



Southern California Stormwater Monitoring Coalition

Annual Report 2016-2017

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EXECUTIVE SUMMARY

Collaboration is a powerful tool for achieving common goals. The Southern California Stormwater Monitoring Coalition (SMC) has exemplified collaboration over the past nearly 20 years filling foundational gaps in knowledge about how to improve stormwater management. Creating monitoring infrastructure, deciphering stormwater mechanisms and processes, and assessing receiving water impacts have brought tremendous leaps in how dischargers and regulators address the challenging issues of urban runoff¹. Cumulatively, the SMC and its project partners has expended over \$9M to fill these data gaps. Fiscal Year (FY) 2016-2017, was the second year of a five-year SMC Master.

The SMC Annual Report provides an opportunity for the member agencies to present and describe the projects they are working on with other member agencies. Likewise, this report provides a brief overview of projects active during the reporting year and summarizes projects either recently completed or planned for the upcoming year. Each project summary presented in this report includes the lead agency managing the project, the partner agencies, sources of funding, and a list of prepared publications.

The 2016-2017 reporting year included projects covering a wide range of environmental and water quality disciplines. Member agencies were involved in their second five-year regional bioassessments of stream health, and continued a multi-year monitoring and assessment project on Low Impact Development. The SMC also completed the group's first ever toxicity testing laboratory inter-calibration exercise and explored the implications of the results and corrective actions to address concerns. Additionally, the SMC Steering Committee initiated two new projects during FY 2016/17 including a project to help provide standardized MS4 monitoring procedures across member agencies and the development of a regional water quality index with visualization tools. Finally, the SMC approved the support and funding for a new project which will begin in FY 17/18 the development of the SMC data portal which will use Regional Monitoring Data as a demonstration of capabilities.

¹ Southern California Stormwater Monitoring Coalition 2014 Research Agenda. 2014. K Schiff, ED Stein, S Aminzadeh, A Boehm, G Hildebrand, L Honeybourne, I Nasser, P Ode, S Taylor, D Senn, J Smith, C Sommers, E Strecker. Technical Report 828.

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ACRONYMS AND ABBREVIATIONS

CASQA	California Storm Quality Association
LID	Low Impact Development
NPDES	National Pollutant Discharge Elimination System
PSA	Perennial Stream Assessment
SCCWRP	Southern California Coastal Water Research Project
SETAC	Society for Environmental Toxicity and Chemistry
SMC	Southern California Stormwater Monitoring Coalition

1 INTRODUCTION

The goal of the Southern California Stormwater Monitoring Coalition (SMC) 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. The SMC develops and funds cooperative projects to improve the knowledge of stormwater quality management and reports on the progress of those projects on an annual basis.

The 2016-2017 Annual Report represents an opportunity to report on the status of collaborative projects that are being worked on by member agencies. This report is intended provide a brief overview of projects active during the reporting year and summarize projects either recently completed or planned for the upcoming year. Each project summary presented in this report includes the lead agency managing the project, sources of funding, and a list of prepared publications.

1.1 OVERVIEW OF THE 2016-2017 ANNUAL REPORT

Member agencies are involved in multiple projects or individual projects that have different times for completion and are at various implementation stages. Project information is presented in several sections of this report depending on the implementation status. Recently completed projects, active projects, and projects planned for the upcoming year are provided in Section 3 to Section 5. The 2016-2017 Annual Report outline is as follows:

Section 3: SMC member agencies completed several projects during the 2016-2017 reporting year including:

- Toxicity Testing Laboratory Intercalibration Study

Section 4: SMC projects that were active during the 2015-2016 reporting year included:

- Implementing the 2015-2019 Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program
- SMC California LID Evaluation and Analysis Network (SMC CLEAN) Project
- Development of standardized MS4 monitoring programs
- Development of a water quality index and visualization method

Section 5: The SMC also has the following projects planned to potentially begin in the 2016-17 reporting period including:

- Development of the SMC Data Portal and Initial Population with Regional Monitoring Data

Information on past annual project updates reported in the SMC Annual Report are available on the SMC website at the following link:

SoCal SMC Annual Reports (<http://www.socalsmc.org>)

2 STORMWATER MONITORING COALITION OVERVIEW

As a result of an increasing regulatory focus and limited scientific knowledge base, both stormwater regulators and municipal stormwater management agencies throughout Southern California have formed a collaborative working relationship to improve the science of stormwater management. The goal of this relationship is to develop the technical information necessary to better understand stormwater mechanisms and impacts, and then develop tools to effectively and efficiently improve stormwater decision-making. There was early recognition that these issues are often not localized but typically cross watershed and jurisdictional boundaries. This relationship culminated in a formal letter of agreement, signed in 2000, 2009, and again in 2015 by all Phase I municipal stormwater National Pollutant Discharge Elimination System (NPDES) lead permittees and the NPDES regulatory agencies in Southern California to create the Stormwater Monitoring Coalition (SMC). The SMC is directed by a Steering Committee consisting of member agencies' program managers who are the lead representatives for their respective organizations (Table 2-1).

