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**ANNUAL MONITORING REPORT 2006-2007**

**Stormwater Monitoring Coalition  
Of Southern California**

**September 2, 2007**

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## INTRODUCTION

As a result of the increasing regulatory focus and the lack of scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout southern California have developed a collaborative working relationship. The goal of this relationship is to develop the technical information necessary to better understand stormwater mechanisms and impacts, and then develop the tools that will effectively and efficiently improve stormwater decision-making. As individuals and agency representatives, there was early recognition that these issues are oftentimes not localized, but typically cross watershed and jurisdictional boundaries. This relationship culminated in a formal letter of agreement, signed in 2000, by all of the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in southern California to create the Stormwater Monitoring Coalition (SMC) (Table 1).

The SMC has been so successful that the member agencies have decided to renew the letter of agreement for another five years. Moreover, the organization's appeal has been recognized by others and is resulting in four new member agencies. The new agencies include Caltrans, the City of Los Angeles, the State Water Resources Control Board, and the US Environmental Protection Agency. The SMC welcomes these new members and looks forward to working together.

**Table 1. List of member agencies in the Stormwater Monitoring Coalition.**

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California Regional Water Quality Control Board, Los Angeles Region <sup>1</sup>
California Regional Water Quality Control Board, San Diego Region <sup>1</sup>
California Regional Water Quality Control Board, Santa Ana Region <sup>1</sup>
California Department of Transportation, Caltrans
City of Long Beach <sup>1</sup>
City of Los Angeles, Watershed Protection Division
County of Orange, Public Facilities and Resources Dept. <sup>1</sup>
County of San Diego Stormwater Management Program <sup>1</sup>
Los Angeles County Department of Public Works <sup>1</sup>
Riverside County Flood Control and Water Conservation District <sup>1</sup>
San Bernardino County Flood Control District <sup>1</sup>
Southern California Coastal Water Research Project <sup>1</sup>
State Water Resources Control Board
US Environmental Protection Agency, Office of Research and Development
Ventura County Watershed Protection District <sup>1</sup>

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<sup>1</sup> original SMC member agency

The first project supported by the SMC was to develop a five-year Research Agenda. The research agenda, published in 2001, consisted of 15 unique projects developed around three main foci: 1) developing a regional monitoring infrastructure; 2) understanding stormwater runoff mechanisms and processes; and 3) assessing receiving water impacts. The SMC has made tremendous progress implementing the Research Agenda. Nine of the 15 projects have been started and nearly all have been completed. Each of these projects has, in one form or another, influenced stormwater management. Three examples of the SMC's influence include: 1) the project on evaluating microbial

source tracking (MST) has led to a significant change in how MST is conducted in southern California; 2) the project on indicators of peak flow directly influenced the development of peak flow criteria in Los Angeles; 3) the project to establish standardized data formats has led to language in multiple stormwater NPDES permits requiring electronic data submittal. The SMC is currently developing an agreement to update and revise the research agenda. This will provide vision and direction to the SMC for the next five years.

Not only does the collaborative nature of SMC projects represent value in terms of improved effectiveness of management activities, but value in terms of cost efficiency to its member agencies. All of the completed SMC projects have been on time and on (or under) budget. The cost of the studies is divided among multiple agencies rather than each agency trying to support individual isolated projects. In addition, the SMC has been successful in attracting outside resources and agency support. For example, all but a single project has attracted additional funds amounting to well over \$700,000. In addition, we have received in-kind assistance from inland wastewater dischargers, environmental groups, universities, and regulatory or stormwater agencies that are not currently SMC members. The power of collaboration should magnify as the SMC continues to be successful in accomplishing its goals. Below is a list of the project accomplishments during the 2006-07 Fiscal Year.

## **PROJECT ACCOMPLISHMENTS**

### **Building A Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program**

Status: 95% complete

Project budget: \$280,000

Assessment of freshwater biological communities represents a potentially powerful tool for evaluating the effects of discharges in southern California creeks and streams. Bioassessments integrate the effects of multiple stressors, including chemical pollutants and physical alterations in receiving waters. The value of biological assessments is that they are closer to many of the defined beneficial uses of receiving waters (i.e. aquatic life, warm water habitat, cold water habitat) than chemically-derived water quality objectives.

