OC Public Works
Integrity, Accountability, Service, Trust
Shane L. Silsby, Director

January 31, 2019

Dave Gibson, Executive Officer
California Regional Water Quality Control Board, San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108

Subject: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan 2017-18 Annual Report, Orange County MS4 Co-Permittees, PIN 658018

Dear Mr. Gibson:

The County of Orange, in cooperation with the Orange County Flood Control District and the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano (Permittees), is pleased to submit the following document:

- South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan 2017-18 Annual Report

This submittal comprises a South Orange County Watershed Management Area Water Quality Improvement Plan Annual Report prepared by the County as Principal Permittee, 12 individual Jurisdictional Runoff Management Program Annual Reports and updated Jurisdictional Runoff Management Plans (Local Implementation Plans) prepared by the Permittees.

If you have any questions, please contact Cindy Rivers at (714) 955-0674.

Sincerely,

Amanda Carr
Deputy Director
OC Environmental Resources

300 N. Flower Street, Santa Ana, CA 92703
P.O. Box 4048, Santa Ana, CA 92702-4048
www.ocpublicworks.com
714.667.8800 | Info@OCPW.ocgov.com

OC PublicWorks

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

SIGNED CERTIFIED STATEMENT:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Amanda Carr

Amanda Carr
Deputy Director
OC Public Works

1/31/18

Date

ALISO VIEJO
Live Life Inspired

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report
SIGNED CERTIFIED STATEMENT:

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Shaun Pelletier
Director of Public Works/City Engineer

1/29/19
Date

TEL 949.425.2500 FAX 949.425.3899 12 JOURNEY, SUITE 100 | ALISO VIEJO, CA | 92656-5335 CITYOFALISOVIEJO.COM

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

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Lisa Zawaski
Senior Water Quality Engineer
City of Dana Point

29 January 2019
Date

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

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David Shissler, P.E.
Director of Public Works

1/29/19
Date

505 Forest Ave. Laguna Beach, CA 92651 Tel (949) 497-3311 FAX (949) 497-0771

Signed Certified Statement

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Kenneth H. Rosenfield, P.E.
Assistant City Manager/Public Services Director
City of Laguna Hills

1/30/2019
Date

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Jacki Scott, Public Works Director
City of Laguna Niguel

1-18-19
Date

CITY of LAGUNA WOODS

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report
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Moy Yahya
Water Quality Manager

1-29-2019
Date

24264 El Toro Road • Laguna Woods, CA 92637 • Phone (949) 639-0500 • Fax (949) 639-0591 • Website: www.lagunawoodscity.org

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit)
Water Quality Improvement Plan Annual Report
SIGNED CERTIFIED STATEMENT:

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29JAN2019

Devin Slaven, CPSWQ, QSD/QSP
Environmental Manager
City of Lake Forest

Date

City of Mission Viejo

Public Works Department

Edward Sachs
Mayor

Greg Raths
Mayor Pro Tem

Wendy Bucknum
Council Member

Brian Goodell
Council Member

Trish Kelley
Council Member

Subject: **South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report**

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Joe Ames, P.E.
Assistant City Engineer
City of Mission Viejo

1/29/2019
Date

CITY OF RANCHO SANTA MARGARITA
22112 El Paseo • Rancho Santa Margarita • California 92688-2824
949.635.1800 • fax 949.635.1840 • www.cityofrsm.org

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

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Brendan Dugan
Public Works Director/City Engineer
City of Rancho Santa Margarita

1-30-19
Date

City of San Clemente

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

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Dave Rebensdorf
Utilities Director

1/29/19
Date

32400 PASEO ADELANTO
SAN JUAN CAPISTRANO, CA 92675
(949) 493-1171
(949) 493-1053 FAX
www.sanjuancapistrano.org

RE: South Orange County Watershed Management Area (San Juan Hydrologic Unit) Water Quality Improvement Plan Annual Report

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Thomas Toman
Acting ~~Assistant~~ Public Works Director
City of San Juan Capistrano

1/30/19
Date

SOUTH ORANGE COUNTY WATERSHED MANAGEMENT AREA

Water Quality Improvement Plan 2017-2018 Annual Report

Submitted to the
San Diego Regional Water Quality Control Board
By:

South Orange County
Watershed Management Area

Water Quality Improvement Plan 2017-2018 Annual Report

Submitted to the
San Diego Regional Water Quality Control Board
By:

The Orange County Copermittees (PIN 658018) which consists of the County of Orange (PIN 246113), Orange County Flood Control District (PIN 246115) and Cities of Aliso Viejo (PIN 205031, Dana Point (PIN 219073), Laguna Beach (PIN 236118), Laguna Hills (PIN 236131), Laguna Niguel (PIN 236133), Laguna Woods (PIN 236148), Lake Forest (PIN 236212), Mission Viejo (PIN 240995), Rancho Santa Margarita (PIN 251715), San Clemente (PIN 255215), and San Juan Capistrano (PIN 255344)

January 2019

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Executive Summary

The South Orange County Watershed Management Area (SOC WMA) Water Quality Improvement Plan (Plan) identifies priority water quality conditions for the San Juan Hydrologic Unit and describes a framework of goals, strategies, and schedules, to protect and restore the condition of streams within this nearly 500 square mile region.

This annual report presents actions, milestones, and monitoring results from the 2017-18 reporting year; however, it should be noted that this reporting year was transitional in nature. We[1] officially commenced implementation of the Plan upon formal approval on June 20, 2018, which fell within the last week of the jurisdictional program activities fiscal year cycle (July 1, 2017 – June 30, 2018) and within the last three months of the monitoring water year cycle (October 1, 2017 – September 30, 2018). Within these truncated timeframes, we initiated a number of Plan strategies and transitioned from the Transitional Monitoring Program to the Plan's Monitoring and Assessment Program (MAP).

Track Highlights

The Plan is oriented around three highest priority water quality conditions (tracks): Pathogen Health Risk, Unnatural Water Balance and Flow Regime, and Geomorphic Impacts and Channel Erosion. The main body of the annual report includes an overview of each track, actions we have taken, performance relative to milestones and goals, and commentary about outcomes via environmental condition assessments. Highlights of the actions taken and progress made for each track are listed below.

<u>Pathogen Health Risk</u>

- Initiated Work Plan development for the Comprehensive Human Waste Source Reduction Strategy (CHWSRS)
- Made efforts to identify and track unauthorized encampment
- Achieved "Honor Roll" status in the Heal the Bay 2017-2018 Beach Report Card at 10 beach locations in the Watershed Management Area (WMA); achieved A or B grade 94 percent of the time Countywide during dry weather

<u>Unnatural Water Balance and Flow Regime</u>

- Participated in a task force formed by a local water agency, and consisting of Permittees, and local non-profit coalitions, which focuses on dry weather urban runoff issues, and has already supported a number of initiatives
- Supported efforts to maintain the sand berm at the mouth of Aliso Creek which was not breached during this past summer for the first time in more than a decade
- Expanded dry weather outfall inspections, increasing the cumulative inspection count to an average of 5 visits per outfall, and conducted additional high resolution flow monitoring
- Initiated dry weather outfall capture feasibility studies, including innovative sampling approaches and incorporation of water consumption data to improve flow source identification

[1] The use of "we" "our" and "us" in this annual report is intended to refer to the South Orange County Permittees.

Geomorphic Impacts and Channel Erosion

- Completed the Wagon Wheel Creek Restoration and Stormwater Management Project
- Acquired and analyzed high-resolution LiDAR
- Developed a Hydromodification Management Plan (HMP)-specific Quality Assurance Project Plan (QAPP) for ongoing hydromodification control effectiveness monitoring
- Revised the Integrated Effectiveness Assessment of Hydromodification Control Standards in South Orange County Report to address San Diego Regional Water Quality Control Board (Water Board) comments, as referenced in the WQIP acceptance letter

Special Studies and Other Supporting Efforts

Special studies and program management cut across all Plan tracks, providing valuable information for setting baselines and maintaining focus on the goals of the Plan. Two of the three special studies in the Plan are summarized below.

Stormwater Quality Asset Inventory and Pollutant Load Reduction Estimates

In recognition of the need to standardize water quality asset tracking and performance assessment, we are implementing a special study to develop a water quality asset inventory and model the pollutant load reduction provided by those assets.

As part of this study, we are developing an open-source web application (OC Stormwater Tools) to:

1. Build and maintain a consistent inventory of stormwater best management practice (BMP) assets
2. Support field users and maintenance managers with rapid BMP condition assessment and maintenance tracking
3. Track BMPs within private parcels and verify O&M
4. Store tributary watershed information
5. Model the performance of built and planned BMPs
6. Report progress and future projections for annual reporting.

Elements 1 through 3 are complete and are currently in use by several Permittees and their contractors. Elements 4 through 6 are planned or in progress.

Evaluation of Baseline and Reference In-stream Flow Conditions

The “Flow Condition” or “Flow Ecology” special study will evaluate current flow alteration and develop ecologically-based environmental flow recommendations for several urban watersheds that support federally listed species within the WMA.

Planned activities in 2019 include continued coordination with key stakeholders, further determination of the study scope, and commencement of priority study elements.

Milestones

As part of enrollment in the Provision B.3.c compliance option, the Plan includes annual milestones. Annual milestones for reporting year 2017-18 were completed as planned, and are summarized in the table below.

Initiate development of CHWSRS Work Plan	✔
Conduct ongoing outfall monitoring and update outfall prioritization	✔
Develop an HMP-specific QAPP for ongoing HMP effectiveness monitoring	✔
Revise the 2017 HMP Effectiveness Assessment	✔
Assess the stream monitoring data associated with the Rancho Mission Viejo development	✔

Report Structure

The main body of the annual report includes detailed information about the Plan tracks, special studies, and milestones. The appendices to the annual report include detailed analyses, datasets and full context for various aspects of Plan

implementation. An annotated outline of the appendices is included below.

Appendix A: WMA Monitoring Assessments

Appendix A.1: Receiving Water Monitoring Assessment

Appendix A.1 includes assessment of metals, toxicity, and pesticides data from long term mass emissions (LTME) sites. LTME monitoring is conducted throughout SOC WMA receiving waters to estimate annual loads and toxicity of a wide range of constituents during both dry and wet weather.

