Southern California Stormwater Monitoring Coalition

Annual Report 2017-18

Prepared by:
J. Michael Trapp, PhD
Michael Baker International
Carlsbad, California

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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 by 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 runoff[1]. Cumulatively, the SMC and its project partners has expended over $9M to fill these data gaps. Fiscal Year (FY) 2017-18, was the third 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 2017-18 reporting year included projects covering a wide range of environmental and water quality disciplines. SMC member agencies were involved in multiple projects during FY 2017-18 including:

- Continuing two longer term regional projects:
    - Bioassessments of stream health.
    - A multi-year monitoring and assessment project on Low Impact Development.
- Continuing two targeted projects into their second year of implementation:
    - Providing standardized MS4 monitoring procedures across member agencies.
    - Developing a regional water quality index with visualization tools.
- Beginning the first year of the development of the SMC data portal which will use Regional Monitoring Data as a demonstration of capabilities.
- Completing the group's toxicity testing laboratory inter-calibration exercise and exploring the implications of the results and corrective actions to address concerns.

Looking ahead the SMC has prepared an updated five-year agreement to be approved in the coming fiscal year. The update agreement will span 2019 to 2024 and includes proposed changes to allow the SMC to address the evolving challenges of the stormwater field that the members face and continue

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

the collaborative employment of technologies to meet those needs. Additionally, the SMC has identified two new projects under consideration for funding in FYs 18/19 and 19/20:

- A communication plan to promote the SMC and the findings of its research.
- An update to the SMC research agenda to guide the organization over the course of the new five-year agreement.

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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 2017-18 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 2017-18 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 2017-18 Annual Report outline is as follows:

Section 3: SMC member agencies completed one project during the 2017-18 reporting year:

- Toxicity Testing Laboratory Intercalibration Study

Section 4: SMC projects that were active during the 2017-18 reporting year included:

- Implementing the 2015-2019 Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program
- Development of a Water Quality Index and data visualization method
- Development of the SMC Data Portal and Initial Population with Regional Monitoring Data
- SMC California LID Evaluation and Analysis Network (SMC CLEAN) Project
- Development of standardized MS4 monitoring programs

Section 5: The SMC also has the following projects planned to potentially begin in the 2018-19 reporting period including:

- Update to the research agenda
- Development of a SMC Communications Strategy

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, in 2001 both stormwater regulators and municipal stormwater management agencies throughout Southern California 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	Melissa You
City of Los Angeles, Watershed Protection Division	Charlie Yu
City of San Diego	Ruth Kolb
County of Orange, OC Public Works	Grant Sharp, 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, Vice-Chair
San Bernardino County Flood Control District	Arlene Chun
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 2018

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 sets, knowledge, and experiences.
  - 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 with counterparts and partners on a regional scale.
  - 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 2017-18 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	100% 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, *Ceriodaphnia dubia*	

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; *Hyalella 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, *Hyalella* (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 was completed and approved during FY 2017-18. The main report findings were all four species can be recommended for future use as part of the SMC monitoring programs. A Specific guidance for stormwater testing was also provided for potential variable-inducing steps, including hardness of dilution water, feeding, sample handling and water renewals, and aging of organisms. Additionally, intercalibrations were 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	*Ceriodaphnia* Survival		*Ceriodaphnia* Reproduction		*Hyalella* Survival		*Strongylo-centrotus* Development	*Mytilus* Embryo Development
	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 REGIONAL BIOASSESMENT

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

Lead Agency	*Southern California Coastal Water Research Project (SCCWRP)*
Technical Leads	*Raphael Mazor, SCCWRP* *Eric Stein, 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 use, stressors, ambient monitoring	

Background

Southern California's coastal watersheds contain important aquatic resources that support a variety of ecological functions and environmental values. Comprising over 7,000 stream-kilometers, both humans and wildlife depend on these watersheds for habitat, drinking water, agriculture, and industrial uses. In order to assess the health of streams in these watersheds, the Stormwater Monitoring Coalition (SMC), a coalition of multiple state, federal, and local agencies, initiated a regional monitoring program in 2009. Using multiple indicators of ecological health, including benthic macroinvertebrates, benthic algae, riparian wetland condition, water chemistry, water column toxicity, and physical habitat, this survey represents the first comprehensive assessment of southern California's watersheds based on a probabilistic survey design. Through the re-allocation of permit-required monitoring efforts, the SMC has developed a cooperative sampling program that is efficient and cost-effective for participants.