Table 2-1. List of Member Agencies in the Stormwater Monitoring Coalition

Agency	Lead Representative ^(a)
California Department of Transportation, Caltrans	Bhaskar Joshi
City of Long Beach	Alvin Papa
City of Los Angeles, Watershed Protection Division	Charlie Yu
City of San Diego	Ruth Kolb
County of Orange, OC Public Works	Grant Sharp, Vice-Chair
County of San Diego Stormwater Management Program	Joanna Wisniewska
Los Angeles County Flood Control District	Geremew Amenu
Riverside County Flood Control and Water Conservation District	Rebekah Guill
San Bernardino County Flood Control District	Harold Zamora
Southern California Coastal Water Research Project	Ken Schiff, Treasurer
Ventura County Watershed Protection District	Arne Anselm, Chair
California Regional Water Quality Control Board, Los Angeles Region	Ivar Ridgeway
California Regional Water Quality Control Board, San Diego Region	Chad Loflen
California Regional Water Quality Control Board, Santa Ana Region	Adam Fischer
State Water Resources Control Board	Greg Gearheart
US Environmental Protection Agency, Office of Research and Development	Mike Borst

* List current as of June 2017

The value of the SMC to its member agencies is at least four-fold, including:

- The ability to share costs for implementing projects.
 - Cost reductions for SMC member agencies can be significant since collaborative projects can reduce costs by more than 90% relative to financing alone. In addition, the majority of projects have non-member agency cost matching. Since its inception, non-member cost matching has totaled nearly \$3.5 million, which is an almost 2:1 match of member costs.
- The ability to stretch member agencies' skill bases.
 - Stormwater management requires a wide variety of knowledge, including regulatory policy, engineering, hydrology, biology, chemistry, toxicity, and microbiology, to name a few. Many member agencies have limited staff and, by working together, garner the additional skills that are not sustainable within each agency.
- The ability to communicate.
 - Discussions among member agencies provide context and a richness of ideas for application to local issues. Similarly, discussion between regulatory and regulated agencies in an informal setting leads to more effective implementation of management activities.
- Projects conducted under the SMC umbrella have nearly always resulted in management action.
 - Often, it is difficult for a single agency to affect the current course of regulatory management. Because SMC projects are initiated and vetted through the regulated and regulatory management agencies, the results are adopted quickly into the management framework, including alterations to NPDES permits. In turn, these collaborative relationships help regulated agencies meet compliance with their MS4 Phase I permits.

3 PROJECTS COMPLETED DURING REPORTING TERM

This section provides an overview of the SMC member agencies' projects that were completed during the 2016-17 reporting year. This overview briefly summarizes each project, identifies some key study questions, and lists publications produced from the project efforts. SMC associated projects reported in this report are funded through mechanisms which include direct SMC funds, special agreements with direct funding from member organizations, in kind services, grants / match funding, or direct funding of members with institutional / coordination support of the SMC organization.

3.1 TOXICITY TESTING LABORATORY INTERCALIBRATION

Table 3-1. Toxicity Testing Laboratory Intercalibration Study

Lead Agency	SCCWRP
Status	90% Complete
Project Budget	\$65,000 (SMC direct funding)
External Project Partners:	
Aquatic Bioassay & Consulting Laboratory	Marine Pollution Studies Laboratory
Aquatic Testing Laboratories	MBC Applied Environmental Services
Aquatic Toxicity Lab (University of California, Davis)	Nautilus Environmental
City of Los Angeles Environmental Monitoring Laboratory	Pacific Ecorisk
Los Angeles County Sanitation District	
Technical Lead	Ken Schiff, SCCWRP
Key Words: toxicity test, <i>Ceriodaphnia dubia</i>	

Aquatic toxicity testing has become a standard measurement in stormwater management. Field samples are evaluated in the laboratory by exposing test organisms and documenting their response. Responses range from lethality to critical life stage development or reproduction success, and response is measured with highly uniform and repeatable methods. Cumulatively, stormwater management agencies in Southern California spend nearly \$1 million annually conducting toxicity tests.