Appendix A.2: MS4 Outfall Discharge Assessment

Appendix A.2 includes information about the five elements in the MS4 outfall assessment: outfall inventory, dry and wet weather monitoring, high resolution flow monitoring, and outfall prioritization. The dry and wet weather monitoring gathers both field observation data and water chemistry data. The 2018 outfall re-prioritization incorporated field and flow data gathered after the initial prioritization.

Appendix A.3: Sediment Monitoring Assessment

Appendix A.3 includes 2018 adjustments to the Regional Harbor Monitoring Program (RHMP) and its Quality Assurance Project Plan (QAPP) as well as information about the 2018 RHMP sampling event. The RHMP provides a comprehensive survey of water quality, sediment quality, and aquatic life biodiversity on a five-year cycle in four embayments in the San Diego Region: Dana Point Harbor, Oceanside Harbor, Mission Bay and San Diego Bay. These surveys aim to assess the status and trends of water and sediment quality as well as the health and diversity of marine life in the four harbors. The monitoring data for the 2018 RHMP sampling will be available in early 2019.

Appendix A.4: HMP Effectiveness Monitoring Assessment

Appendix A.4 includes information about the hydromodification control effectiveness monitoring program and the 2017-18 assessment and reporting of data from stream monitoring conducted as part of the Rancho Mission Viejo Ranch Stream Monitoring Plan and Habitat Conservation Plan. The Permittees submitted the draft Hydromodification Management Plan Effectiveness Monitoring Quality Assurance Project Plan (HMP QAPP) on August 20, 2018, for Water Board review. On November 20, 2018, the Water Board informed the Permittees the HMP QAPP was considered final. The first year, of the three-year, HMP QAPP monitoring is scheduled to begin in spring or early summer 2019.

Appendix A.5: Area of Special Biological Significance (ASBS) Monitoring Assessment

Appendix A.5 includes information about Areas of Special Biological Significance (ASBS) monitoring within SOC WMA. Two of the identified ASBS in Southern California, Irvine Coast ASBS and Heisler Park ASBS, are located within the SOC WMA. The Plan does not address the Irvine Coast ASBS as there are no direct MS4 discharge locations noted within the Irvine Coast ASBS coastline. For the Heisler Park ASBS, the City of Laguna Beach continues to participate in the Southern California Bight Regional Monitoring Program (Bight).

Appendix B: Regional Monitoring Assessments

Appendix B.1: Southern California Stormwater Monitoring Coalition Regional Monitoring Program (Bioassessment)

Appendix B.1 includes information about the south Orange County spring 2018 bioassessment monitoring, spatial pattern analyses, and special studies. Permittees participate in a regional bioassessment monitoring program sponsored by the

Southern California Stormwater Monitoring Coalition (SMC) and managed by the Southern California Coastal Water Research Project (SCCWRP). The program is a means of assessing the biological quality of aquatic habitat by evaluating the assemblage of benthic macroinvertebrates, physical habitat condition, algae assemblages, water chemistry, and in some cases, sediment chemistry and toxicity.

Appendix B.2: Unified Beach Monitoring Assessment

Appendix B.2 includes analysis for the Unified Beach Water Quality Monitoring and Assessment Program (Unified Program) monitoring data during the 2017-18 reporting period (October 1 – September 30) and the AB411 Season (April 1 – October 31). The purpose of the Unified Program is to continually assess coastal water quality compliance with the beneficial use standards of water contact recreation. Sampling responsibilities are shared between three partners: Orange County Public Works (OCPW) on behalf of the Permittees, Orange County Health Care Agency (OCHCA), and South Orange County Wastewater Authority (SOCWA).

Appendix B.3: Southern California Bight Regional Monitoring Program

Appendix B.3 includes information about the Southern California Bight Regional Monitoring Program (Bight) and the workplans developed for three Bight elements: sediment quality, harmful algae blooms, and trash. Water quality impacts are evaluated by the Bight on a five year monitoring and reporting cycle, with the current cycle beginning in 2018 (Bight '18).

Appendix C: TMDL Assessments

Appendix C.1: Beaches and Creeks TMDL

Appendix C.1 includes analysis of Beaches and Creeks TMDL monitoring data during the 2017-18 reporting period (October 1 – September 30). The Water Board adopted the Fecal Indicator Bacteria TMDL in 2010, which includes 30 water bodies in south Orange County.

Appendix C.2: Baby Beach TMDL

Appendix C.2 includes analysis of the Baby Beach TMDL monitoring data during the 2017-18 reporting period (October 1 – September 30). The Water Board adopted the Baby Beach Total Maximum Daily Load (TMDL) in June 2008. Baby Beach water quality has improved significantly through the bacteria source investigation and implementation of BMPs to address suspected bacteria sources.

Appendix D: Quality Assurance Report

Appendix D summarizes results of Quality Assurance / Quality Control assessments and evaluations, including precision, accuracy, comparability, representativeness, and completeness of the monitoring data for the 2017-18 reporting period (October 1 – September 30).

Appendix E: Public Education and Outreach

Appendix E includes information about the public education and outreach program's background, the targeted public education actions taken by Permittees in 2017-18, the data driven approach, and the response to the Water Board 2018 over irrigation audit. The robust public education and outreach program, H_2OC, provides resources to residents and businesses, and encourages personal behavior change to reduce pollutants in stormwater discharges to and from the MS4.

Appendix F: Revised HMP-IEA

Appendix F includes the revised Hydromodification Management Plan (HMP) Integrated Effectiveness Assessment (IEA) of Hydromodification Control Standards (based on the 2017 draft). Comments received from the Water Board and data from the Rancho Mission Viejo (RMV) monitoring program were incorporated as part of this revision.

Appendix G: JRMP Annual Report Forms

Appendix G includes the Jurisdictional Runoff Management Program (JRMP) Annual Report Forms for each Permittee.

Appendix H: Updated LIP/JRMPs

Appendix H includes the updated Local Implementation Plans (LIP) / Jurisdictional Runoff Management Programs (JRMP) for each Permittee.

Appendix I: Special Study Work Plan

Appendix I includes the work plan for the Stormwater Quality Asset Inventory and Pollutant Loading Estimates special study.

Appendix J: Plan Amendments

Appendix J includes 2017-18 amendments to the Plan in the format of a change log.

Introduction

Plan Background

The South Orange County Watershed Management Area Water Quality Improvement Plan (Plan) identifies priority water quality conditions for the San Juan Hydrologic Unit and describes a system of goals and strategies to protect and restore the condition of these waters. The Plan is oriented around three highest priority water quality conditions (tracks):

Pathogen Health Risk. This priority applies to recreational waters in dry and wet weather conditions. Strategies focus on addressing human sources of pathogenic microorganisms to reduce health risks to swimmers, surfers, and other water recreators.

Unnatural Water Balance and Flow Regime. This priority applies to streams and estuaries, particularly during dry weather. Strategies focus on reducing unnatural flows to these systems to restore natural flow regime, decrease pollutant loads, and improve water quality, riparian habitat, and biological condition.

Geomorphic Impacts and Channel Erosion. This priority applies to streams that are experiencing excess channel erosion and associated impacts to the physical structure of the streams. Strategies focus on restoration of priority segments to help arrest further degradation and improve physical conditions for habitat regeneration to occur.

Together, these three tracks serve as a framework for guiding near-term actions and assessing progress toward addressing issues of importance to the local community.

Annual Report Purpose & Objectives

We[2] have prepared this annual report to provide clear and targeted information to demonstrate compliance with the San Diego Regional MS4 Permit (Order R9-2013-0001 as amended by Order No. R9-2015-001 and Order No. R9-2015-0100) (Regional MS4 Permit) and consistency with the commitments of the Plan. We intend to achieve several other objectives with the form and content of this report:

- Summarize relevant information in a convenient format
- Focus on highest priority water quality conditions and effective actions to improve them
- Clearly differentiate between completed actions and future expectations
- Summarize the value created by stormwater programs

This annual report presents actions, milestones, and monitoring results from the previous reporting year; however, it should be noted that the outcomes of the Plan are unlikely to be discernible from environmental variability at the annual time scale. Therefore, this annual report will be complemented every five years by a more detailed assessment that may recommend changes in strategies, milestones and other elements of the Plan.

Regulatory Basis and Time Period Included

We developed the Plan in response to Provision B of the Regional MS4 Permit. The Plan was approved by the San Diego Regional Water Quality Control Board Executive Officer on June 20, 2018.

[22] The use of “we” “our” and “us” in this annual report is intended to refer to the South Orange County Permittees, which includes the County of Orange, Orange County Flood Control District, and the Cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano.

Per Provision F.3.b.(3) of the Regional MS4 Permit, the Plan annual report must include (paraphrased):

- Plan progress, including:
  - Progress toward milestones
  - Strategies planned for the next reporting period
  - Proposed modifications to strategies
  - Strategies implemented or no longer implemented
  - Previous modifications to the Plan, Jurisdictional Runoff Management Programs (JRMPs), or Best Management Program (BMP) Design Manuals
  - Proposed modifications to the Plan, JRMPs, or BMP Design Manuals
- Progress of special studies
- Receiving water and outfall monitoring data
- Findings of assessments

We officially commenced implementation of the Plan upon formal approval. This annual report considers Plan implementation efforts and monitoring data collected through September 30, 2018, as well as jurisdictional program activities through June 30, 2018. In practice, some of the new strategies described in the Plan began in 2016 in parallel with Plan development. This first annual report describes some of these efforts, even if they occurred before the reporting year. In future annual reports, we will focus specifically on the previous year's efforts.

Report Organization

We have organized this report to focus on the three primary tracks of the Plan and crosscutting special studies that serve one or more planning tracks. Each track's section includes an overview of the track, actions we have taken, performance relative to milestones and goals, and commentary about outcomes via an environmental condition assessment (**Figure 1**).