The survey was designed to address three main questions:

1) What is the biological condition of perennial streams in the region?

2) What stressors are associated with poor condition?

3) Are conditions changing over time?

Objectives and Products

As part of administering the SMC stream survey, SCCWRP conducts regular meetings of the SMC's technical workgroup, conducts training, and produces regular reports to summarize selected findings for member agencies.

The stream survey is the data-producing backbone that allows the SMC to pursue a great deal of its research agenda, often providing essential regional context that makes site-specific studies more relevant and interpretable. In particular, the following elements from the research agenda are partially or fully addressed by the SMC stream survey:

Project Accomplishments (FY 2017-2018)

The workgroup has produced a report summarizing key findings, highlighting an analysis of new algal-based bioassessment indices in southern California. Other topics covered in the report include an analysis of sediment toxicity, hydromodification assessments, and a preview of an in-development index to assess stream physical habitat integrity. Articles highlighting applications of SMC data covered the recent Integrated 305b/303d report, as well new landscape models to predict ranges of bioassessment scores in unsampled scores, which may help identify streams where biological integrity may be constrained by watershed development.

In addition to producing the report, the SMC continued regular survey operations, including the collection of bioassessment data at approximately 80 sites in southern California streams. These data will be summarized in future reports.

Project-Related Publications

Mazor, R., Beck, M., and Brown, J. 2017 Report on the Stormwater Monitoring Coalition Regional Stream Survey. SCCWRP Technical Report #1029. Southern California Coastal Water Research Project. Costa Mesa, CA. (http://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1029_2017SMCReport.pdf)

These recent publications make use of data collected by the SMC stream survey, but were produced for other projects:

JK Howard, KA Fesenmyer, TE Grantham, JH Viers, PR Odes, PB Moyle, SJ Kupferburg, JL Furnish, A Rehn, J Slusark, RD Mazor, NR Santos, RA Peek, AN Wright. 2018. A freshwater conservation blueprint for California: prioritizing watersheds for freshwater biodiversity. Freshwater Science DOI:10.1086/697996.

RD Mazor, JT May, A Sengupta, KS McCune, BP Bledsoe, ED Stein. 2018. Tools for managing hydrologic alteration on a regional scale: Setting targets to protect stream health. Freshwater Biology DOI:10.1111/fwb.13062.

AC Mehinto, DR VanDervort, W Lao, G He, MS Denison, SM Vliet, DC Volz, RD Mazor, KA Maruya. 2017. High throughput in vitro and in vivo screening of inland waters of Southern California. Environmental Science: Processes and Impacts 19:1142-1149

A Sengupta, SK Adams, BP Bledsoe, KS McCune, RD Mazor. 2018. Tools for managing hydrologic alteration on a regional scale: Estimating changes in flow characteristics at ungauged sites. Freshwater Biology DOI:10.1111/fwb.13074.

ED Stein, A Sengupta, RD Mazor, K McCune, BP Bledsoe, K McCune, S Adams. 2017. Application of regional flow-ecology relationships to inform watershed management decisions: Application of the ELOHA framework in the San Diego River watershed, California, USA. Ecohydrology. https://doi.org/10.1002/eco.1869.

Project Impact

Beyond collecting and leveraging 10 times the data any individual agency can collect on its own, the SMC survey provides resource managers with the ability to contextualize their programs and improve understanding of the effectiveness of management actions, prioritization of streams most in need of protection, and identification of stressors that are likely to pose the greatest risk to stream health (such as eutrophication, elevated ionic concentrations, and habitat degradation). In addition, the SMC provides crucial insight into how to manage for aquatic life uses of urban streams (particularly those that have been modified for flood control purposes), which in turn helps state regulatory agencies evaluate the unique constraints stormwater agencies face.

Since the initiation of the SMC perennial stream survey in 2009, stormwater agencies have been able to coordinate their monitoring efforts with regulatory agencies, reallocate resources, and generate the needed data in a cost-neutral way, while simultaneously allowing regulated agencies to fulfill their permit obligations. This survey serves as the regional component of the statewide Perennial Stream Assessment, allowing both the SMC and the State Water Resources Control Board to leverage resources and support each other's surveys.