One of the goals of the SMC is to combine data sets for comparing watersheds over time. One challenge to using toxicity testing is that the various SMC member agencies currently utilize different test species and a variety of endpoints. Although standardized methods are used by the multiple contract laboratories who conduct SMC toxicity testing, the method protocols typically have options or interpretations left to the laboratory, potentially leading to different test outcomes. This uncertainty is compounded by concerns about the toxicity test's inherent variability within each laboratory.

As a result of these challenges, the SMC decided to conduct a laboratory intercalibration study to assess comparability. The goal was to identify key recommended test species and endpoints, quantify intra- and inter-laboratory variability for each test, and make recommendations for how to minimize that variability, where applicable. An advisory committee was created to help design, implement, and interpret the intercalibration study, then construct the recommendations in this guidance manual.

The recommended test species included two freshwater species (*Ceriodaphnia dubia* 6-8 day chronic survival and reproduction test; *Hyaella azteca* 96-hour acute survival test) and two marine species (*Strongylocentrotus purpuratus* and *Mytilus galloprovincialis* short-term chronic larval development tests) based on commonality to current monitoring requirements and maintaining existing trends, sensitivity to toxicants, ease of testing/cost, and other criteria. Two iterations of laboratory intercalibrations were conducted. Each iteration was comprised of four samples delivered blind to each laboratory, lab dilution water, lab dilution water spiked with copper, a runoff sample created with artificial rainfall, and a duplicate. Comparability was evaluated on three factors:

Test acceptability (negative control and reference toxicant response),

Intra-laboratory precision (duplicate sample response), and

Inter-laboratory precision (among lab response).

Up to ten laboratories participated, including contract labs, municipal monitoring labs, and research labs. All laboratories were certified by the State of California for toxicity testing.

After two intercalibration iterations, nearly all laboratories scored comparable (moderate to very high comparability) for three of the four species (four of five endpoints), including both marine species, *Hyaella* (the newest method), and the survival endpoint for *Ceriodaphnia* (Table 4-4). Approximately half the laboratories, however, scored moderate or better comparability for the *Ceriodaphnia* reproduction test, and these laboratories were not consistent between intercalibration rounds. While intra-laboratory precision was generally comparable for *Ceriodaphnia* reproduction, there was a range of responses among laboratories to each sample, including the lab dilution water. The best inter-laboratory precision for the *Ceriodaphnia* reproduction test was observed for the runoff sample.

Based on these results, a final project report will be completed for SMC approval during FY 2016-17. The main report findings will be all four species can be recommended for future use as part of the SMC monitoring programs. Specific guidance for stormwater testing will be provided for potential variable-inducing steps, including hardness of dilution water, feeding, sample handling and water renewals, and aging of organisms. Additionally, intercalibrations will be recommended specifically for the *Ceriodaphnia* reproduction test to assess sources of variability in both stormwater and laboratory dilution water.

Table 3-2. Summary of laboratory comparability scoring for *Ceriodaphnia dubia* (6-8 day) survival and reproduction, *Hyalella* survival, *Strongylocentrotus* embryo development, or *Mytilus* embryo development tests.

Lab	<u>Ceriodaphnia Survival</u>		<u>Ceriodaphnia Reproduction</u>		<u>Hyalella Survival</u>		<u>Strongylocentrotus Development</u>	<u>Mytilus Embryo Development</u>
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1 ^a	Round 1 ^a
A	Moderate	High	Very High	Low	Low	High	Moderate	- ^b
B	Very High	High	Moderate	High	Low	High	-	-
C	Low	High	Low	High	Low	Very High	-	-
E	Moderate	-	Moderate	-	-	-	-	Very High
F	Moderate	High	Moderate	Low	Low	Very High	Moderate	Low
G	High	-	High	-	-	-	-	-
H	Low	-	Low	-	-	-	-	-
I	High	Moderate	High	Low	Moderate	Very High	High	Very High
J	Low	High	Low	Low	High	Very High	Moderate	Moderate

^a Only tested in Round 1

^b - indicates sample not tested

Project-related Publications

Gossett, R. and Schiff, K. 2010. [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 3rd Edition. Southern California Coastal Waters Research Project, Technical Report 615.

Gossett, R. and Schiff, K. 2006 [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 2nd Edition. Southern California Coastal Waters Research Project, Technical Report 521.

Gossett, R. Renfrew, D. and Schiff, K. 2004 [Stormwater Monitoring Coalition Laboratory Guidance Document](#), 1st Edition. Southern California Coastal Waters Research Project, Technical Report 420.