Major components of this annual report include:

Executive Summary- Provides highly summarized information about the Plan tracks, special studies, and milestones as well as an annotated outline of the appendices.
Annual Report Body - Provides summarized results and evidence with references to further information available in the appendices or outside sources. The report body is intended to focus primarily on the highest priority tracks and similar efforts that support these tracks.
Appendices - Provides detailed analyses, datasets and full context available to back up findings and recommendations presented in the annual report body. The appendices include the following:

A - Watershed Management Area Monitoring Assessments
B - Regional Monitoring Assessments
C - Total Maximum Daily Load (TMDL) Assessments
D - Quality Assurance Report
E - Public Education and Outreach
F - Revised Hydromodification Management Plan - Integrated Effectiveness Assessment (HMP - IEA) Report
G - JRMP Annual Report Forms
H - Updated Local Implementation Plan (LIP)/JRMPs
I - Special Study Work Plan
J - Plan Amendments

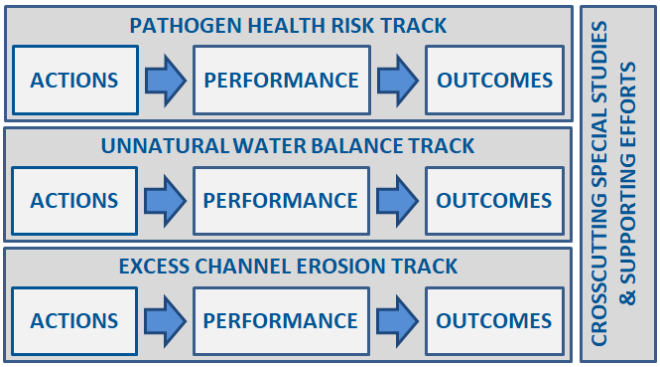

Figure 1. Highest Priority Planning Tracks Outline Flow Chart

Program Summary

Highlights

Beginning with identification of the highest priority conditions in 2016, we began developing new tools, implementing new strategies and adapting monitoring and assessment programs to align with these priorities. Formal Plan approval in June 2018 marked an exciting transition to a greater focus on these priorities and the new cross-cutting efforts that will support these tracks.

Major highlights include:

- Initiated Work Plan development for the Comprehensive Human Waste Source Reduction Strategy (CHWSRS)
- Made efforts to identify and track unauthorized encampment
- Achieved "Honor Roll" status in the Heal the Bay 2017-2018 Beach Report Card at 10 beach locations in the Watershed Management Area (WMA); achieved A or B grade 94 percent of the time Countywide during dry weather
- Formed a task force made up of a water agency, Permittees within the respective service area, and a local non-profit coalition around dry weather urban runoff issues, which has already supported a range of initiatives
- Supported efforts to maintain the sand berm at the mouth of Aliso Creek; it has been more than a decade since the berm did not breach through the dry season
- Expanded dry weather outfall inspections, increasing the cumulative inspection count to an average of 5 visits per outfall, and conducted additional high resolution flow monitoring
- Initiated dry weather outfall studies, including innovative sampling approaches and incorporation of water consumption data to improve flow source identification
- Developed OC Stormwater Tools, and began using the innovative, web-based platform to inventory more than 2,000 BMPs and 400 development project sites
- Built initial elements of a performance-based program around the unnatural water balance track
- Conducted a critical iterative review of the public education and outreach program, H_2OC, and enhanced the H_2OC brand and messaging.

Additional information on these highlights are provided in the following sections.

Formal Plan approval also brought significant changes to our monitoring and assessment program, focused to a greater extent on highest priority conditions and question-based program design.

Annual Milestones

As part of enrollment in the Provision B.3.c compliance option, the Plan includes annual milestones. The status of 2018 milestones are summarized in **Figure 2**.

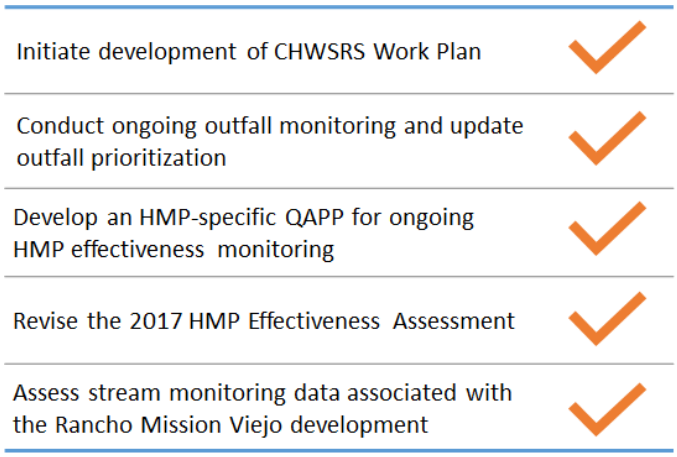

Figure 2. Annual milestones for reporting year 2017-2018 were completed as planned

Lessons Learned

Our intent is to use the annual report as an opportunity to reflect on lessons learned during the previous year. Due to the very short implementation period, we have had limited experience that is specific to the Plan. However, our collective experience and lessons learned with the

stormwater program development and management has informed the Plan structure, including:

- Adopting a question-based framework to the monitoring and assessment program. We believe this will provide more meaningful information for decision making and effectiveness assessment of the Plan, than an “everything, everywhere” monitoring approach.
- A better understanding of the effect of hydrologic and physical conditions on biological conditions led us to adopt a function-based hierarchy for stream restoration, which influenced our selection of highest priority conditions. Given the complications posed by “urban stream syndrome” we find it useful to be able to focus our efforts on underlying stressors (e.g., flow regime, channel form) rather than having to spread our focus across a broad range of parameters.
- We have continued to learn about the objectives we share with other agencies, including water agencies, resource agencies, and non-governmental organizations. Several of the strategies in the Plan are designed around these shared objectives and are intended to provide shared benefits.

Pathogen Health Risk Track

Overview: Use source tracking to target cost-effective control measures that reduce pathogen loads and swimmer illness rates

Human pathogens refer to a wide category of microorganisms, such as bacterium, protozoa, and viruses that cause illness in humans. Waterborne, fecal-derived human pathogens are a key source of impairment of recreational beneficial uses due to the risk they pose to human health. Fecal indicator bacteria (*Enterococcus*, fecal coliform, *Escherichia Coli* and total coliform) are not human pathogens but are used as indicators of pathogens present in water as they have been historically easier and less costly to measure and have been shown to correlate with illnesses.

Numerous ongoing efforts throughout Southern California are beginning to show that a microbial source tracking (MST)-based and pathogen-focused approach should result in greater public health benefit for significantly lower cost than traditional approaches that focus on treatment of indicator bacteria in stormwater runoff. For example, the San Diego Region Wet Weather Bacteria Cost Benefit Analysis[3] (2017) showed that a human waste source control approach would have approximately 20 times greater benefit per unit cost than a traditional stormwater control approach. Additionally, scientific advancements in MST and pathogen detection are resulting in the commercial availability of more reliable and less expensive analytical techniques.

The strategies we have described in the Plan align with these advancements in scientific understanding and monitoring techniques. While our current jurisdictional efforts to control bacteria will remain in effect, the new initiatives we undertake as part of the Plan will focus principally on human waste source identification and abatement. Our approach begins with source tracking as an implementation planning tool to focus our pathogen abatement efforts and structural BMP implementation based on targeted information regarding the nature and extent of human sources. Source identification will be followed by the human waste abatement / remediation measures that they identify, which we expect to result in significant long-term pathogen reduction benefit during both dry and wet weather.

Figure 3 presents the Comprehensive Human Waste Source Reduction Strategy (CHWSRS) work

[3] https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/issue3/Final_CBA.pdf

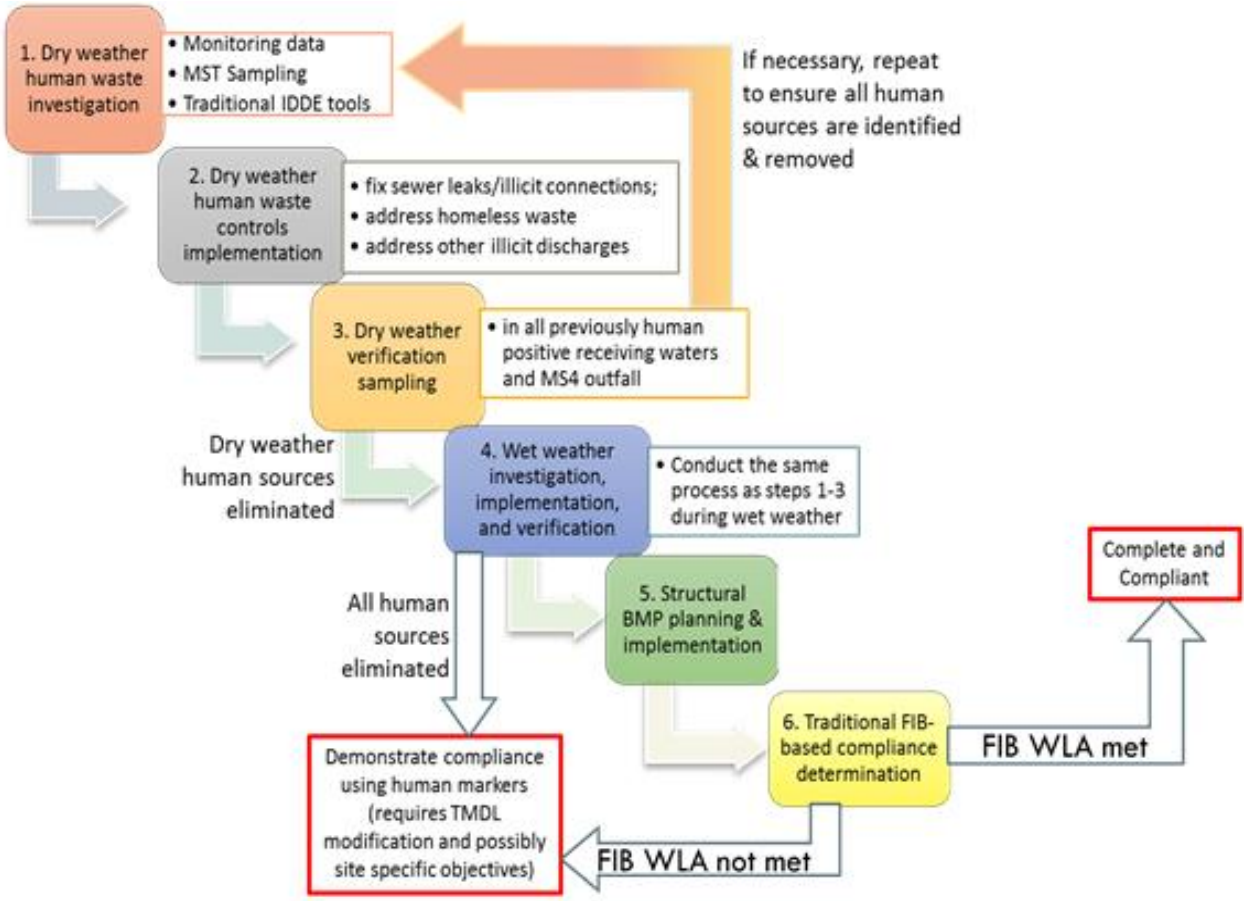

Figure 3. Comprehensive Human Waste Source Reduction Strategy Work Flow

flow described in the Plan which includes a phased approach for identification, abatement, and abatement verification of human waste sources. It also includes conceptual TMDL compliance pathways that would be assessed based on data acquired through execution of this strategy.