SMC Research Objectives Addressed

3.1: Standardizing approaches to dry and wet weather monitoring (dry weather only).

3.2: Improving stormwater agency reporting and communication.

3.3: Characterization of stormwater effects

3.4: Contaminants of emerging concern

4.1: Adapt biological assessment tools for non-perennial streams

4.2: Develop new tools for causal assessment

4.4: Hydromodification guidance for urban streams

4.5: Evaluate potential of remote sensing technology

5.6: Use attainability analysis case study for an engineered channel

6.1: Improved quantification of links between nutrient concentrations and indicators of beneficial uses

6.4: Interactions between stormwater runoff and cyanotoxins

4.2 WATER QUALITY INDEX AND VISUALIZATION

Table 4-2. Water Quality Index and Visualization

Lead Agency	*SCCWRP*
Technical Leads	*Grant Sharp, OC Public Works* *Ken Schiff, SCCWRP*
Project Budget	*$210,000 (direct SMC Funding)*
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 programs, 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 is greatest, locations where the need for protection is best applied, 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, with the goals of improving the ability to measure condition and track trends. 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 non-technical audiences.

Objectives and Products

The goal of this project is to produce a multi-indicator index that incorporates biology, chemistry, and physical habitat into a single and easily understood condition score – the Water Quality Index (WQI). The WQI should support effective communication to executive management and others charged with making decisions, but also be technically robust enough for hands-on managers to use in the decision-making process. Thus, the WQI should also be capable of being quickly and easily dissected into its component metrics for greater detail and insight, if desired.

Project Accomplishments (FY 2017-2018)

In previous years, a Project Technical Committee agreed that the WQI should focus on the aquatic life beneficial use category and the primary questions the WQI should 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?

The Project developed independent lines of evidence for both stressor condition and biological response condition (Figure 1). Stressor condition scores included both chemistry and physical habitat. Response condition scores included invertebrates and algae. A relatively unique approach to stressor scoring focused on modeling the probability of individual stressor levels to support aquatic life. Biological response was focused on existing scoring tools including the California Stream Condition Index (CSCI) and the Algal Stream Condition Index (ASCI). Ultimately, the WQI is converted into four narrative categories including:

- *Healthy Condition*: the site is not stressed and biological condition is healthy. The response action in this category is to protect the site from future stress.
- *Resilient*: the site is stressed but the biological condition is healthy. The response action in this category is to minimize or reduce stress at the site.
- *Impacted by known chemistry or physical habitat measures*: the site is stressed and the biological condition is unhealthy. A response action in this category may include prioritization for restoration.
- *Impacted, causes unknown*: the site is not stressed but the biological condition is unhealthy. The response action in this category may include conducting a causal assessment to identify the unknown/unmeasured stressor

