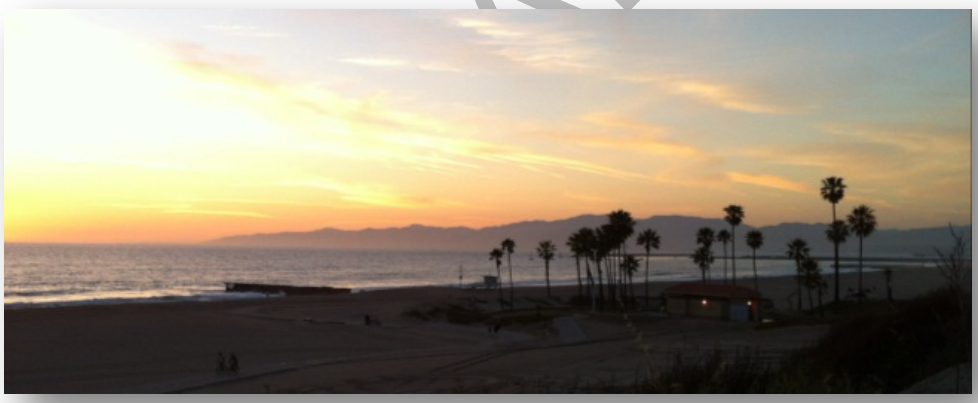
Santa Monica Bay Jurisdictional Group 2 and 3 Enhanced Watershed Management Program - DRAFT

Prepared by:

City of Los Angeles
Los Angeles County Flood Control District
County of Los Angeles
City of Santa Monica
City of El Segundo



The MWH Team

MWH Geosyntec consultants CWE M2 Resource Consulting, Inc.

Table of Contents

Table of Contents

Table of Contents

List of Appendices

Appendix Name

List of Tables

Table of Contents

List of Figures

Table of Contents

List of Acronyms

Acronym	Definition
AED	Allowable Exceedance Day
ASCE	American Society of Civil Engineers
Basin Plan	Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties
BIOL	Preservation of Biological Habitats of Special Significance Beneficial Use Designation
BMP	Best Management Practice
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIMP	Coordinated Integrated Monitoring Program
City	City of Los Angeles
CML	Compliance Monitoring Location
CMP	Corrugated Metal Pipe
COMM	Commercial and Sport Fishing Beneficial Use Designation
County	County of Los Angeles
CSMP	Coordinated Shoreline Monitoring Plan
CTR	California Toxics Rule
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
DP	Dissolved Phosphorus
ED	Exceedance Day
EMC	Event Mean Concentration
ESA	Environmentally Sensitive Area
ESCP	Erosion and Sediment Control Plan
EWMP	Enhanced Watershed Management Program
FC	Fecal Coliform
FIB	Fecal Indicator Bacteria
GIS	Geographic Information System
GM	Geometric Mean
HUC	Hydraulic Unit Code
IBD	International BMP Database
IC/ID	Illicit Connections and Illicit Discharges
IGP	Industrial General Permit
IND	Industrial Service Supply Beneficial Use Designation
IRWMP	Integrated Regional Water Management Plan

Acronym	Definition
JG2/JG3	Jurisdictional Groups 2 and 3
L-SWPPP	Local Storm Water Pollution Prevention Plan
LA	Los Angeles
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LAX	Los Angeles International Airport
LFD	Low-Flow Diversion
LID	Low Impact Development
LRP	Local Resource Program
MAR	Marine Habitat Beneficial Use Designation
MCM	Minimum Control Measure
MG/L	Milligrams per Liter
MIGR	Fish Migration Beneficial Use Designation
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MUN	Municipal and Domestic Supply Beneficial Use Designation
MWD	Metropolitan Water District of Southern California
MWH	MWH Americas, Inc.
N	Nitrogen
NA	Not Applicable
NAV	Navigation Beneficial Use Designation
NH_3	Ammonia
NO_3	Nitrate
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NSMBCW	North Santa Monica Bay Coastal Watershed
O&M	Operation and Maintenance
OPTI	Online Project Tracking and Integration System
Permit	Los Angeles Regional Water Quality Control Board Order No. R4-2012-0175
PCBs	Polychlorinated Biphenyls
PIPP	Public Information and Participation Program
POTW	Publically-Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
RAA	Reasonable Assurance Analysis
RARE	Preservation of Rare and Endangered Species Beneficial Use Designation
REC-1	Water Contact Recreation Beneficial Use Designation
REC-2	Noncontact Water Recreation Beneficial Use Designation
Regional Board	Los Angeles Regional Water Quality Control Board
RWL	Receiving Water Limitation
SBPAT	Structural Best Management Practice Prioritization and Analysis Tool