SMC Research Objectives Addressed

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

4 ONGOING PROJECT ACCOMPLISHMENTS

This section provides an overview of the SMC member agencies' active projects along with a brief summary describing the intent of each project, some key study questions, the regional motivation behind the projects, and a list of publications produced from project efforts. While a brief overview is provided in the Annual Report, detailed information can be obtained from the list of technical publications provided at the end of each section or by contacting the Technical Leads.

4.1 IMPLEMENTATING A NEW 5-YEAR REGIONALLY CONSISTENT AND INTEGRATED FRESHWATER STREAM BIOASSESSMENT MONITORING PROGRAM

Table 4-1. 2015-2019 Regional Freshwater Stream Bioassessment Monitoring Project

Lead Agency	SCCWRP
Technical Leads	Raphael D. Mazor, SCCWRP
Project Budget	\$1,126,966 Total Project Funding \$426,330 total SMC contribution \$552, 636 in-kind contribution for sampling and analysis from all participating partners \$150,000 match from SWRCB – SWAMP funds
Key Words: bioassessment, freshwater stream biology, aquatic life stressors, sediment	

Background

In 2015, the SMC initiated the first year of its redesigned stream bioassessment survey, and has since completed three years of sampling. This survey builds upon earlier assessments to address key information gaps. In particular: 1) the biological conditions of nonperennial streams; 2) a better assessment of trends or changes in site conditions, and 2) a change in focus on new analytes and stressors of interest (e.g., sediment contamination, hydromodification).

Results from the first year of the survey were summarized in a report that featured an analysis of the biological conditions of engineered channels. The SMC analyses showed that good biological conditions (as indicated by bioassessment index scores similar to reference) were rarely observed in hardened channels. This report has guided conversations about the assessment of aquatic life beneficial uses in modified channels, notably with the State Water Board as it develops a Biointegrity/Biostimulatory policy.

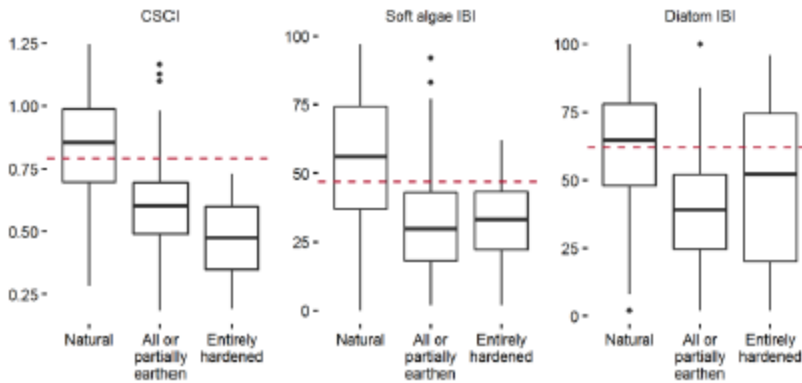


Figure from SMC’s 2015 annual report.

Other articles in the report highlighted results from special studies on cell bioassays, vertebrates in Southern California streams, and applications of SMC data to support management (e.g., Watershed Quality Improvement Plans in the San Diego region).

In 2016, SMC survey participants conducted a pilot study on sediment quality in streams in the region. Preliminary analysis suggests that toxicity and sediment contamination by pyrethroids is rare, but can be severe in certain locations. These results will be analyzed and presented in the survey’s next annual report.

Objectives and Products

The SMC regional monitoring program serves to provide information on the overall regional condition of streams in southern California, trends in condition, and information on important stressors that may affect stream health. In addition to providing critical contextual information for interpreting all other stream monitoring in the region, the SMC regional monitoring program produces data and information that supports numerous local watershed management programs and informs development of statewide policy

Products include annual reports, fact sheets for SWAMP, and data that are available for all SMC members. The regional program also serves to promote data quality and comparability and consistency in field and laboratory data collection efforts.

The most recent report from the SMC survey has been published as a SCCWRP technical report:

RD Mazor. 2017. *2015 Report on the SMC Regional Stream Survey*. SCCWRP Technical Report #963.

Costa Mesa, CA. Available from

http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/963_2015_SMC_Report_EnginChannels.pdf

Project Accomplishments (FY 2016/2017)

SMC survey participants collected samples at 69 sites in the Spring of 2017. Data submission is underway.