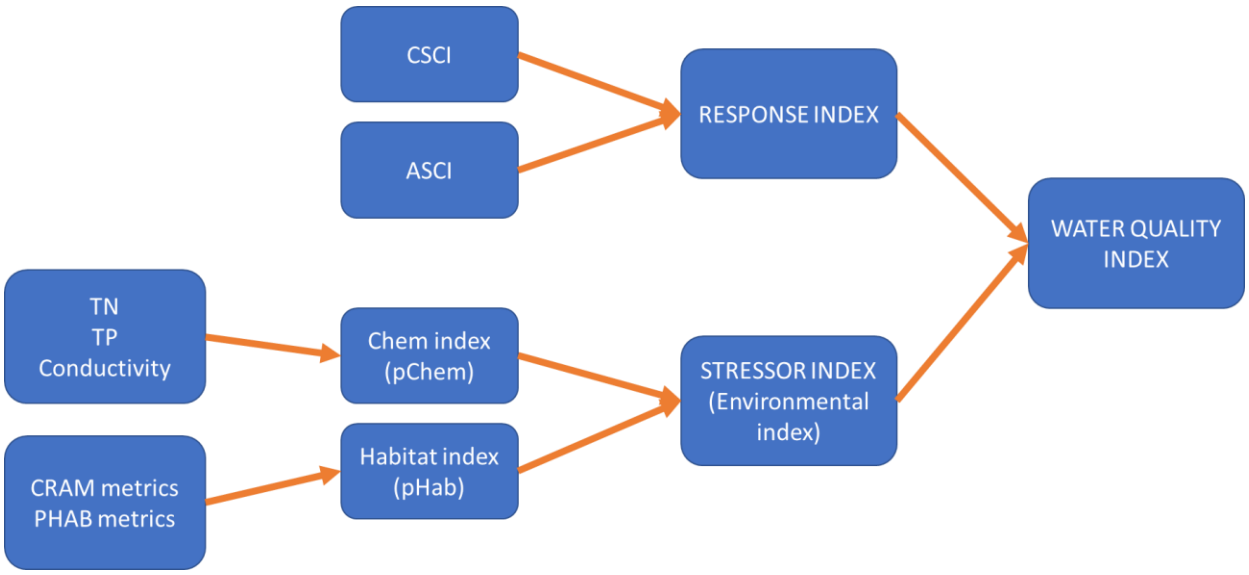

Figure 1. Schematic itemizing the components of the Water Quality Index.

The Project Advisory Committee, and then the SMC Steering Committee, approved of this approach and endorsed the WQI. The goal will be to incorporate the WQI into the next Regional Stream Monitoring 5-year report.

In the upcoming fiscal year, the Project Team will be automating the WQI so that the component metrics and the overall WQI condition score can be calculated and displayed "on the fly".

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

2017 Report on the SMC Regional Stream Survey. 2018. RD Mazor, M Beck, JS Brown. Technical Report 1029. Southern California Coastal Water Research Project. Costa Mesa, CA.

2015 Report on the Stormwater Monitoring Coalition Regional Stream Survey. 2017. RD Mazor, ED Stein. Technical Report 0963. Southern California Coastal Water Research Project. Costa Mesa, CA.

4.3 SMC DATA PORTAL

Table 4-3 SMC Data Portal

Lead Agency	*SCCWRP*
Technical Leads	*Eric Stein, SCCWRP*
Project Budget	$320,000 Total Project Funding $320,000 total SMC contribution
Key Words: data portal, open data, regional monitoring, reporting	

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

Update and upgrade the SMC's data sharing and integration capabilities by migrating to an open data portal. Proposed products:

a. 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
b. 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

Project Accomplishments (FY 2017-2018)

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 Impact

The data portal will make data from all SMC projects, both regional monitoring and other projects, accessible to all SMC members and the public via a simple web-based tool. This will facilitate the use of SMC data to support project and programmatic decision making, including developing new assessment tools, enhancing causal assessment, exploring management priorities, and evaluating program effectiveness. Moreover, the data portal provides the foundation for developing innovative and interactive data reporting tools, such as the Water Quality Index.

SMC Research Objectives Addressed

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

3.2 Improving Storm Water Agency Reporting and Communication

4.4 SMC CLEAN PROJECT

Table 4-4. SMC CLEAN

Lead Agency	*San Bernardino County Flood Control District*
Technical Leads	Arlene Chun, San Bernardino County Flood Control Daniel Apt, Olaunu Matt Yeager, Yeager Environmental Associates/ RCFC&WCD Michael Trapp, Michael Baker International
Project Budget	$370,000 Total Project Funding $370,000 total SMC contribution Approximately $30,000 in-kind contribution for OC Public Works for ongoing monitoring and staff time. Approximately $30,000 in-kind contribution for OC Public Works for ongoing monitoring and staff time. Part of a larger project with total funding of $1,100,000 – ($600K Prop 40 grant funding and $500K in SMC match)
Key Words: LID, Green Infrastructure, monitoring, BMP performance, effectiveness	

Background

The SMC California LID Evaluation and Analysis Network (SMC CLEAN) is designed to understand the effectiveness of LID and Green Infrastructure 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.