Acronym	Definition
SCCWRP	Southern California Costal Research Project
SHELL	Shellfish Harvesting Beneficial Use Designation
SMB	Santa Monica Bay
SMB EWMP Group	Santa Monica Bay EWMP Group
SMURRF	Santa Monica Urban Runoff Recycling Facility
SPWN	Fish Spawning Beneficial Use Designation
SQMP	Stormwater Quality Management Plan
SUSMP	Standard Urban Stormwater Mitigation Plan
SWAMP	Surface Water Ambient Monitoring Program
SWMM	Stormwater Management Model
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TKN	Total Kjeldahl Nitrogen
TLR	Target Load Reduction
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
UV	Ultraviolet
WARM	Warm Freshwater Habitat Beneficial Use Designation
WBPC	Water Body Pollutant Combinations
WERF	Water Environment Research Foundation
WDID	Waste Discharger Identification
WILD	Wildlife Habitat Beneficial Use Designation
WLA	Waste Load Allocation
WMA	Watershed Management Area
WMG	Watershed Management Group
WMP	Watershed Management Plan
WQBEL	Water Quality-Based Effluent Limitation
WRRDA	Water Resources Reform and Development Act of 2014

Executive Summary

The Santa Monica Bay (SMB) Jurisdictional Groups 2 and 3 (JG2/JG3) Enhanced Watershed Management Program (EWMP) has been developed by the Santa Monica Bay Enhanced Watershed Management Group (SMB EWMP Group), which is comprised of City of Los Angeles, County of Los Angeles, City of Santa Monica and City of El Segundo. The EWMP is a requirement of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175 (Permit), which was adopted by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective on December 28, 2012. The purpose of the Permit is to ensure the MS4s in Los Angeles County are not causing or contributing to exceedances of water quality objectives set to protect the beneficial uses in the receiving waters in the Los Angeles region.

The Permit allows Permittees to customize their stormwater programs through the development and implementation of a Watershed Management Program (WMP) or an Enhanced Watershed Management Program (EWMP) to achieve compliance with receiving water limitations (RWL) and water quality-based effluent limits (WQBELs). The City of Los Angeles (City), City of Santa Monica, City of El Segundo, Unincorporated areas of the County of Los Angeles (County), and the Los Angeles County Flood Control District (LACFCD), collectively referred to as the SMB EWMP Group, submitted a notice of intent (NOI) to develop an EWMP in June of 2013 to fulfill the requirements of the Permit.

ES-1 INTRODUCTION

As part of the Permit requirements, the SMB EWMP Group developed a Coordinated Integrated Monitoring Plan (CIMP) to monitor the effectiveness of the EWMP and resultant change in surface water quality. The CIMP is intended to serve as a guide for future adaptive management of the EWMP.

The SMB watershed management area (WMA) EWMP Group area falls within the boundaries of JG2 and JG3, which are located within the central region of the Santa Monica Bay Watershed. Natural Subwatersheds within the SMB EWMP Group Area include the urbanized Dockweiler and Santa Monica subwatersheds, as well as natural open space located in the Castle Rock, Pulga Canyon, Temescal Canyon, and Santa Monica Canyon subwatersheds. The JG2/JG3 area totals 34,362 acres within the Santa Monica Bay Watershed. **Figure ES-1** illustrates the extent of the SMB EWMP Group Area.