Project-Related Publications

RD Mazor. 2017. *2015 Report on the SMC Regional Stream Survey*. SCCWRP Technical Report #963. Costa Mesa, CA. Available from http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/963_2015_SMC_Report_EnginChannels.pdf

SMC Research Objectives Addressed

4.1 Adapt Biological Assessment Tools for Non-Perennial Streams

3.3 Characterization of Stormwater Effects

4.2 LOW IMPACT DEVELOPMENT PROJECT (SMC CLEAN)

Table 4-2. Low Impact Development Project

Lead Agency	San Bernardino County Flood Control District
Report Year Project Started	2015-2018
Status	30% Complete
Initial Project Budget	\$370,000 (SMC direct funding for Current 3 year project funding) Part of a larger project with total funding of \$1,100,000 – (\$600K Prop 40 grant funding and \$500K in SMC match)
Technical Lead	Arlene Chun, San Bernardino County Flood Control District Daniel Apt, Olaunu Matt Yeager, Yeager Environmental Associates Michael Trapp, Michael Baker International
Key Words: LID, monitoring, BMP performance, effectiveness	

Background

The SMC California LID Evaluation and Analysis Network (SMC CLEAN) is designed to understand the effectiveness of LID BMPs. The mission of SMC CLEAN is to develop a thorough understanding of the effectiveness of LID BMPs in California both in the short term for use in calibration of watershed programs and the long term for modification of LID design, construction, and maintenance, through coordination with project partners and others performing LID monitoring and serving as a clearing house for LID monitoring information, developing targeted LID research questions and performing targeted LID monitoring based on these questions, analysis of LID monitoring data, and recommendations for the design, construction, maintenance, and monitoring of LID in updates to the Southern California LID Manual to ensure that LID BMPs are implemented in the most effective manner. The SMC CLEAN mission will be achieved through the implementation of the following goals identified in the SMC CLEAN Work Plan:

Goal #1: Development and Ongoing Facilitation of a Technical Advisory Committee to assist in accomplishing the SMC CLEAN Mission & Goals.

Goal #2: Provide Ongoing Collaboration with Project Partners and Others Performing LID Monitoring and Serving as a Clearing House for LID Monitoring Information.

Goal #3: Development of Targeted LID Research Questions

Goal #4: Development of LID Monitoring Plan Elements

Goal #5: Perform Targeted LID Monitoring

Goal #6: Analyze LID Monitoring Data Collected

Goal #7: Make Recommendations & Update the Southern California LID Manual

Objectives and Products

The objectives and products of the SMC CLEAN project are identified below according to each of the SMC CLEAN Goals identified above:

Goal #1: Development and Ongoing Facilitation of a Technical Advisory Committee to assist in accomplishing the SMC CLEAN Mission & Goals.

Goal #2: Provide Ongoing Collaboration with Project Partners and Others Performing LID Monitoring and Serving as a Clearing House for LID Monitoring Information.

Goal #3: Development of Targeted LID Research Questions

Goal #4: Development of LID Monitoring Plan Elements

Goal #5: Perform Targeted LID Monitoring

Goal #6: Analyze LID Monitoring Data Collected

Goal #7: Make Recommendations & Update the Southern California LID Manual

Project Accomplishments (FY 2016/2017)

Task 1: Form and Coordinate a Project Technical Advisory Committee

For FY 2016/2017 SMC CLEAN TAC Meetings were held on October 6, 2016, February 17, 2017, May 22, 2017, and most recently on August 15, 2017. TAC meetings for FY 2016/2017 focused on the following:

Finalization of the SMC CLEAN Standard LID Project Data-Information List

Review and discussion of the SMC CLEAN Targeted LID Research Questions

Discussion of the Proposed SMC CLEAN Research/Monitoring Approach

Results of literature review

UCSD Scripps Research Proposal

Overview of bioretention site field visits

Discussion of the Draft SMC CLEAN LID/GI Monitoring Protocol

Discussion of a potential LID Data Submittal

Review of the SMC CLEAN Project Budget

Ballona Biofilter Monitoring Presentation

Review of the revised Draft SMC CLEAN LID/GI Monitoring Protocol

Overview of existing monitoring & stakeholder collaboration

Review of the Final SMC CLEAN Work Plan

Review of the Final SMC CLEAN LID/GI Monitoring Protocol

Presentation of potential functions of an SMC CLEAN LID Data Submittal Tool

Work under this task during FY 2016-2017 also included updating and finalizing the SMC CLEAN Work Plan.

Task 2: Research Existing Data

This task focused on the research and evaluation of existing LID monitoring data both through a literature review and collaboration with project partners. Data was obtained from UCSD, Riverside County Flood Control and Water Conservation District, Orange County Public Works, the Council for Watershed Health, Loyola Marymount University, and the UC South Coast Research and Extension Center. This task also included coordination with the SWRCB in obtaining any monitoring data from Prop 84 and Prop 1 Grant LID projects. This task also included coordination with the UC MRPI grant, which is a grant that has a biofilter research component with the intent to obtain data from the proposed research and provide input on how the biofilters will be monitored. Work under this task also included finalization of the SMC CLEAN Standard LID Project Data-Information List; development of a research approach and draft Targeted LID Research Questions revisions of those questions based on comments from the TAC and finalization of the SMC CLEAN Targeted LID Research Questions.