Objectives and Products

Objectives for he SMC CLEAN include:

- Development and Ongoing Facilitation of a Technical Advisory Committee to assist in accomplishing the SMC CLEAN Mission & Goals.
- Provide Ongoing Collaboration with Project Partners and Others Performing LID Monitoring and Serving as a Clearing House for LID Monitoring Information.
- Development of Targeted LID Research Questions

- Development of LID Monitoring Plan Elements
- Perform Targeted LID Monitoring
- Analyze LID Monitoring Data Collected
- Make Recommendations & Update the Southern California LID Manual

Project Accomplishments (FY 2017-2018)

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

For FY 2017-18 SMC CLEAN TAC Meetings were held on August 15, 2017, January 22, 2018, April 4, 2018, and most recently on July 16, 2018. TAC meetings for FY 2017-18 focused on the following:

- Finalization of the Work Plan in August 2017
- Presentation of the Final Work Plan
- Presentation of the Final SMC CLEAN LID/GI Monitoring Protocol
- Discussion of the SMC CLEAN Data Submittal Tool
- Discussion of LID data acquisition and flow
- Presentation of maintenance and inspection protocols including the BMP
- Rapid Assessment Method (RAM), SFPUC maintenance protocols.
- Discussion of the need for a standard bioretention maintenance/inspection protocol
- Presentation and discussion of proposed monitoring with maintenance assessments
- Presentation of project schedule and project outcomes
- Updates to the SMC LID Manual
- Proposed SMC CLEAN project deliverables
- Ongoing updates of existing monitoring
- Ongoing stakeholder collaboration updates

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

- Coordination with UC South Coast Research and Extension Center on potential reconfiguration of their site to integrate a bioretention cell/biofilter for monitoring
- Coordination meeting on August 24, 2017 with Council for Watershed Health regarding LID/GI ongoing monitoring
- Ongoing collaboration with the UC MRPI (Multi-campus Research Programs and Initiatives) Grant related to stormwater, LID, and GI.
- Ongoing coordination with the State Water Board to develop statewide standards for data for GI/LID
- Coordination with SCCWRP on BMP Submittal tool scope of work

3. Development of Targeted LID Research Questions

- The targeted research questions were finalized with the finalization of the Work Plan in August 2017

4. Development of LID Monitoring Plan Elements

- Finalization of the SMC CLEAN LID/GI Monitoring Protocol
- Developed SMC CLEAN monitoring approach for LID monitoring projects
- Developed approach for monitoring with maintenance assessments

5. Perform Targeted LID Monitoring

- Monitoring performed at OCPW, RCFC&WCD, San Diego, and other Orange County LID sites.
- Coordination with OCPW on reconfiguration of BMPs for monitoring, use of artificial stormwater, and use of SMC CLEAN monitoring protocol
- Coordination with RCFC&WCD about staff augmentation to capture additional events at their site, and review of existing data, use of SMC CLEAN monitoring protocol, and maintenance protocols.
- Performed BMP RAM for RCFC&WCD biofiltration basin and planter boxes

6. Analyze LID Monitoring Data Collected

- Review, analysis, and presentation of data collected from OCPW, RCFC&WCD, San Diego, and other Orange County LID sites.

7. Make Recommendations & Update the Southern California LID Manual

- Analysis of the of the SMC LID manual and identified proposed updates
- Evaluated and identified elements of a new SMC LID Monitoring, Maintenance, and Construction Manual

Project Impact

The project has developed a standard LID/GI monitoring protocol and standard LID/GI data and information list both providing standardization of LID/GI monitoring and data to be collected for future LID/GI projects in California. Additionally, with collaboration with project partners such as the SWRCB, CWH and UC MRPI the project is helping to shape the future of LID/GI monitoring and assessment in California.

SMC Research Objectives Addressed

5.1 Optimizing Best Management Practices for Southern California

3.1 Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring

4.5 STANDARDIZED MS4 MONITORING PROGRAMS

Table 4-5. Standardized MS4 Monitoring Programs

Lead Agency	*Ventura County Watershed Protection District*
Technical Leads	*David Laak, Ventura County Watershed Protection District* *Ken Schiff, SCCWRP*
Project Budget	*$123,293 (Direct SMC funding to develop project work plan)*
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. This presents potential for redundancy, inefficiency, and ineffective outcomes when gleaned from a regional scale. 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 developing a standardized approach for MS4 monitoring 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.

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. All three tasks were guided by a project Advisory Committee comprised of a subset of regulated and regulatory SMC members. The outcome of the project is the workplan that incorporates the feedback from SMC members on the products of the first two tasks. The third task was also reviewed by an external Advisory Committee comprised of monitoring experts throughout California. SMC member agencies should evaluate the efficacy of the monitoring recommendations and consider updating model program requirements as needed.