2018 Progress Report

Actions

Based on the short time period between Plan approval and this initial annual report, our 2018 actions are limited. Primary efforts focused on start-up of the comprehensive human waste source control strategy identified in the Plan, ongoing jurisdictional source control strategies and strategies to achieve indicator bacteria TMDLs.

Initial efforts on regional human waste source control program. We initiated development of the CHWSRS Work Plan in September 2018. We developed this strategy as a core element of the Plan approach for pathogen health risk. Through the Work Plan process, we will develop more details regarding execution of this strategy.

Following unauthorized encampment trends. Consistent with our focus on human waste sources, we expanded our focus on identifying locations of unauthorized encampments and updating trends where available. This focus will assist in future source identification investigations as part of implementing the pending CHWSRS Work Plan.

Ongoing investment in jurisdictional housekeeping measures. In 2018, we continued to implement bacteria and pathogen source control strategies, including:

- Implementing pet waste source control programs, including public education and outreach

- Implementing illicit discharge detection and elimination programs
- Conducting trash cleanups
- Requiring BMPs in Priority Development Projects based on the provisions of the Permittees' BMP Design Manuals
- Operating existing dry weather flow diversions and treatment systems

Ongoing focus on sewer spill control. Together with our wastewater partner agencies, we have continued to implement the Countywide Area Spill Control (CASC) Program, focused on reducing the risk of sanitary sewer overflows and providing response.

Ongoing implementation and monitoring associated with bacteria TMDLs. The County conducted monitoring and reporting associated with the Baby Beach Indicator Bacteria TMDL (See Appendix C.1) and the Twenty Beaches and Creeks Indicator Bacteria TMDL (See Appendix C.2)

Performance: Achievement of Milestones and Goals

Our actions lead to delivery of milestones and progress toward numeric goals established in the approved Plan. This annual report focuses on measurable performance while recognizing that it is early in the implementation period.

Annual Milestones. The Plan identified an annual milestone for 2018: "Initiate development of CHWSRS Work Plan." This effort was initiated in September 2018. Efforts will be ongoing through 2018 and the first half of 2019.

Progress toward Goals. We did not attempt to update estimates of progress toward Plan goals in this annual report. The progress assessment reported in Section 3.1.4 of the Plan continues to be the most current report of estimated load reduction. The Plan documents significant progress toward load reduction targets based on existing BMPs and jurisdictional source control measures.

Outcomes: Environmental Condition Assessment

As we implement strategies to reduce bacteria and pathogen loads, we must also assess if our actions are resulting in the desired outcomes by monitoring environmental conditions. Datasets for assessing current conditions and trends related to human pathogen health risk remain limited so the proxy of indicator bacteria data has been used.

Trends in monitoring data indicate ongoing improvement in dry weather water quality conditions. For instance, dry weather final Baby Beach TMDL targets were achieved for Total Coliform, Fecal Coliform, and *Enterococcus* during the reporting period, as indicated in **Figure 4, 5, and 6**.

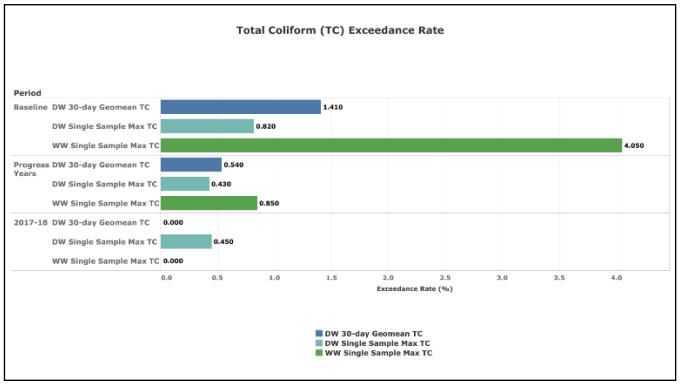

Figure 4. Total Coliform Exceedance Rate Comparing Baseline Period with Progress Years and Current Reporting Year

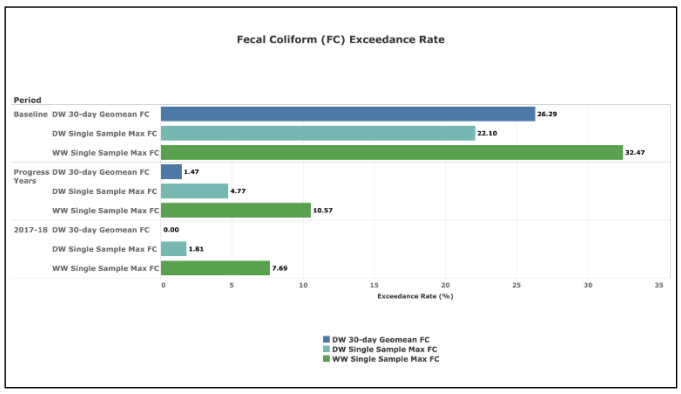

Figure 5. Fecal Coliform Exceedance Rate Comparing Baseline Period with Progress Years and Current Reporting Year

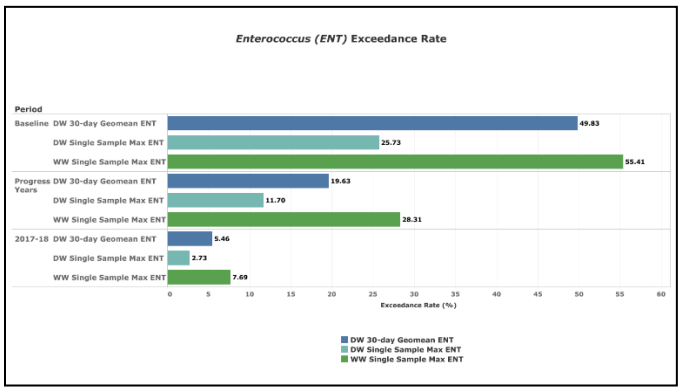

Figure 6. *Enterococcus* Exceedance Rate Comparing Baseline Period with Progress Years and Current Reporting Year

Improvements in dry weather water quality conditions are likely attributable to our jurisdictional housekeeping efforts, structural BMP implementation, and operation of dry weather diversions.

Similarly, wet weather water quality has also shown improvements. The wet weather interim Baby Beach TMDL targets were achieved for Total Coliform, Fecal Coliform, and *Enterococcus.* Additionally, the 31.1% load reduction milestone was met for *Enterococcus*.

Improvements in water quality can also be attributed to bacteria source investigations, which showed no samples tested positive for human markers. Additional dry and wet weather data analyses for the two bacteria TMDLs are located in Appendix C.

Deterioration in water quality was noted in 2018 at Poche Beach near the mouth of Prima Deshecha. The Poche Clean Beach Project, which utilizes sand filtration and ultraviolet (UV) disinfection to treat runoff from Prima Deshecha Channel in San Clemente, experienced diminished performance compared to previous years, resulting in more frequent exceedance of bacteria limits at the beach. The County, the City of San Clemente, and the South Orange County Wastewater Authority are coordinating to develop a long-term solution for this outfall.

Planned 2019 Efforts

Our planned efforts for 2019 include focused investment in two prongs of the comprehensive pathogen source control strategy:

Continue Stakeholder Coordination. We will continue to coordinate and work with County Intra- and Inter- agencies and local wastewater agencies as part of CHWSRS Work Plan development and fill data gaps in:

- Sanitary sewer system infrastructure sewer data
- Private lateral data
- Rehabilitation/lining project locations
- Sanitary sewer system improvement or expansion capital improvement projects
- Recycled water network and infrastructure
- Areas with septic coverage (On-site Wastewater Treatment Sites)
- RV dump station locations

Monitoring plan development and initial implementation. The CHWSRS Work Plan will be submitted to the San Diego Regional Water Quality Control Board (Regional Water Board) in June 2019. With Regional Water Board acceptance, we will begin collecting, analyzing, and interpreting samples to determine the presence and magnitude of human markers in dry weather flows.

Continued efforts to address unauthorized encampments. For the 2019 Point in Time Count, the County has increased efforts and resources to collect comprehensive data of Orange County's homeless population and help drive regional coordination of resources to assist individuals and families experiencing homelessness in Orange County. The County has concentrated its efforts on building a responsive “System of Care” in Orange County including the increase of shelter beds, recuperative care, and permanent supportive housing.

Human waste source control will be our primary focus for this track in the coming 5 years. Through this investment, we intend to develop a much better understanding of human waste sources and make significant progress in abating these sources, resulting in improvements in water quality and a refined set of management actions focused on key remaining sources.

Our other supporting efforts planned in 2019 include:

- Assess the reliability of the human-specific (HF183) Bacteroidales genotypes with propidium monoazide (PMA) treatment to distinguish between viable cells (indicative of raw sewage) and dead cells
- Continue to participate in the San Diego Regional Reference Streams and Beaches Special Study identified in the Plan.
- Continue to develop the OC Stormwater Tools platform (see additional detail below) to support quantification of existing BMPs and planning of future BMPs for controlling indicator bacteria and pathogens found in stormwater.
- Continue to implement jurisdictional housekeeping programs and Countywide sewer spill control programs.
- Continue public education and outreach programs, including those addressing pathogen load reductions

Unnatural Water Balance Track

Overview: Prioritize water conservation, recycling and outfall treatments to restore riparian ecosystems and improve recreational quality

Disruption in the natural flow regime of a stream system is considered one of the key stressors associated with “urban stream syndrome” described by Walsh, et al. (2005)[4] and is a major threat to ecosystem integrity in South Orange County. Unnatural flows from storm drain outfalls can convert ephemeral creeks to perennial flow, providing water for invasive plants such as Arundo Donax, and carrying nutrients that can contribute to excess algal growth and associated water quality impacts. In moderate to high stress urban streams, perennialization of urban streams is associated with lower biological integrity (Mazor et al., 2012)[5]. Unnatural flows to naturally perennial systems can also affect ecosystem integrity via water quality impacts or significant changes to flow regime.