Task 3: Implement initial monitoring procedures in a beta test phase

Coordination with existing monitoring sites was ongoing throughout FY 2016-2017 to implement LID monitoring consistent with the SMC CLEAN GI/LID Monitoring Protocol and to help answer the SMC CLEAN Targeted LID Research Questions. This coordination included site visits to the RC Flood Campus, OCPW Glassell Campus, UCSD Scripps, and the UC South Coast Research and Extension Center regarding monitoring going forward. Coordination with the RC Flood Campus site also included evaluating the potential for staff augmentation to assist in performing more intensive targeted monitoring of their biofilters. Coordination with OCPW focused on reconfiguration of monitoring to isolate biofilters and obtain flow measurements.

Task 4: Summarize Monitoring Data, Provide Recommendations, and Update the LID Manual

Activity for this task in FY 2016-2017 included a review of the SMC Manual and identification of sections that will need updating or addition, such as a monitoring protocol section and updates to maintenance and design related to results of the SMC CLEAN recommendations. Work under this task also included revisions and finalization of the SMC CLEAN Standard LID/GI Monitoring Protocol as a result of research and analysis of existing data and collaboration with project partners which is a primary recommendation of the team and will be integrated into the updated manual. This task also included coordination, scoping out the functions, and the development of recommendations for the creation of an online SMC CLEAN LID Data Submittal Tool.

Task 5: Ongoing Collaboration with Project Partners

Collaboration with project partners succeeded throughout FY 2016/2017 to obtain data, coordinate on future monitoring, and establish data standards. This included coordination with Orange County Public Works, Riverside County Flood Control and Water Conservation District, USCD Scripps, UCI Irvine, UCLA, SCCWRP, the Council for Watershed Health, and the SWRCB. Coordination with the SWRCB focused on participation regarding the LID/GI Data Standards Initiative.

Project-related Publications

N/A

SMC Research Objectives Addressed

- 3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring
- 5.1 Optimizing Best Management Practices for Southern California
- 5.3 Evaluating the Potential Benefits and Negative Impacts of On-site Stormwater Retention

4.3 WATER QUALITY INDEX AND VISUALIZATION

Table 4-3 Water Quality Index and Visualization

Lead Agency	<i>SCCWRP</i>
Technical Leads	<i>Grant Sharp, OC Public Works Ken Schiff, SCCWRP</i>
Project Budget	<i>\$210,000 (direct SMC Funding)</i>
Key Words: regional comparability, standardized reporting, water quality index	

Background

Assessments of water quality and aquatic ecosystem condition are the crucial part of most regulatory, management, and citizen monitoring program, providing important information to identify and prioritize problems or track trends. However, many assessments use different indicators and/or different methods for combining indicators into overall measures of condition. While some progress has been made toward standardizing assessment approaches at regional scales, there is no widely applicable system in the Southern California region (or at state and national scales) for integrating multiple indicators into overall measures of aquatic ecosystem health. Nor is there a readily accessible means of communicating assessment results to managers and the public in ways that highlight areas where risk or the need for protection is greatest risk and to help set priorities for management actions such as pollutant source reduction or natural resource restoration.

A number of initiatives have prioritized the development of aggregated water quality and aquatic ecosystem indices and related visualization tools, providing the basis for a coordinated effort to develop such tools for use in Southern California. In September, 2014, a group of interested parties representing a number of MS4 programs, Regional Water Boards, and SCCWRP held a workshop to discuss the potential wider application of existing index and online data visualization tools being developed and/or applied separately by a number of programs in Southern California and the Central Coast. The technical report from the workshop captured participants' agreement on the value of a coordinated effort that would broaden the applicability of the approaches discussed at the workshop, with the goals of improving abilities to measure condition and track trends, reducing development costs, and enhancing regional assessments. Such a project would build on related efforts by the SMC and others to standardize monitoring designs and protocols, develop regional assessments, and improve the communication of results to a wider range of audiences.

Objectives and Products

Discussion at the workshop identified two priority areas critical to accomplishing these goals: 1) defining the structure of one or more indices and how they would be applied in synthesizing and interpreting monitoring results, and 2) defining how online visualization tools could support these activities. The two goals of this project, thus, are to:

Develop a common set of water quality and aquatic ecosystem indices for Southern California that would aggregate a number of separate condition indicators, and

Identify design criteria for data visualization and analysis tools.