Approximately 49 percent of the SMB EWMP Group area is open space, of which approximately 93 percent is located in the northern natural portion of the subwatersheds and approximately 7 percent is located in the urbanized Dockweiler subwatershed. The boundary of the Santa Monica Bay, as defined by the National Estuary Program, extends from the Los Angeles/Ventura County line to the northwest, southward to Point Fermin located on the Palos Verdes Peninsula to the southeast. The land area that drains into the SMB follows the crest of the Santa Monica Mountains on the north to Griffith Park, then extends south and west across the Los Angeles coastal plain to include the area east of Ballona Creek and north of the Baldwin Hills. South of Ballona Creek, the drainage area is a narrow coastal strip between Playa del Rey and Palos Verdes. Natural subwatersheds and associated water bodies/tributaries are shown in **Table ES- 1**.

Figure ES-1
Santa Monica Bay Enhanced Watershed Management Plan Group Area

Table ES-1
Santa Monica Bay EWMP Area Natural Subwatersheds and Associated Water Bodies/Tributaries

Subwatershed	Water Body	Water Body/Tributary
Castle Rock	Santa Ynez Canyon	Quarry Canyon Trailer Canyon
Pulga Canyon	La Pulga Canyon	-
Temescal Canyon	Temescal Canyon	-
Santa Monica Canyon	Santa Monica Canyon	Rustic Canyon Creek Sullivan Canyon Creek Mandeville Canyon Creek
Santa Monica	Santa Monica Bay	-
Dockweiler	Santa Monica Bay	-

When designated beneficial uses of a particular receiving water body are being compromised by exceeding water quality, Section 303(d) of the federal Clean Water Act (CWA) requires identifying and listing that water body as "impaired". Once a water body has been deemed impaired, a Total Maximum Daily Load (TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a "factor of safety" included). Once established, the TMDL allocates the loads among current and future pollutant sources to the water body.

There are currently four TMDLs in effect for the water bodies within the JG2/JG3 geographical scope, plus one that has not yet been approved by the United States Environmental protection Agency (USEPA) and is therefore not yet effective. These TMDLs are summarized in . identifies the applicable WQBELs and/or RWLs established pursuant to TMDLs included in the Permit and addressed by this EWMP.

Table ES-2
North Santa Monica Bay Coastal Watersheds (NSMBCW) TMDLs

TMDL Name	Agency	Effective Date
SMB Beaches (SMBB) Bacteria TMDL, Reconsideration of Certain Technical Matters of the SMBB Bacteria TMDL, Resolution R12-007[1]	Regional Board	Not yet effective
SMB TMDL for DDT and PCBs	USEPA	March 26, 2012
SMB Nearshore Debris TMDL, Resolution R10-010	Regional Board	March 20, 2012
SMB Beaches (SMBB) Bacteria TMDL, Dry Weather, Resolution 2002-004[2]	Regional Board	July 15, 2003
SMB Beaches (SMBB) Bacteria TMDL, Wet Weather, Resolution 2002-022[2]	Regional Board	July 15, 2003

1. This TMDL revision is not yet approved by USEPA.
2. This TMDL was revised pursuant to Resolution R12-2007.

Table ES-3
Final Permit RWLs and WQBELs for SMB TMDLs

Reference	Parameter	Effluent Limitation/ Receiving Water Limitation
SMB Nearshore Debris TMDL	Trash – WQBEL	Zero
	Plastic Pellets – WQBEL	Zero
TMDL for PCBs/DDT (for LA County MS4)	DDT – WQBEL	27.08 g/yr (based on 3-year averaging period)[2]
	PCBs – WQBEL	140.25 g/yr (based on 3-year averaging period)
SMBB Bacteria TMDL	Total coliform (daily maximum) – WQBEL	10,000 Most Probable Number (MPN)/100 mL
	Total coliform (daily maximum), if the ratio of fecal-to-total coliform exceeds 0.1 – WQBEL	1,000 MPN/100 mL
	Fecal coliform (daily maximum) – WQBEL	400 MPN/100 mL
	Enterococcus (daily maximum) – WQBEL	104 MPN/100 mL
	Total coliform (geometric mean[1]) – WQBEL/RWL	1,000 MPN/100 mL
	Fecal coliform (geometric mean[1]) – WQBEL/RWL	200 MPN/100 mL
	Enterococcus (geometric mean[1]) – WQBEL/RWL	35 MPN/100 mL

1. The rolling 30-day geometric mean is calculated based on the previous 30 days. The reopened 2012 TMDL, which has not yet been approved by USEPA, modified this to weekly calculation of a rolling six week geometric mean using five or more sample, starting all calculation weeks on Sunday.
2. Group load-based WQBELs that apply to all SMB MS4 dischargers; the individual load-based WQBELs for JG2/JG3 MS4 agencies would be an area-weighted fraction of this.

