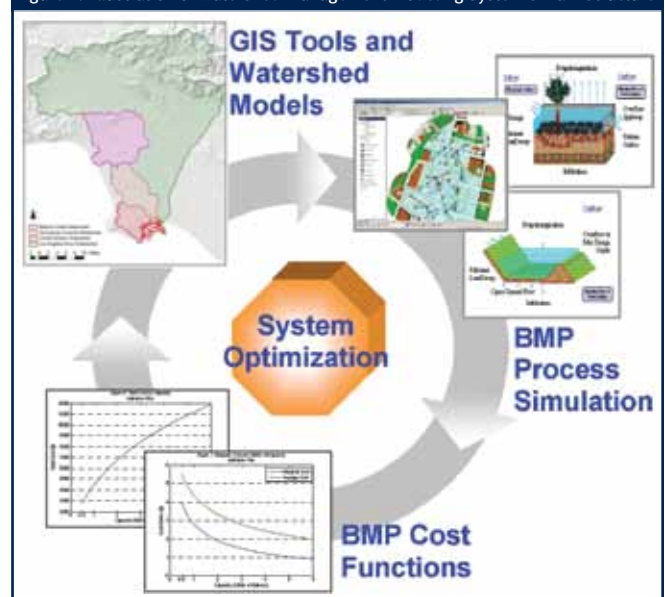
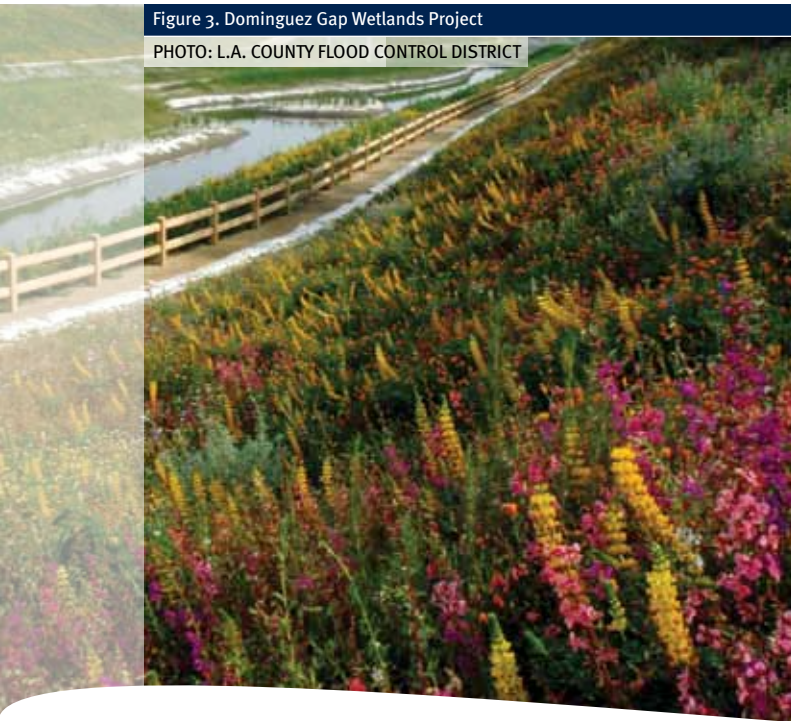


Figure 3. Dominguez Gap Wetlands Project

PHOTO: L.A. COUNTY FLOOD CONTROL DISTRICT



Typical BMPs considered by the WMMS include local scale (often referred to as LID-type BMPs) and sub-watershed scale BMPs. Local scale BMPs present a great option for individual cities to control pollution at their source. Examples include local bioretention or permeable pavements, which are typically installed in a small scale, distributed throughout a watershed. Sub-watershed scale BMPs treat or infiltrate residual runoff from the entire sub-watershed. The general scale of a sub-watershed is approximately one square mile. Sub-watershed scale BMPs include infiltration basins or treatment wetlands. Although often limited by available space in urban areas, they can create opportunities for new habitat areas and public open spaces. Examples of such projects include the Sun Valley Park and Dominguez Gap Wetland projects. The Sun Valley Park project addresses runoff from approximately 40 acres of urban area by providing flood protection, water conservation, and water quality improvement. The Dominguez Gap Wetland project (Figure 3) treats 1.3 million gallons per day diverted from the Los Angeles River and directly from local urban runoff.