The workshop report identified a number of current efforts in the region and statewide that would be expected to provide starting points, alternative concepts, and useful input to the proposed effort. Of particular interest is the approach the California Central Coast Healthy Watersheds Project has taken to create a web-based data navigator and report card system that can be used for efficient aquatic assessments to guide resource management.

Project Accomplishments (FY 2016/2017)

During this fiscal year, the SMC Executive Committee approved the outcome of the first task, developing a list of the critical monitoring questions the new water quality index is meant to address:

- What is the condition of the beneficial use?
- If the beneficial use is impacted, what is the cause?
- What is the source of the cause?
- What is the trend in beneficial use condition?

Based on the recommendation of the project Advisory Committee, beneficial use includes the physical, chemical, and biological aspects of our waterbodies. Thus, the Water Quality Index will incorporate all three of these indicators of beneficial use. The upcoming year will develop the algorithms to combine and score these indicators.

Project-related Publications

[Model monitoring program for municipal separate storm sewer systems in southern California](#). 2004. Model Monitoring Technical Committee. Technical Report 419. Southern California Coastal Water Research Project. Westminster, CA.

[Final Report on Bioassessment in Nonperennial Streams - Report to the State Water Resources Control Board](#). 2012. R Mazor, K Schiff, P Ode, ED Stein. Technical Report 695. Southern California Coastal Water Research Project, Costa Mesa, CA

[Ecological Condition of Watersheds in Coastal Southern California: Progress Report of the Stormwater Monitoring Coalition's Stream Monitoring Program First Year \(2009\)](#). 2011. RD Mazor, DJ Gillett, K Schiff, K Ritter, E Stein. Technical Report 639. Prepared for the Stormwater Monitoring Coalition Bioassessment Workgroup. Southern California Coastal Water Research Project. Costa Mesa, CA

SMC Research Objectives Addressed

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

3.2 Improving Storm Water Agency Reporting and Communication

3.3 Characterization of Stormwater Effects

3.4 Contaminants of Emerging Concern

4.4 STANDARDIZED MS4 MONITORING PROGRAMS

Table 4-4. Standardized MS4 Monitoring Program Summary

Lead Agency	<i>Ventura County Watershed Protection District</i>
Technical Leads	<i>Arne Anselm, Ventura County Watershed Protection District Ken Schiff, SCCWRP</i>
Project Budget	<i>\$123,293 (Direct SMC funding to develop project work plan)</i>
Key Words: regional comparability, standardized monitoring	

Background

In May 2012, the SMC held a workshop to identify the similarities and differences in stormwater monitoring among member agencies. The ultimate outcome was that existing SMC member agency monitoring and reporting requirements were inconsistent, leading to incompatible sampling programs and incomparable data and information across programs. The result is a large potential for redundancy, inefficiency, and ineffective outcomes. This is exacerbated by our already limited resources for assessing receiving water environmental health and end-of-pipe compliance.

The technical report developed from the workshop findings established a resource guidance document for stormwater monitoring programs. Likewise, the workshop helped to further highlight the many barriers that program managers face when implementing changes in established monitoring programs. These barriers are coupled with agencies having limited resources, a need to navigate numerous practical considerations and a need to continue existing trend monitoring designs. Based on the recommendations received, the workshop participants supported an SMC project to develop a guidance document for stormwater monitoring. This document is intended to be used in writing and renewing permits, preparing monitoring plans and reporting framework, and gathering and interpreting regional dataset. This project is the first step of creating the stormwater monitoring guidance document.

Objectives and Products

The goal of this project is to create a workplan for a developing a standardized approach for monitoring MS4 programs in southern California. This workplan will serve as a technical document that provides an updated inventory of the elements of MS4 programs, compares monitoring approaches, and outlines steps for developing a Uniform Approach to Stormwater Monitoring (UASM) for SMC members. The overall effort will detail the process for implementing changes in municipal stormwater monitoring requirements through engaging stakeholders, especially Regional Board staff, and to reach consensus on how stormwater monitoring will be addressed in future permits and monitoring plans. The standardized MS4 monitoring program project is intended to be model guidance for adoption by stormwater NPDES permit monitoring and reporting programs, specifically for stormwater outfall monitoring (wet and dry weather) and receiving water monitoring. Existing

monitoring programs will be analyzed for exploring need and potential for standardization of the following monitoring elements:

Monitoring objectives and management question

- Outfall screening, selection criteria, and description
- First flush requirement and subsequent qualifying storm event
- Sampling and analysis protocols and methods
- Flow measurement methods
- Priority constituents, associated laboratory analytical methods, and reporting limits
- QA/QC and Data validation
- Data analyses and reporting for answering monitoring questions

This project utilizes a three-task approach to accomplish the project objectives: a) identify the most important monitoring questions; b) update the inventory of the SMC monitoring programs; c) create the workplan for UASM. The outcome of the project is the workplan that incorporates the feedback from SMC members on the products of the first two tasks. SMC member agencies should evaluate the efficacy of the monitoring recommendations, and update model program requirements as needed.