Flow regime is one of the foundations of the function-based hierarchy for stream assessment and restoration (Harman et al. 2012)[6]. In developing this highest priority planning track, we focused on reduction of unnatural flows as a foundational step towards restoration of more natural flow regimes to support more natural and resilient ecosystems. Additional benefits are expected to include reduction in nuisance conditions that can impair recreation experience (i.e., hiking), reduction in water waste, and water supply augmentation via urban runoff capture. Our key strategies associated with this track include:

Research source of flows. Natural flows in creeks are necessary to provide adequate water for natural processes and wildlife; however, unnatural flows can cause changes in flow regime and/or contribute pollutant loads. This strategy characterizes outfall flows to determine which are natural and which are not. This information will be useful to recognize

[4] Walsh CJ, Roy AH, Feminella JW, Cottingham PD, Groffman PM, Morgan RP II. 2005. The urban stream syndrome: Current knowledge and the search for a cure. Journal of the North American Benthological Society 24(3):706-723.

[5] Mazor, R., Schiff, K., Ode, P., and Stein, E.D. 2012: Final Report on Nonperennial Streams. SCCWRP Technical Report 695.

[6] Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.

where flows are necessary for ecosystem function and where flows are coming from unnatural sources.

Prevent flows into the MS4. This strategy focuses on addressing unnatural, unpermitted flows into the MS4 through several categories of actions, including outreach and incentive programs, enforcement of prohibited discharges, source controls and capture systems in priority development and redevelopment projects, and retrofits with green streets and low impact development. Addressing controllable flows into the MS4 will conserve water supply, reducing use per capita, and will reduce the amount of unnatural flows conveyed through the MS4.

Capture or treat flows from MS4. This strategy focuses on reducing or improving unnatural flows at the outfall from the MS4 system. This includes several categories of actions, including efforts to retain and infiltrate water, capture and divert water to a treatment or water reclamation plant, and treat and discharge water (where in-stream flows are beneficial).

The ultimate goal we identified in the Plan is to eliminate unnatural, unpermitted dry weather flows from the MS4 to inland receiving waters and estuaries. We also established milestones and interim goals are related to reduction in unnatural flows.

2018 Progress Report

Actions

Since identification of this priority water quality condition in April 2016, we have invested continuously to build richer and more useful datasets to fill data gaps to support restoration decisions and form partnerships to support unnatural water balance management. Highlights of our progress are summarized below.

Outfall inspections. Beginning in 2016 as part of Plan development, we made focused changes to outfall inspection protocols to provide more meaningful information to assess unnatural water balance. This included assessment of flow rates, degree of flow connectivity to streams, and the relative contribution of storm drain flow to in stream flow. As part of this program, we have inspected 368 locations, including 286 outfalls greater than 36" in size, as depicted in **Figure 7**. Repeat assessments have focused on flowing outfalls, most of which we have assessed more than 5 times.

Outfalls shown in **Figure 7** as stars have had high resolution flow monitoring in addition to field observations. The dashboard also includes a list of facility names, with the corresponding prioritization score from Appendix J of the Plan, and histograms of the number of site visits and the percentage of observations with flow. Dashboards like this one enable inspectors to review data, plan routes, and enable managers to view the scope of the Outfall Inspection and High Resolution Flow Monitoring efforts.

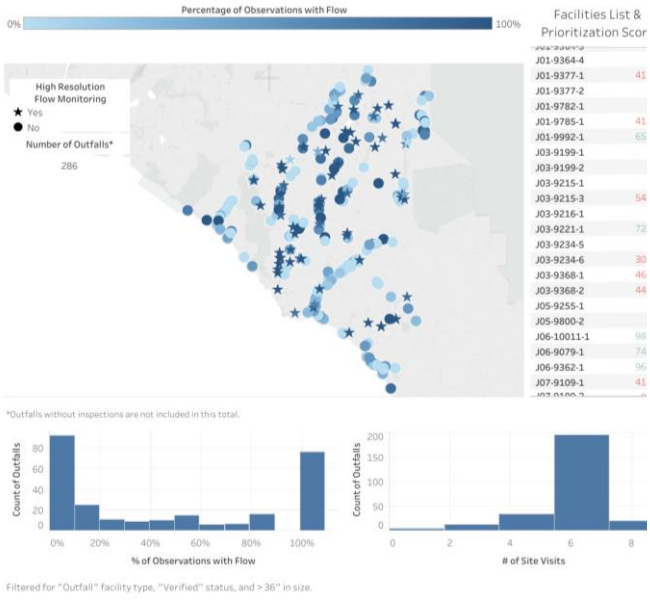

Figure 7. Outfall Inspection Dashboard – Overview

The dashboards depicted in **Figure 7** can be found at:
http://public.tableau.com/views/AnnualReportOutfallObservationsthrough2018/OutfallObservations?:embed=y&:display_count=yes&publish=yes

High resolution flow monitoring. High resolution outfall flow monitoring commenced in 2016 and has expanded to include more than 80 outfalls. Since this time, we have monitored most flowing outfalls for two week periods and we have monitored select outfalls continuously since 2016. We estimate that the monitored outfalls make up more than 80% of the total outfall dry weather flow in the WMA. Outfalls with high resolution flow monitoring are shown as stars in **Figure 7**.

Urban Runoff Reduction Task Force. In 2018, the City of Laguna Niguel, City of Laguna Hills, City of Aliso Viejo, City of Mission Viejo, City of Dana Point (via Letter of Commitment), County of Orange, Moulton Niguel Water District, Orange County Coastkeeper, and Laguna Bluebelt Coalition executed a memorandum of understanding (MOU) to coordinate efforts to reduce dry weather runoff. We have met quarterly with this group since MOU execution in February 2018. Examples of our efforts undertaken as part of this task force include:

- Neighborhood outreach, led by the Laguna Bluebelt Coalition with the support of grants from MNWD.
- Development and submittal of a grant application to Metropolitan Water District of Southern California to implement a “Smart Watershed Network” to integrate outfall flow measurement and water consumption information to support decisions.
- Sharing water consumption data as part of outfall capture feasibility studies.
- Planning the H2O for HOAs Public Education workshop held in October 2018.
- Coordinating public education and outreach messaging, leveraging resources, and brainstorming future projects and efforts.

We look forward to continuing these efforts and identifying new collaborative efforts moving forward.

Overwatering is Out Campaign and Relaunch of H_2OC Website. In 2017-18, we conducted a critical iterative review of the public education and outreach program, H_2OC, and enhanced the H_2OC brand, website and messaging. This included a reinvestment in our award-winning “Overwatering is Out” campaign. More information regarding the revitalization of H_2OC and response associated with the audit can be found in Appendix E.

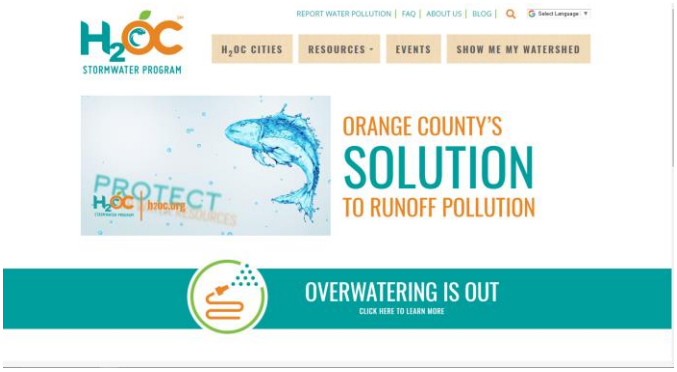

Figure 8. Homepage of recently relaunched H_2OC website (h2oc.org) and Overwatering is Out campaign

Pilot outfall capture feasibility studies. We initiated nine pilot outfall capture feasibility studies in August 2018 to characterize flow sources and assess opportunities for water conservation, treatment, and/or diversion in these watersheds. Our additional objectives for these studies include piloting new monitoring techniques and making progress toward near-term Plan milestones. These nine outfalls represent a significant portion of the Aliso Creek Watershed and comprise more than 15 percent of the total estimated dry weather flow outfall discharge in the WMA. The outfalls selected for this pilot are primarily located within the Moulton Niguel Water District service area so that we could take advantage of collaborative efforts underway. Pilot study elements include:

- Real-time flow metering for extended periods to measure diurnal and seasonal patterns.
- Acquisition and analysis of water consumption data, overlaid temporally and spatially with outfall flow records.