EWMP Development Process

Development of the EWMP for the SMB EWMP Group included four major components:

- Identification of water quality priorities to provide the basis for prioritizing implementation activities, as well as the selection and scheduling of BMPs in the Reasonable Assurance Analysis (RAA).
- Identification of watershed control measures (i.e., BMPs – best management practices) to reduce the impact of stormwater and non-stormwater on receiving water quality.
- Reasonable Assurance Analysis (RAA) to demonstrate that control measures, specifically BMPs, will be effective.
- Stakeholder involvement to provide the opportunity for meaningful stakeholder input throughout the development of the EWMP.

ES-2 WATER QUALITY PRIORITIES

Water quality priorities provide the basis for prioritizing project implementation; selecting and scheduling BMPs; and focusing monitoring activities developed in the CIMP. Details on the development of the water quality priorities are included in the CIMP (MWH Team B, 2014).

Based on the water quality characterization, the water body–pollutant combinations (WBPCs) were classified into one of three categories, in accordance with Section IV.C.5(a)ii of the Permit. **Table ES-4** summarizes the criteria for each category, as defined by the Permit. **Table ES-5** presents the WBPCs for the SMB EWMP. Natural subwatersheds in SMB were further modeled into compliance monitoring location (CML) subwatersheds. These modeled CML subwatersheds are herein referred to "subwatersheds" and were used in the RAA.

Table ES-4
Description of Water Body-Pollutant Prioritization Categories

Category	Description
1	Water body-pollutant combinations under Category 1 (highest priority) are defined in the Permit as "water body-pollutant combinations for which water quality-based effluent limitations and/or receiving water limitations are established in Part VI.E and Attachments L through R [of the Permit]."
2	Category 2 (high priority) water body-pollutant combinations are defined as "pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment."
3	Category 3 (Medium Priority) designations are to be applied to "water body-pollutant combinations that are not 303(d)-listed, but which exceed applicable receiving water limitations contained in the Permit and for which MS4 discharges may be causing or contributing to the exceedance."

Table ES-5
Water Body Pollutant Prioritization[1]

Category	Water Body	Pollutant	Compliance Deadline
1	SMB Beaches	Summer dry weather bacteria	7/15/2006 (Final: Single sample summer AEDs)
	SMB Beaches	Wet weather bacteria	7/15/2009 (Interim: 10% single sample ED reduction) 7/15/2013 (Interim: 25% single sample ED reduction) 7/15/2018 (Interim: 50% single sample ED reduction) 7/15/2021 (Final: Single sample AED) 7/15/2021 (Final: Geometric Mean [GM])
	SMB Beaches	Winter dry weather bacteria	11/1/2009 (Final: Single sample winter AEDs)[2]
	SMB Offshore/ Nearshore	Debris	3/20/2016 (20% load reduction) 3/20/2017 (40% load reduction) 3/20/2018 (60% load reduction) 3/20/2019 (80% load reduction) 3/20/2020 (100% load reduction)
	SMB	DDTs	Compliance schedule to be developed through EWMP[3]
	SMB	PCBs	Compliance schedule to be developed through EWMP[3]
2	Santa Monica Canyon Channel	Lead	NA
	Santa Monica Canyon Channel	Indicator bacteria	NA
3	None	None	None

1. Listed in order of compliance deadline, interim and final are included.
2. Compliance date per 2013 reopened TMDL, which is not yet effective (i.e., USEPA and Office of Administrative Law approval is pending).
3. Although the TMDL lacks a formal compliance schedule for the WQBEL, the TMDL Executive Summary does state, "The time frame for attainment of the TMDL targets for the rest of Santa Monica Bay (other than the Palos Verdes shelf) is 11 years for DDT and 22 years for PCBs."