Although similar attempts have been made in other parts of the country, the scale and level of details of the WMMS is unprecedented. This is the first for a model of this type to provide unparalleled modeling that accounts for parcel scale details of hydrologic, pollutant transport, and BMP processes while encompassing 3,000 square miles of coastal watersheds

Using the integrated, watershed-based approach, the WMMS will help decision-makers use the results of the model to develop projects that achieve overall watersheds' goals (i.e., TMDL) while recognizing the needs of individual municipalities and other public and private entities within the watershed (i.e., open space development).

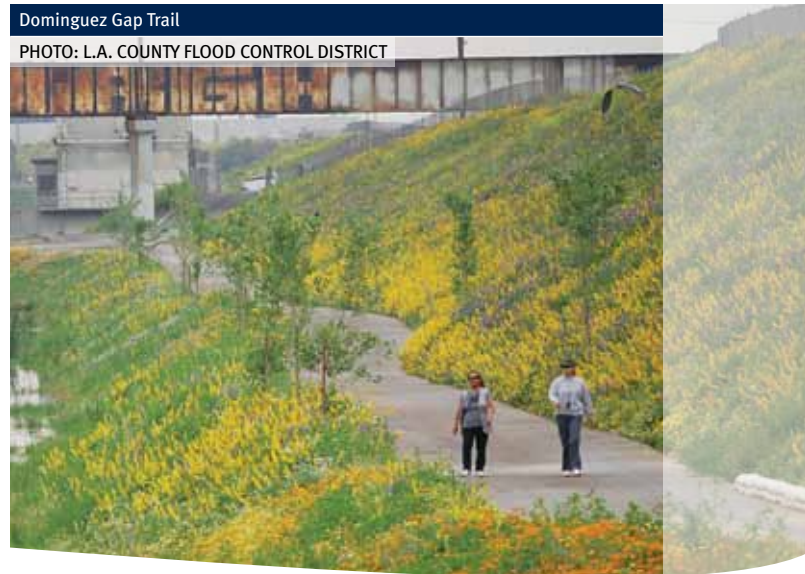
The model results will be presented in terms of type and quantity of BMPs allocated to specific land use parcels. This allows for decision-makers to conveniently select locally available parcels/areas and implement them. This will particularly help municipalities and other TMDL-responsible parties in preparing the multi-pollutant TMDL implementation plans that are required by regulatory agencies. During the TMDL implementation phase, the WMMS can be used to facilitate an iterative adaptive approach to ultimate water quality improvement goals through continuous refinement and improvement of the selected BMP solutions.

Furthermore, the WMMS provides an excellent framework that would help assess feasibility of projects with multi-benefits including water quality, water conservation, flood protection, and open-space development.

The WMMS and its results will be made available to the public. Using the WMMS, different entities within the watershed can work cooperatively to develop cost-effective and mutually beneficial solutions that address multiple issues, such as water quality, water conservation, flood protection, and open space development. This would eventually lead to an integrated, watershed-based stormwater management plan. Further, this would help to achieve the sustainable development of watersheds and stormwater infrastructure.

Dominguez Gap Trail

PHOTO: L.A. COUNTY FLOOD CONTROL DISTRICT



MARK PESTRELLA is an Assistant Director of the County of Los Angeles Department of Public Works and a licensed Civil Engineer in the state of California. Among his many responsibilities, Pestrella oversees the department's Water Resources Branch, which includes the Los Angeles County Waterworks Districts and the planning, operations, and maintenance functions of the Los Angeles County Flood Control District.