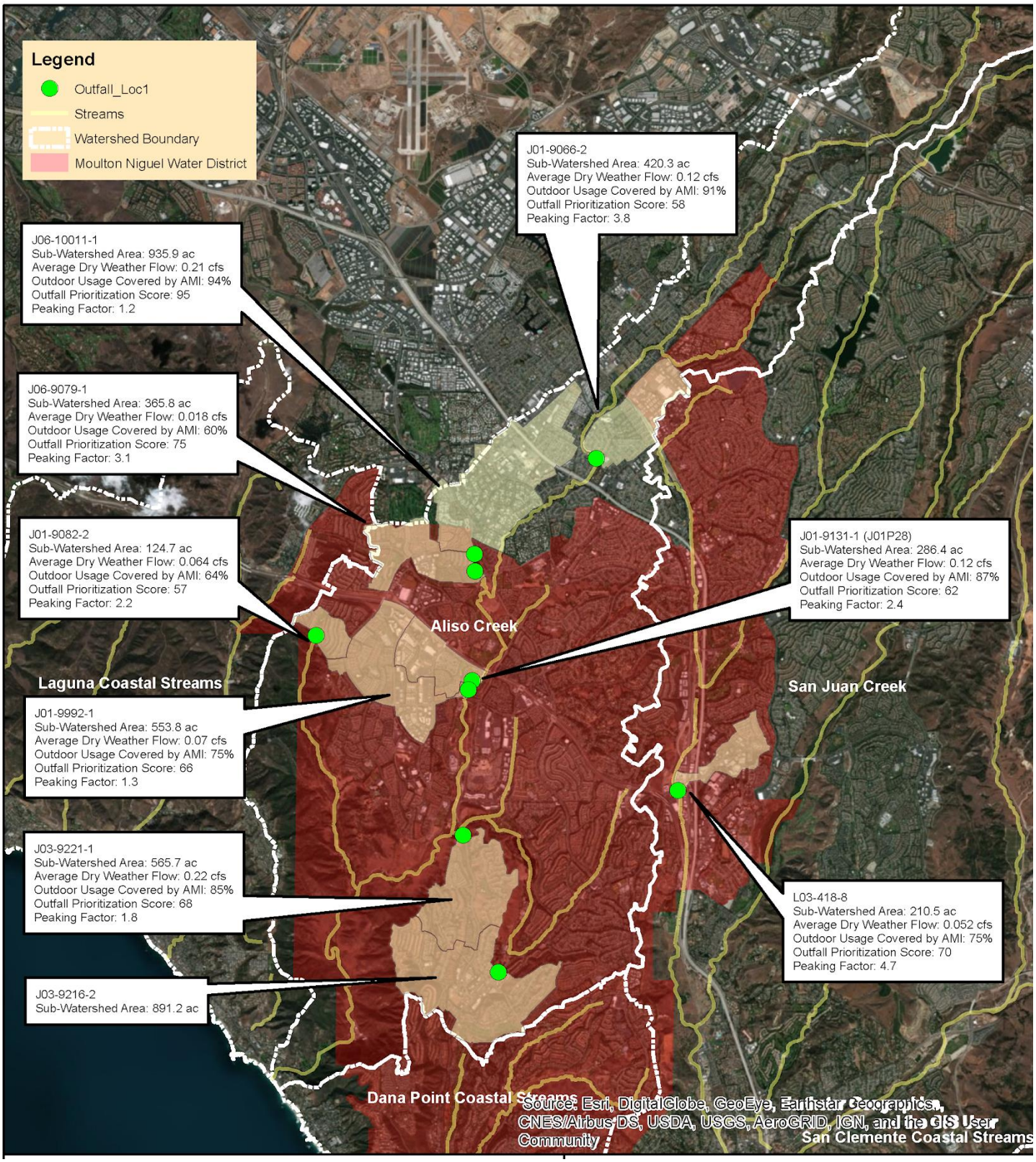

Figure 9. Pilot Outfall Capture Feasibility Studies Locations and Tributary Watersheds

- Water quality sampling to support flow-source-identification, including traditional parameters as well innovative parameters, such as personal care products (PCPPs), and potentially human markers.
- Compilation and review of stormwater, sanitary, and water infrastructure in the vicinity of outfalls to assess feasibility of treatment or diversion approaches.
- Assessment of data related to in-stream flow regime and potential impacts of low flow diversion.

Figure 10 demonstrates correlation between reductions in outfall flow with reductions in outdoor water consumption on an hourly scale. Such correlations can be incorporated into outfall flow source studies that determine unnatural water balance strategy decisions. The pilot studies are scheduled for completion in June 2019.

Performance: Achievement of Milestones and Goals

Annual Milestones. The 2018 milestone for this track calls for "Conduct ongoing outfall monitoring and update outfall prioritization as part of Annual Report." The updated prioritization is available in **Appendix A.2**. With this update to the outfall prioritization, we incorporated the results of additional outfall inspections and flow monitoring records obtained since the original prioritization completed in 2016.

Progress toward Goals. Our first interim goal calls for 10 percent reduction in unnatural dry water flow from the MS4 to inland receiving waters by 2023. In order for us to assess progress toward this goal, it is first necessary to conduct monitoring and assessment to establish the existing flow regimes. Our Plan calls for this assessment to be completed in 2021 based on review of flow monitoring data collected between 2010 and 2020. At that time, we will be able to begin assessing progress toward this goal. For reference, the nine outfalls selected for pilot outfall capture feasibility studies comprise approximately 15 percent of estimated flow in the WMA.

Outcomes: Environmental Condition Assessment

Analysis of recent and historical flow data can help evaluate trends and provide context for the unnatural water balance and flow regime track.

Outfall Inspections. As part of transitional monitoring and Plan development, we performed inspections at 286 major outfalls (36 inches and larger), with an average of five visits per outfall. Of

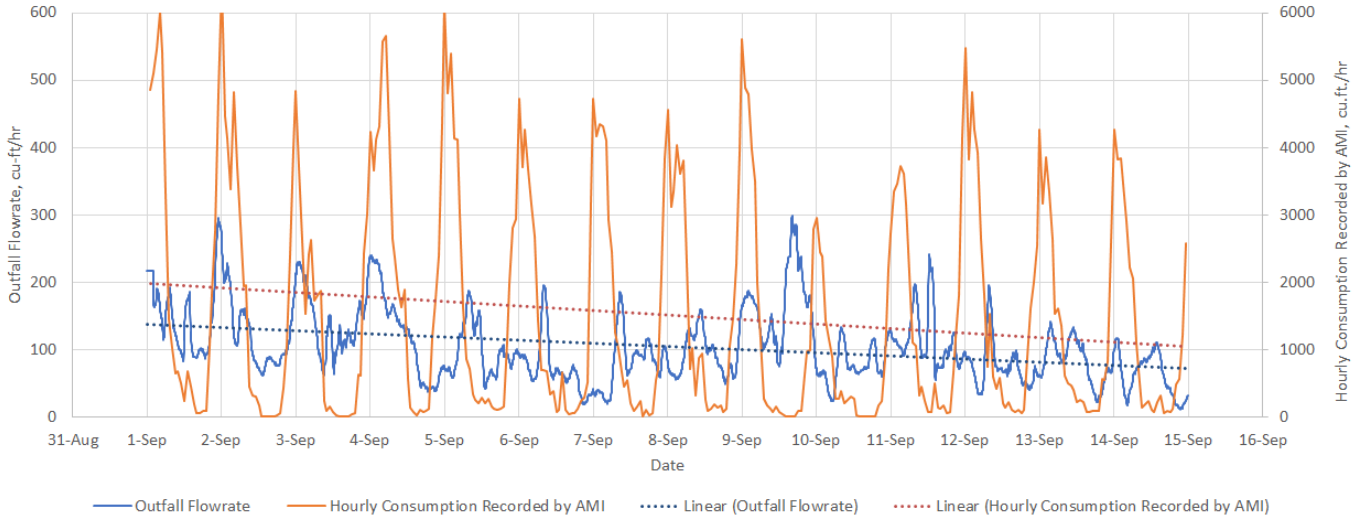

Figure 10. Comparison of Outfall Flow (Blue) and Outdoor Water Consumption Data (Orange) For Dry Weather Period in September 2018

these outfalls, there was a range of flow persistence as presented in **Table 1**.

Table 1. Percent of outfall inspections with observed flow

Percent of Inspections with Flow	Count of Outfalls
0%	98
1% to 34%	49
34% to 67%	37
67% to 99%	25
100%	77
Total	286

Analysis of these data have allowed us to focus our monitoring assessment efforts and may serve as a basis for better understanding seasonal trends in flow presence when coupled with additional data.

Flow Gaging Stations. The County operates a network of flow gaging stations on major stream reaches in the WMA. These stations provide data that can support longer-term trend analyses. These data support a preliminary understanding of the long term variability in dry weather flow rates, illustrate a correlation between drought and streamflow, and suggest a trend in flow reduction over time. We will use these data and other lines of evidence to characterize baseline flow regime.

Figure 11 depicts a flow gauging station in lower Aliso Creek allowing the examination of long term trends in dry season flow regimes. Data indicate a significant reduction in average dry weather flows during the 2012-2016 drought period. This is partially due to conservation improvements and influenced by antecedent season rainfall. Dry weather flow has increased slightly from the 2016 levels; however, is still well below pre-drought levels.

Planned 2019 Efforts

We plan to advance multiple parallel efforts, intended to make progress toward interim goals while improving our understanding of conditions to support appropriate decisions about management actions at an outfall level. In addition to continuation of 2018 activities, efforts we plan to undertake in 2019 include:

Completion of pilot outfall capture feasibility studies. As introduced above, pilot outfall capture feasibility studies are in progress and are scheduled for completion in June 2019. We will then use these pilot studies as a template and learning experience to guide further outfall studies. Our long term goal of conducting outfall studies is to develop a WMA-scale portfolio of potential outfall projects that help us achieve goals and milestones while adhering to the Plan hierarchy of source control, resource recovery, treatment, and diversion.

Flow conditions special study. As described further below, we plan to initiate the special study titled “Evaluation of Baseline and Reference In-stream Flow Conditions”. This study is intended to aid with more precise and definitive implementation of dry weather discharge control strategies for individual receiving waters and/or stream reaches within the WMA by assessing the degree of hydrologic alteration within water bodies across the WMA.

Permitted discharge and water impoundment inventory. To help improve the understanding of potential sources of dry weather flow, we have initiated and will complete an inventory of permitted discharges and water impoundments. To the extent possible, estimates of dry weather discharge from these impoundments will be tracked as part of this inventory.