The goal of this study is to build a regionally consistent bioassessment monitoring program. This project will be completed in three phases including: 1) building a monitoring infrastructure; 2) calibrating and validating a regional assessment tool; and 3) designing an integrated, coordinated regional monitoring program. The first phase focuses on creating a monitoring infrastructure so that multiple agencies are properly trained, data are collected in comparable manners, and data can be efficiently shared. The second phase focuses on developing an assessment tool that is robust enough to be used by all agencies across the region. This will enable a consistent approach for evaluating the status of freshwater biological communities and provide the answers

regarding community impacts to managers in meaningful and understandable terms. The third phase focuses on creating a study design that most efficiently answers specific questions of interest at large regional scales. Addressing some questions at regional scales can provide cost efficiency for addressing reference condition, cumulative impacts, and when nested within a local sampling design, provides unparalleled information for providing context to local monitoring data.

Our main collaborator on this project is the California Department of Fish and Game (CDF&G). The project is 50% funded by the SWRCB, whose main desire is to ensure integration with the Surface Water Ambient Monitoring Program (SWAMP). This will provide further value to SMC member agencies. To help accomplish this project, an SMC Technical Subcommittee has been formed.

All three phases have been implemented by the SMC. The first goal towards monitoring infrastructure is complete. SMC member agencies have used training, workshops, field audits, enhanced laboratory quality assurance activities, and written or collated information management and field protocol documents. Of particular note, SMC member agencies have helped to create an important network of laboratory taxonomists called the Southwestern Association of Freshwater Invertebrate Taxonomists that will be important in standardizing and ensuring the quality of laboratory identifications. The second task to evaluate an assessment tool is nearing completion. The southern California index of biological integrity (SC IBI) was being tested in 15 low gradient streams of varying levels of impact. It was clear from this study that the IBI is not the best assessment tool for describing impact in these habitats. The low gradient project was so successful that the Working Group helped SCCWRP and CDFG to prepare a State Consolidated Grant proposal to test the SC IBI in another important habitat; non-perennial streams. Finally, the Working Group has designed an integrated, collaborative Regional Watershed Monitoring program. The goal of the Regional Watershed Monitoring program is to increase the effectiveness of existing NPDES monitoring programs by integrating among permittees and SWAMP to achieve a large-scale assessment of watershed condition. The cost of implementing this program would be negligible because the Working Group identified significant redundancies and inefficiencies in existing monitoring programs that could be reprogrammed towards a regional design. Finally, the Working Group has found additional partners to help contribute to the regional monitoring program including the Wetland Recovery Project (WRP), other RWQCBs, and other NPDES permittees.

This project is in its final phases. The written workplan should be completed within the next quarter and a regional watershed monitoring program could be implemented as soon as 2008.

**Laboratory Intercalibration Study**

Status: 35% complete

Project budget: \$60,000

One goal of the southern California Stormwater Monitoring Coalition (SMC) is to compile monitoring data from separate monitoring programs to make regionwide assessments. The SMC has begun integrating their monitoring programs by agreeing on goals, objectives, and study designs as part of their development of a southern California Model Monitoring Program [ftp://ftp.sccwrp.org/pub/download/PDFs/419\\_smc\\_mm.pdf](ftp://ftp.sccwrp.org/pub/download/PDFs/419_smc_mm.pdf). As part of the model monitoring program, 11 analytical laboratories that perform chemical analysis of runoff samples for SMC member agencies conducted an intercalibration study to assess interlaboratory variability and enhance comparability.

The laboratory intercalibration study quantified the range of variability both within and among laboratories that SMC member agencies can expect when examining their own data, or combining data with other agencies. It was successful because the laboratories worked together to minimize interlaboratory variability through the use of performance-based limits for accuracy, precision, and sensitivity. The intercalibration study also defined a series of protocols for specific analytical techniques where performance-based guidelines needed to be enhanced with methodological consistency to ensure comparability. Finally, the intercalibration and resulting guidelines/protocols were documented in a Laboratory Guidance Manual for SMC member agency laboratories [ftp://ftp.sccwrp.org/pub/download/PDFs/420\\_smc\\_chem.pdf](ftp://ftp.sccwrp.org/pub/download/PDFs/420_smc_chem.pdf).