Project Accomplishments (FY 2016/2017)

Significant progress has been made on the first two steps of the process: a) a list of monitoring questions has been prepared and reviewed by the SMC executive members; b) all available documents describing watershed monitoring programs (EWMP, WQIP) in the region have been reviewed; c) an updated inventory of the stormwater outfall monitoring programs are available for the SMC executive committee.

Project-related Publications

Sercu, B., Anselm, A., Schiff, K. *Regional Stormwater Monitoring Coalition and Evaluation: Survey, Workshop, and Research Priorities*. Southern California Stormwater Monitoring Coalition. January 2013.

Bernstein, B.B.; et. al. *Model Monitoring Program for Municipal Separate Storm Sewer Systems in Southern California*. Southern California Stormwater Monitoring Coalition. August 2004.

SMC Research Objectives Addressed

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

3.4 Contaminants of Emerging Concern

5 PROJECTS PLANNED FOR 2016-2017

The summaries reported in this section represent strategic planning efforts or new projects that have been identified as supporting a SMC priority and have received member agency support to be implemented during the 2016-2017 reporting year.

5.1 DEVELOPMENT OF THE SMC DATA PORTAL AND INITIAL POPULATION WITH REGIONAL MONITORING DATA

Table 5-1 Development of the SMC Data Portal and Initial Population with Regional Monitoring Data

Lead Agency	<i>SCCWRP</i>
Technical Leads	<i>Steve Steinberg, Eric Stein</i>
Project Budget	<i>\$320,000 Total SMC Funding</i>
Key Words: data portal, open data, regional monitoring	

Background

Sharing and leveraging data to make regional assessments and comparisons among member agencies is the backbone of the SMC, which is why data sharing and integration is consistently ranked as one of the SMC’s highest priority research projects. The SMC’s first data integration and sharing project was in 2003, where standardized data transfer formats (SDTF) were created and successfully used. In addition, several member agencies currently have these requirements in their NPDES permits. Technology has changed over the last decade. Open data portals are the new standard, which evolves the SDTF approach to create simplicity and ease of use, dynamic quality assurance checkers, a map-based web query interface, and easily customizable data visualization or on-the-fly calculations. This new technology comes largely without expensive investments in software or hardware among SMC member agencies – most members can submit or access data with a standard web browser – and requires only basic training. This approach can also streamline and enhance annual reporting requirements. While it is an “open data portal” the data can be constrained to any limited number of users, from only SMC members to public-facing, and based on simple toggle switches, can be changed at any point in time

Objectives and Products

This project proposes to update and upgrade the SMC’s data sharing and integration capabilities by migrating to an open data portal. The migration to an open data portal will require two phases comprised of four tasks. The first phase is to develop the portal architecture. This phase can be flexible and scalable to all of the SMC data categories including discharge, IC/ID, or receiving water monitoring, and can incorporate a variety of data types such as chemistry, microbiology, toxicity, physical habitat, rainfall/flow, or biological information. The second step is implementing an initial data set – we chose the SMC’s Regional Stream Monitoring program. The Regional Stream Monitoring program provides a great initiator since sampling standardization and field/lab quality assurance already ensures comparability in data generation. As the Regional Monitoring results are increasingly being used for compliance assessments and watershed planning, new data requests pour in and now

comprise up to 80% of the program's Administrative costs. So, open data portal investments now, ultimately will reduce ongoing costs for regional monitoring. The tasks associated with implementing the Regional Monitoring data set includes data submittal tools, data query tools, and data visualization and reporting tools.

The project will produce the following products:

A data portal that provides the architecture to accommodate data from the Regional Stream Monitoring program, and a framework to incorporate data from a broad range of additional SMC projects and programs

Incorporation of the SMC Regional Stream Monitoring program into the data portal to test and verify the enhanced ease of data entry, automated data and quality assurance checking, and web-based data query/download and automated reporting tools

An SMC specific open data portal with data sharing, analysis and reporting capabilities

Upload and/or connection between SMC data portal and CEDEN for appropriate data types

Project Accomplishments (FY 2016/2017)

N/A

Project-related Publications

N/A

SMC Research Objectives Addressed

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

3.2 Improving Storm Water Agency Reporting and Communication