Initiation of the Smart Watershed Network grant. This would include installing up to 60 flow measurement stations in the Aliso Creek watershed and developing data infrastructure to

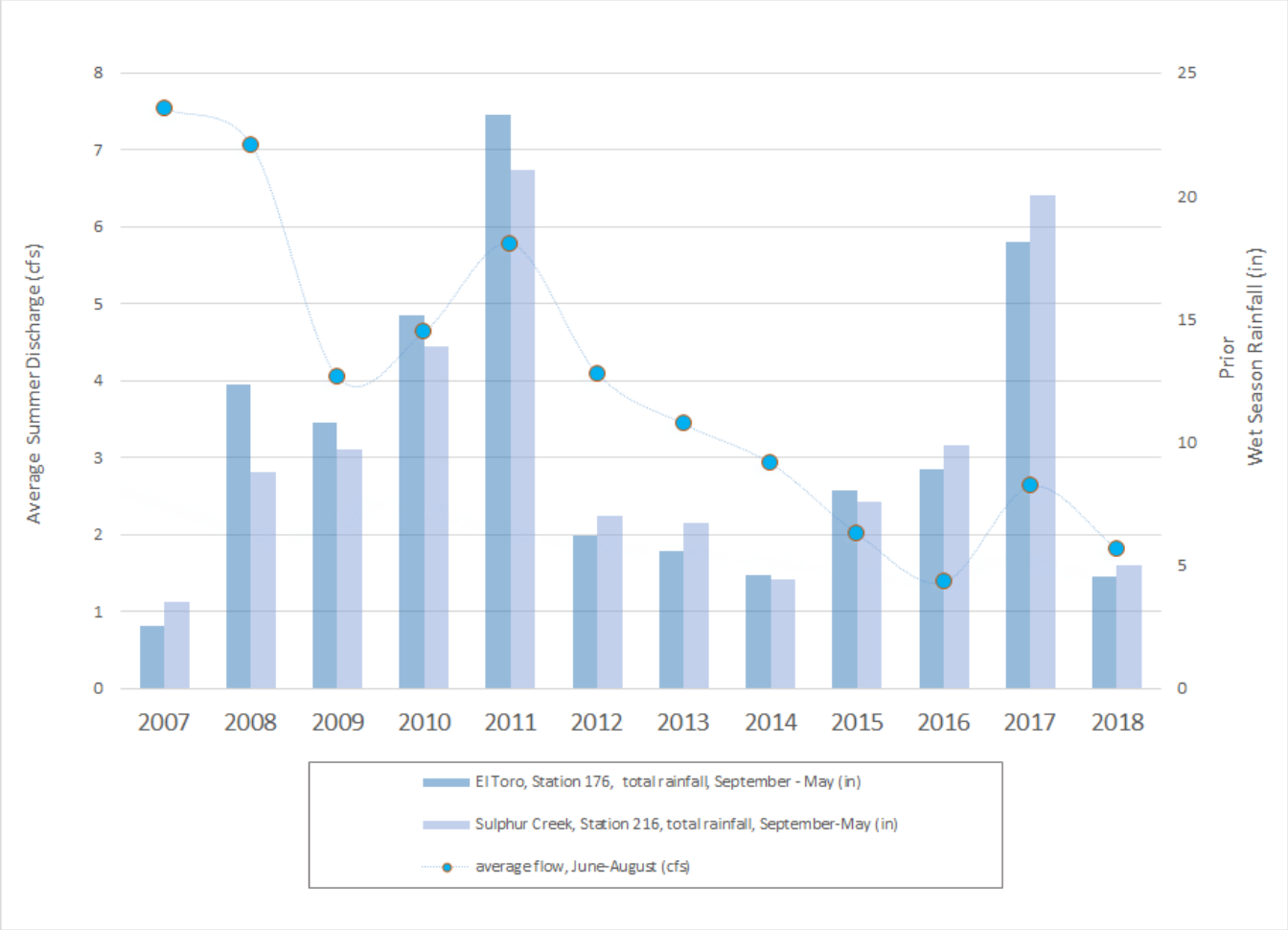

Figure 11. 2006 – 2018 Lower Aliso Creek Gauge Stations Flow Data

support analysis of flow metering data alongside water consumption data. This would be a collaborative effort with Moulton Niguel Water District.

Channel Erosion and Geomorphic Impacts Track

Overview: Identify and rehabilitate 23,000 linear feet of high priority erosion sites using a geomorphically-referenced design approach

Within the network of streams and creek systems in the WMA, certain reaches have experienced severe erosion resulting from historic development, such that the underlying physical form of the stream has been altered. This condition influences the physical habitat (i.e., channel geometry, substrate, vegetation) and hydraulic flow regimes (i.e., velocity, erosive energy) of a channel. Where erosion is active and ongoing, effects of erosion on the physical habitat of the stream can be key barriers to the recovery of riparian ecosystems.

Our Plan focuses on identifying and rehabilitating locations where (1) excess erosion and scour is actively occurring and is an important limiting factor in channel ecology, and (2) there are reasonable opportunities to build rehabilitation projects designed to serve the full range of flow and temporal conditions (e.g., peak flood flows; geomorphically-significant flows; low flows). By constructing feasible rehabilitation projects to abate excess erosion over a range of time, we intend to make improvements in physical habitat and hydraulic regime (i.e., underlying tiers in the stream

Figure 12. Before-After Conditions of the Wagon Wheel Creek Project.

rehabilitation framework layer) that can support improvements in biological communities.

In addition to rehabilitation of priority reaches, this track also focuses on (1) avoidance of future impacts through our ongoing implementation of the South Orange County Hydromodification Management Plan, and (2) earlier detection of progressing erosion through the use of remote sensing.

2018 Progress Report

Actions

During this reporting period, we completed the Wagon Wheel Creek project, acquired riparian LiDAR and revised the Hydromodification Management Plan.

Completion of Wagon Wheel Creek Restoration and Stormwater Management Project. Led by Orange County Parks, this project stabilized Wagon Wheel Creek to protect the remaining oak and sycamore woodland and other riparian vegetation; protect flooding of recreational resources and limit erosion hazards to Riley Wilderness Park; and ensure public safety within the Park. The County incorporated geomorphically-referenced elements into this project that are generally consistent with those described in the Plan, including bioengineered grade control, riparian vegetation restoration, buried bank stabilization to protect key infrastructure, trail improvements, and stormwater detention. **Figure 12** provide an example of before-after conditions of the Wagon Wheel Creek Project. Major incision and bank failure were mitigated through bioengineered grade control, riparian vegetation restoration, and bank stabilization. This project included prioritized rehabilitation work at 11 sites over approximately 10,000 lineal feet of stream channel (rehabilitation efforts cover a portion of this reach). The County completed construction in 2017.

Acquisition and analysis of high-resolution LiDAR. In anticipation of this highest priority track, we obtained high-resolution LiDAR data in 2016 for approximately 170 miles of stream and riparian corridor within the WMA. **Figure 13** provides an example view of the LiDAR-based stream channel assessment web map, including stream centerlines, interpreted bank lines, cross-sections, and LiDAR-based land cover. We intend to use these data to help detect changes over time, allowing us to identify future instabilities before they become

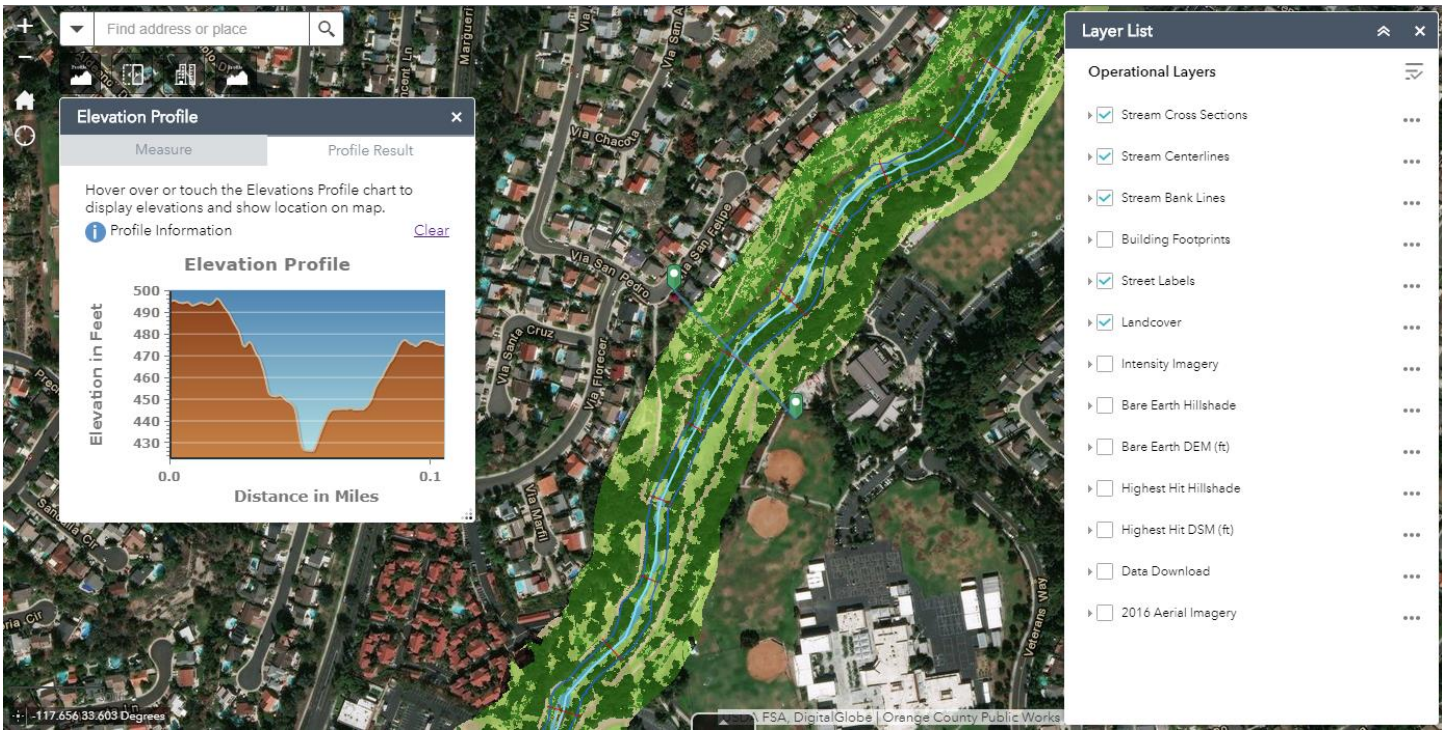

Figure 13. LiDAR-Based Stream Channel Assessment Web Map

severe. These data will also support design of rehabilitation projects. LiDAR data obtained in 2016 were analyzed to develop a high-resolution land surface model, and land cover classifications relevant to hydraulic and geomorphic analyses (e.g., vegetation density, bare soil, standing water, and hardened surfaces). To help expose these data to a range of users, the County developed a geoprocessing tool to allow development of user-defined cross sections. This dataset will be updated at five-year intervals to support change analyses.