Project Accomplishments (FY 2017-2018)

This project was completed this FY and the final report can be found at the SMC website (http://socalsmc.org/). The inventory of MS4 monitoring programs was based upon reviewing 7 MS4 National Pollutant Discharge Elimination System (NPDES) permits, 4 annual reports, and 39 monitoring plans, including enhanced watershed management plans (EWMPs), coordinated integrated monitoring plans (CIMPs), or water quality improvement plans (WQIPs). Based on the review, seven monitoring questions were identified to address priority management objectives that were help in common among all SMC member agencies. The seven standardized monitoring questions included:

Q1. What pollutants are associated with stormwater and non-stormwater runoff?

Q2. What are the sources of the identified pollutant(s)?

Q3. How effective are the BMPs for reducing flow and contaminant concentrations?

Q4. If (and how) runoff discharge is influencing the quality of receiving water?

Q5. What is the overall health of receiving waters?

Q6. If (and what) receiving waters need management actions based on its overall health?

Q7. How effective are the current water quality management plans?

Designing consistent monitoring elements, a core component of a standardized MS4 monitoring framework, is the key to ensure that the above-mentioned standardized monitoring questions are efficiently and effectively answered. The MS4 monitoring elements can be classified into four broad categories: design and planning, field techniques for sample collection, laboratory methods, and reporting. The details of the monitoring elements (e.g., qualifying storm events, sampling frequency, data analysis techniques, etc.) influences the efficacy and efficiency of a monitoring program for answering each monitoring question. The monitoring element details were compared across the various SMC monitoring programs for similarities and dissimilarities. Based on these similarities and dissimilarities of monitoring elements, and their linkage to the standardized monitoring questions, a list of monitoring elements to be standardized is recommended.

The recommendations identified some specific knowledge gaps that needed to be addressed for standardizing each monitoring element. The knowledge gaps are summarized below:

- Standardize qualifying storm events

- Standardize sampling site screening while planning for MS4 monitoring
- Standardize field-sampling procedures
- Standardize laboratory analytical methods
- Standardize data analyses and reporting format

A workplan to address each knowledge gap is included in the report for developing the final UASM guidance document. The recommended workplan is a critical pathway to standardized MS4 monitoring in southern California. The workplan can be used as a scope of work for the next step in the UASM process.

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 2018-2019

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 2018-2019 reporting year.

5.1 UPDATE TO THE RESEARCH AGENDA

Table 5-1 Update to the Research Agenda

Lead Agency
Southern California Stormwater Monitoring Coalition
Technical Leads
Michael Trapp, Michael Baker International Ken Schiff, SCCWRP
Project Budget
Key Words: communication, outreach

Background

As a result of, increasing regulatory focus, inconsistent application of regulatory requirements, and the previous lack of scientific and planning knowledge base, stormwater regulators and municipal stormwater management agencies throughout Southern California have realized a benefit in developing a collaborative working relationship. The goal of this relationship has been to further develop the technical information necessary to better understand stormwater mechanisms and impacts, and to develop the tools that will effectively and efficiently improve stormwater management decision-making. Among individuals and agency representatives, there was early recognition that these issues are oftentimes not localized, and typically cross watershed and jurisdictional boundaries. This relationship culminated in the formation of the Southern California Stormwater Monitoring Coalition (SMC) by a formal agreement, signed in 2000. The membership of the SMC includes all of the Phase I municipal stormwater NPDES lead permittees and the NPDES regulatory agencies in Southern California.

To help the SMC focus their attention and efforts, the SMC has created research agendas which identify areas of study and potential investigations. These research agendas have roughly coincided with the start of the five-year agreements (2009 and 2014) which serve as the governing document for the SMC.

The two SMC research agendas to date have been developed by assembling a panel of outside experts in various relevant water resource subject areas to provide a wide range of perspectives on the challenges faced by the stormwater world. The expert panels included members representing engineering, chemistry, biology, toxicology, modeling, statistics, hydrology, and other disciplines. For

both agendas, the panel of experts convened for a three-day workshop that included in-depth discussion on SMC management issues prior to synthesizing the outcomes into a research plan. The first agenda included 15 projects focused around the following three main themes: building a monitoring infrastructure, understanding mechanisms and processes, and assessing receiving water impacts. Ten of these fifteen projects in the five-year agenda were completed and nearly all have had an immediate regulatory impact on regional municipal stormwater agencies. Similarly, the second research agenda identified four subject areas with 21 specific research goals. Sixteen of the 21 goals were applied to the objectives of one or more special projects.