The laboratory Guidance Manual and intercalibration effort, however, was incomplete in three areas. The first area was the need to repeat the intercalibration periodically as new laboratories, or new personnel at existing laboratories, come along. The second area was the need to intercalibrate on additional constituents. The original laboratory calibration focused on suspended solids (TSS), nutrients, and trace metals. Organic constituents such as chlorinated hydrocarbons (CHC), organophosphorus pesticides (OP), and polycyclic aromatic hydrocarbons (PAH) were not included. Third, the integration of the laboratory performance-based guidelines were insufficiently integrated into monitoring programs. While the Laboratory Manual could be used as citation for monitoring agencies or regulatory compliance, no specific permitting or contractual language was provided for SMC member agencies.

The goal of this project is to complete the three areas of missing information to make the Laboratory Guidance Manual an ongoing and effective document. It will involve three steps: 1) repeat the laboratory intercalibration for TSS, nutrients, and trace metals; 2) initiate an intercalibration for organic constituents and toxicity; and 3) create draft contract language for integration into stormwater monitoring programs. A technical Working Group consisting mostly of laboratory managers has been formed to assist in the study.

The SMC has successfully finished the first task of the study. The intercalibration of TSS, nutrients, and trace metals was based on customized certified reference materials just for our project and runoff samples from different land use types. Gratifyingly, most of the laboratories that participated previously successfully completed the second iteration. An objective laboratory scoring system, which consists of letter scores for each analyte, has been developed and is being used for the contract language in task 3.

Pending formal agreement signatures, the working group is prepared to implement the toxicity testing element of the intercalibration.

### **Bacterial Reference Watershed Study**

Status: 90% complete

Project budget: \$165,000 + in-kind services

High fecal indicator bacteria levels are one of the most common surface water impairments in southern California. Frequent exceedences of bacterial water quality standards have resulted in development of Total Maximum Daily Loads (TMDL) as a regulatory mechanism to address bacterial contamination in several southern California watersheds.

Current water quality standards for freshwater use fecal coliforms or *E. coli* as an indicator of fecal contamination because their presence is well correlated with the many waterborne disease-causing organisms or pathogens. However, fecal coliforms and *E. coli* are naturally present in the intestines of warm-blooded. Consequently, fecal contamination of surface waters can result from numerous sources of fecal pollution, including human sewage, manure from livestock operations, indigenous wildlife and urban runoff. In undeveloped areas wildlife, such as small and large mammals and birds, have the potential to be a significant source of fecal bacteria to surface waters.

In recognition of the potential for natural sources to affect bacteria levels in surface waters, several TMDLs either allow or require development of numeric targets that account for natural bacteria levels. For example, the Malibu Creek Bacteria TMDL requires responsible jurisdictions to monitor unimpaired streams in the local watershed during dry weather, dry winter weather, and wet weather for at least one full year in order to develop a representative numeric target for allowable bacteria exceedence days. Several similar studies are currently being considered or proposed in Ventura, Los Angeles, Orange, and San Diego counties; however, there is currently no coordination between these proposed studies.

The objective of this project is to assess natural bacteria levels in numerous streams throughout southern California in order to provide a regional characterization of background bacteria concentrations. Bacterial indicators were measured from unimpaired streams in 12 southern California watersheds weekly for one full year. These data were used to investigate background levels, frequency of exceedences of relevant water quality standards, and spatial and temporal patterns.

This project is a partnership of numerous SMC agencies who are participating via in-kind contributions. Three regional water quality control boards, six storm water agencies, and several cities cooperated on field data collection and laboratory analysis. Following laboratory and field intercalibration, samples were collected weekly between May 2006

and May 2007. Overall, the 30-day geometric mean exceedences of freshwater standards were 2% for *E. coli* and 14% for *enterococci*. There were clear seasonal patterns with exceedences being most common during July and August. Data collection and analysis for this project is complete, with a project report expected in December 2007.

### **Hydromodification Study**

Status: 10% complete

Project budget: \$1,137,440

The process of urbanization has the potential to affect stream courses by altering watershed hydrology. Development and redevelopment can increase the amount of impervious surfaces on formerly undeveloped landscapes. This reduces the capacity of remaining pervious surfaces to capture and infiltrate rainfall and, as a result, a larger percentage of rainfall becomes runoff during any given storm. In addition, runoff reaches the stream channel much more efficiently, so peak discharge rates postdevelopment are higher compared to predevelopment for an equivalent rainfall event. This process has been termed hydromodification.