Hydromodification Management Plan (HMP). We have required priority development and redevelopment projects to incorporate hydromodification controls since 2010 as part of our jurisdictional land development review processes. Since the June 2018 acceptance of the Plan, we are currently implementing the September 2017 HMP with the list of receiving water exemptions. This is our ongoing strategy for controlling impacts of development. Application of these standards to new development and redevelopment projects will improve hydrologic conditions over time.

Hydromodification Management Plan Effectiveness Assessment. In 2017, we conducted an assessment of the effectiveness of our current hydromodification control standards. We revised this assessment in 2018 based on additional monitoring data and Regional Water Board comments. (See Appendix F).

Performance: Achievement of Milestones and Goals

Annual Milestones. The 2018 milestones for this track are presented in **Table 2**.

Progress towards Goals. Our first interim goal calls for 2,000 linear feet of stream reach rehabilitated to abate excess erosion using a geomorphically-referenced approach by 2023. To streamline the stream reach rehabilitation project implementation, we have initiated inter-agency efforts to develop the Programmatic Permitting Framework for Geomorphically-Referenced Basis of Design Projects and will conduct Rehabilitation Alternatives and Feasibility Studies in 2019. These strategies are set to be completed by 2021 to attain the first interim goal of 2,000 linear feet by 2023.

Table 2. 2018 Channel Erosion Milestones

2018 Milestones	Status
Develop an HMP-specific Quality Assurance Project Plan (QAPP) for ongoing hydromodification control effectiveness monitoring and submit for Regional Water Board review (60 days from Plan effective date).	**Complete.** Initially submitted August 20, 2018. Final revised document submitted October 30, 2018 and approved by Regional Water Board.
Revise Integrated Effectiveness Assessment of Hydromodification Control Standards (based on 2017 draft) and submit for Regional Water Board review.	**Complete.** Included with this Annual Report (see Appendix F).
Annually assess and report on stream monitoring data submitted to the County by RMV.	**Complete.** Data were considered as part of the update to the Revised Integrated Effectiveness Assessment of Hydromodification Control Standards (see Appendix F).

Outcomes: Environmental Condition Assessment

The hydromodification effectiveness assessment conducted to date has primarily confirmed the validity of the large river exemption for San Juan Creek. Our planned geomorphic and biological monitoring of lower Chiquita Creek over the next three years will support a more focused assessment of the effectiveness of the flow duration controls described in the HMP.

At this time, we have not projected the expected ecological outcomes from future channel rehabilitation projects. Based on literature and the results of regional monitoring, we believe these projects will result in improvement in ecological condition. Our monitoring and assessment plan call for pre- and post-construction monitoring of rehabilitation projects.

Planned 2019 Efforts

Several efforts are planned in 2019 as summarized below.

Reporting on lessons learned from Wagon Wheel Creek Project. The County plans to prepare a brief summary report on the lessons learned from design, permitting, and construction of the Wagon Wheel Project. This is intended to serve as a reference to help streamline future projects.

Geomorphically-referenced Basis of Design Guidelines. We will continue to coordinate with stakeholders to develop the Geomorphically-referenced Basis of Design Guidelines.

Additional HMP effectiveness monitoring. We will perform additional HMP effectiveness monitoring in lower Chiquita Creek, including geomorphic and biological monitoring, as detailed in the Plan and the HMP-specific QAPP.

Ongoing implementation of the HMP. We will continue to require hydromodification control standards to be met by Priority Development and Redevelopment Projects, except as exempted per the Plan.

Crosscutting Special Studies and Supporting Efforts

Special studies and program management cut across all Plan tracks, providing valuable information for setting baselines and maintaining focus on the goals of the Plan. These efforts provide the basis for adaptively managing Plan implementation.

Special Study - Stormwater Quality Asset Inventory and Pollutant Loading Estimates

In recognition of the need to standardize asset tracking and performance assessment, we identified a special study to conduct a water quality asset inventory and pollutant load reduction analysis for one or more priority watersheds.

As part of this study, we are developing an open-source web application (OC Stormwater Tools) to:

1. Build and maintain a consistent inventory of BMP assets
2. Support field users and maintenance managers with rapid BMP condition assessment and maintenance tracking
3. Track BMPs within private parcels and verify O&M
4. Store tributary watershed information
5. Model the performance of built and planned BMPs
6. Report progress and future projections for annual reporting.

Elements 1 through 3 are complete and are currently in use by several Permittees and their contractors, as depicted in **Figure 14**. Elements 4 through 6 are planned or in progress.

2018 Progress Report

Major efforts undertaken and milestones achieved in 2018 include:

- The La Paz subwatershed in Oso Creek was selected as the special study watershed; however, efforts to inventory data extended across the WMA.
- Asset inventory attributes, condition assessment observations and weightings, and maintenance measurements were chosen and reviewed for 24 structural BMP types.
- The asset inventory module of OC Stormwater Tools was developed and field tested by trial users.
- Permittee water quality asset inventory data were imported into the system and/or entered manually via field or desktop input. The system currently holds more than 2,000 BMP entities and 400 priority development projects entities.
- Workflows were added to the asset inventory module to support its use on mobile devices.
- Training for our staff and contractors was conducted in July 2018.

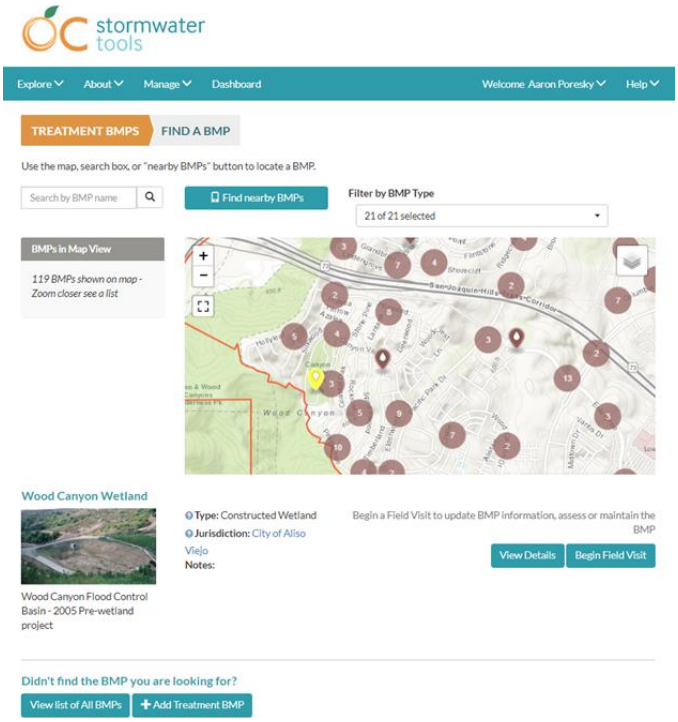

Figure 14. OC Stormwater Tools

Planned 2019 Efforts

Major efforts planned for 2019 include:

- Develop the Modeling Module of OC Stormwater Tools to conduct performance quantification for flows and pollutant loads.
- Develop the Trash Module of OC Stormwater Tools to support inventory, condition assessment, O&M, and benefit quantification of trash capture BMPs relative to the Statewide Trash Provisions.
- Incorporate geoprocessing services to support development and refinement of BMP delineations.

The special study is proposed to be completed two years from Plan approval (June 2020). Use of the OC Stormwater Tools to improve inventories and performance quantification within the WMA will continue beyond the special study term.

Special Study - Evaluation of Baseline and Reference In-stream Flow Conditions

The “Flow Condition” or “Flow Ecology” special study will evaluate current flow alteration and develop ecologically-based environmental flow recommendations for several urban watersheds that support several federally listed species within the WMA. As discussed above, the baseline and reference flow regime is of importance for prioritizing outfall strategies and judging project effectiveness. For example, this study will help inform whether a stream reach is naturally ephemeral. For perennial streams, this study can help understand what level of flow removal would be desirable to support target species.

Combined with the Stormwater Quality Asset Inventory and Pollutant Load Estimates special study, we will use the results and findings from this special study to better characterize the receiving water conditions of the WMA. This will allow us to understand the sources of pollutants and/or stressors within streams, and better target efforts to reduce the discharge of pollutants from MS4 outfalls to receiving waters.

2018 Progress Report

Initial efforts on this study were completed in 2018, including selection of the study team and development of study goals, scope, and potential tasks.

Planned 2019 Efforts

Planned activities in 2019 include coordination with key stakeholders, determination of the study scope, and commencement of priority study elements.

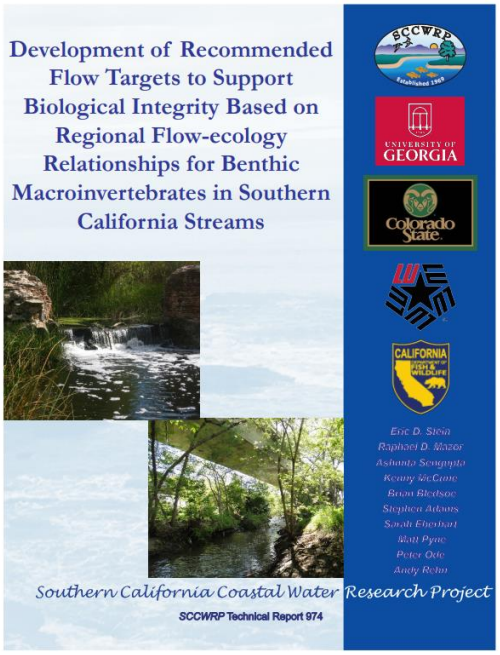

Figure 15. Development of Recommended Flow Targets to Support Biological Integrity Based on Regional Flow-ecology Relationships for Benthic Macroinvertebrates in Southern California Streams

Supporting Effort - Performance-Based Program Development

In 2018, we initiated discussion on the development of a performance-based approach for tracking outcomes in Plan implementation. This approach is intended to enable us to maximize water quality benefits achieved with current funds and to demonstrate incremental progress towards compliance. A performance-based approach includes clear goals, performance metrics with defined accounting standards, tracking tools and a defined adaptive management process. In 2019, we will continue to explore the use of a performance-based program and initiate efforts to developing functional accounting standards for performance measures, creation of a performance-based annual report, and selecting performance measures for the three tracks.