Objectives and Products

The goal of this project is to develop an updated SMC five-year research agenda. This agenda will aim to address the future program, data management, and assessment needs of stormwater permittees while facilitating awareness and improvements to southern California's surface water resources. The new agenda's objectives will be to address data gaps that inhibit effective stormwater management and/or regulation by identifying, designing, and conducting specific special studies intended to yield solutions, in the form of recommended actions or guidance to improve stormwater management.

This project will entail the development and prioritization of a research agenda with the assistance of water quality/resource management/regulatory experts. It is proposed that the SMC Administrative Officer and SMC support staff from the Southern California Coastal Water Research Project (SCCWRP) coordinate this project. The research agenda shall be a list of proposed projects, designed by the water quality/resource management/regulatory experts, which shall form the focus of research/monitoring efforts for the collaborating stormwater discharge and regulating agencies in Southern California.

The scope of work will involve four main tasks:

1. Assemble a panel of experts to design the research agenda. The panel of experts shall consist of a diverse group of technical specialists experienced in addressing or evaluating a variety of stormwater issues.
2. Conduct a workshop which convenes the expert panel. The workshop shall include a summary of SMC progress to date and shall also include summaries from other stormwater agencies interested in similar topics such as the California Stormwater Quality Association (CASQA), and Water Environment Federation (WEF) Stormwater Congress.
3. Create a draft document detailing the research agenda produced by the expert panel. The research agenda shall include a technical prioritization of scientific projects, the technical tasks necessary to address each research project, a proposed schedule for implementing these research tasks, and estimated costs for each research project. The draft report shall also be submitted to the SMC Steering Committee for review with an accompanying presentation during a quarterly meeting.
4. Creation of a final document incorporating comments from the written draft and oral reports.

5.2 SMC COMMUNICATIONS STRATEGY

Table 5-1 SMC Communications Strategy

Lead Agency Southern California Stormwater Monitoring Coalition
Technical Lead Michael Trapp, Michael Baker International
Project Budget
Key Words: communication, outreach

Background

The SMC Steering Committee is responsible for developing and funding cooperative projects that inform development of best-practices for regional stormwater management. While this committee meets quarterly with representatives from each SMC agency, no formal Communication Plan has been developed by SMC for the committee to follow. In 2018, the Steering Committee elected to develop a communication plan to advance the SMC's research agenda, and to enhance the overall level, quality, and consistency of SMC communications. The communication plan articulates strategies and tools for enhancing the impact of SMC communications among both internal and external audiences.

Objectives and Products

The SMC's communications vision is that the timely, comprehensive transfer of SMC news and information to target SMC audiences will increase the organization's effectiveness in promoting:

- The mission and history of the SMC
- The support NPDES compliance
- The value of SMC member agencies' unique, cross-sector discussions
- The positive, long-term management impacts emanating from SMC projects
- The transition of research projects to the execution in member's programs
- The SMC's effectiveness in collaboratively leveraging funding
- Enhanced sharing of information and best practices both inside and outside the stormwater management community
- Facilitate feedback from end users of SMC projects

The SMC has a vested interest in communicating with multiple target audiences, including:

- Target Audience #1: SMC Steering Committee members
- Target Audience #2: Funding authorities within each SMC member agency
- Target Audience #3: SMC member agency co-permittees not represented on the SMC Steering Committee
- Target Audience #4: South Coast industrial (IGP), construction (CGP) and agriculture organizations
- Target Audience #5: South Coast POTWs
- Target Audience #6: MS4 permittees outside coastal Southern California

- Target Audience #7: The General Public/Media

The SMC's communication strategy will work towards creating standards which promote and enhance the vision of SMC. Three main elements have been identified to achieve this goal. First, the SMC will provide more frequent, enhanced communications to Steering Committee members to increase reach and visibility of SMC research. The SMC will also provide more communications to Steering Committee members to improve the ability to shape the research agenda to incorporate needs and priorities of member agencies. Finally, communications products will be developed by the SMC to extend reach and visibility of SMC research outside of SMC member agencies.