Hydromodification can result in adverse effects to stream habitat, surface water quality, and water supply. The stream erosion that results from the increased peak flow can threaten infrastructure, homes, and businesses. Intermittent and ephemeral streams that possess riparian and wetland habitat are at particular risk from effects of hydromodification. Streams in semi-arid regions are especially vulnerable to urbanization due to a prevalence of sand bed channels, lack of vegetative reinforcement, and relatively large net changes in water and sediment supply associated with stormwater runoff. Recent studies by the SMC have indicated that intermittent and ephemeral streams in southern California degrade at lower levels of watershed urbanization than streams in the eastern US.

In response to the effects of hydromodification, state and local agencies are developing standards and management approaches to control and/or mitigate the effects of hydromodification on natural and semi-natural stream courses. Successful implementation of these regulatory programs requires development of tools to better assess hydromodification effects and develop appropriate mitigation and management strategies.

The goal of this project is to develop a series of tools supporting implementation of hydromodification management measures that could be used to better protect the physical, chemical, and biological integrity of streams and their associated beneficial uses. This project will provide tools to answer the following questions: 1) Which streams are at the greatest risk from the effects of hydromodification? 2) What are the anticipated effects in terms of increased erosion, sedimentation, or habitat loss, associated with increases in impervious cover? 3) What are some potential management measures that could be implemented to offset hydromodification effects and how effective are they likely to be?

This project is being conducted in collaboration with researchers from Colorado State University, Fort Collins. In May 2007, we held an initial Technical Advisory Committee meeting for the project, which was attended by over 30 scientists and managers. Based on the results of this meeting, we refined our scope of work and produced the Project Work Plan and Quality Assurance Project Plan (QAPP). Field reconnaissance of sampling sites was completed during the summer of 2007, resulting in the identification of 18 sites where model calibration data will be collected, and an additional 15 sites where data will be collected for development of the screening tools. Field data collection will occur in Fall 2007. Finally, we have continued to coordinate this project with similar efforts being conducted by several county stormwater programs, CASQA, and the Water and Land Use Partnership (WALUP).

### **Low Impact Development Study**

Status: 10% complete

Project budget: \$1,000,000 (\$400,000 SMC plus \$600,000 State Prop 40 Grant)

The Low Impact Development Guidance (LID) Study is being conducted with funding from the State Water Resource Control Board's Consolidated Grants Program, under the Urban Runoff Program of Proposition 40. A proposal was submitted by the County of San Bernardino on behalf of the SMC for the LID Project known as "LID Guidance and Training for Southern California."

The LID Project will develop a comprehensive program to incorporate LID strategies and techniques into the planning and design of public and private sector projects. The LID Project will develop a model program for localities in California that are interested in adopting LID strategies and techniques. This will include determining the key technical and institutional issues that must be addressed for successful implementation, pilot projects that demonstrate the effectiveness of LID, and training and outreach to help solidify an implementation strategy to ensure large-scale and long-term success.

The grant funded portion of the project must be completed by September 2008. This will require a two-year work effort that is organized into the following funding areas:

1. **Pilot Project Planning and Design.** *Establish design criteria and site selection*
2. **Monitoring.** *Implementation and demonstration of technology*
3. **Outreach and Training.** *Reporting and facilitation of wide-spread programmatic implementation*

The SMC will provide the required 25% matching funds (\$200,000) for the grant funded tasks. These tasks include preparing a literature review, conducting a series of training workshops, and developing a field monitoring program for LID features. The Literature Review has been completed and the final report will be made available through the California Stormwater Quality Association Website and the SMC website when operational.

A Technical Advisory Committee has been established and they reviewed the Literature Review and provided guidance on the initial tasks for the project. The TAC will meet as needed to advise the project as it proceeds.

Training workshops are in preparation. Several potential field monitoring sites have been identified, and Stantec Consulting has been hired to develop the monitoring program and select monitoring sites.

Once the grant-funded tasks are completed, the SMC will continue to fund (approximately \$200,000) and manage the project for three additional years that will primarily require field monitoring and analysis of LID features.