ES-3 REASONABLE ASSURANCE ANALYSIS

An important component of the SMB EWMP is the RAA. The RAA is a process used to demonstrate that institutional and structural control measures are expected to be sufficient for achieving applicable WQBELs and/or RWLs having compliance deadlines within the Permit term. In addition to using the RAA as a means for determining the efficacy of existing and potential control measures, the RAA also facilitates the selection of BMPs as well as the prioritization of BMP implementation. While the methodology of the RAA evolved over the course of the EWMP development, the RAA approach described herein is consistent with the applied methodology and the "RAA Guidelines" as issued by the Regional Board (Regional Board, 2014)..

In order to demonstrate reasonable assurance, BMP opportunities were identified in a prioritized manner. Prioritization was based on cost (low cost BMPs were prioritized highest); BMP effectiveness for the pollutants of concern (BMPs that had greater treatment efficiency for the pollutants of concern in a particular analysis region were prioritized higher than other BMPs); and implementation.

The RAA was performed according to the following steps:

- Assume non-modeled non-structural BMP load reduction (2.5-7.5 percent of baseline pollutant load);
- Calculate public retrofit incentives (e.g., downspout disconnects) and redevelopment load reductions;
- Calculate load reductions attributable to anticipated new permit compliance activities of non-MS4 entities (e.g., Industrial General Permit holders and Caltrans);
- Calculate planned and proposed regional/centralized BMP load reductions based on existing plans and parcel screening analysis;
- Meet the total load reduction (TLR) by backfilling the remaining load reduction with specific regional/centralized BMP projects or distributed BMPs assumed treat a percentage of developed land uses.

ES-4 Watershed Control Measures

As part of the development of the EWMP, the Permit specifies that watershed control measures, also referred to as BMPs, shall be identified to: 1) ensure that stormwater discharges meet receiving water and effluent limits as established in the Permit, and 2) reduce overall impacts to receiving waters from stormwater and non-stormwater runoff.

BMPs are grouped into two broad categories, structural and institutional. Structural BMPs are physically-constructed control measures that alter the hydrology or water quality of stormwater or non-stormwater. Structural BMPs includes infiltration basins, bioswales, and bioretention/bioinfiltration. Institutional BMPs are source control measures that prevent the release of flow/pollutants or transport of pollutants, but do not involve construction of physical facilities. Minimum control measures (MCMs), such as street sweeping, are a subset of institutional BMPs.

The EWMP summarizes watershed control measures, including BMP types and existing BMPs, which reduce the current pollutant load to meet past and future compliance requirements. In addition, the EWMP summarizes BMPs to that will be implemented to meet Permit compliance requirements that includes institutional (non-structural), and structural BMPs consisting of low impact development (LID). distributed green streets and regional BMPs.

A summary of BMP capacity in acre-feet (AF) required for TMDL compliance by Permittee is shown in **Table ES-6** for regional projects and in **Table ES-7** for distributed projects.

Table ES-6
Summary of Regional Structural Capacity Required by Permittee for Compliance

Implementation Date for Compliance	Regional BMP Capacity Required for Compliance (AF)				
	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo	Total
2018	0.0	30.1	29.0	30.6	89.7
2021	0.2	105.4	21.3	0.0	126.8
Total	0.2	135.4	50.3	30.6	216.5

Table ES-7
Summary of Distributed BMP Capacity Required by Permittee for Compliance

Implementation Date for Compliance	Green Street BMP Capacity Required for Compliance (AF)				
	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo	Total
2018	0.5	35.1	20.2	0.0	55.8
2021	0.5	25.3	15.1	0.0	40.9
Total	1.0	60.3	35.4	0.0	96.7

The SMB EWMP includes multi-benefit regional projects that retain the stormwater volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects. The EWMP process emphasizes identifying Regional EWMP projects that are individually or collectively able to capture runoff from the 85th percentile, 24-hour storm.

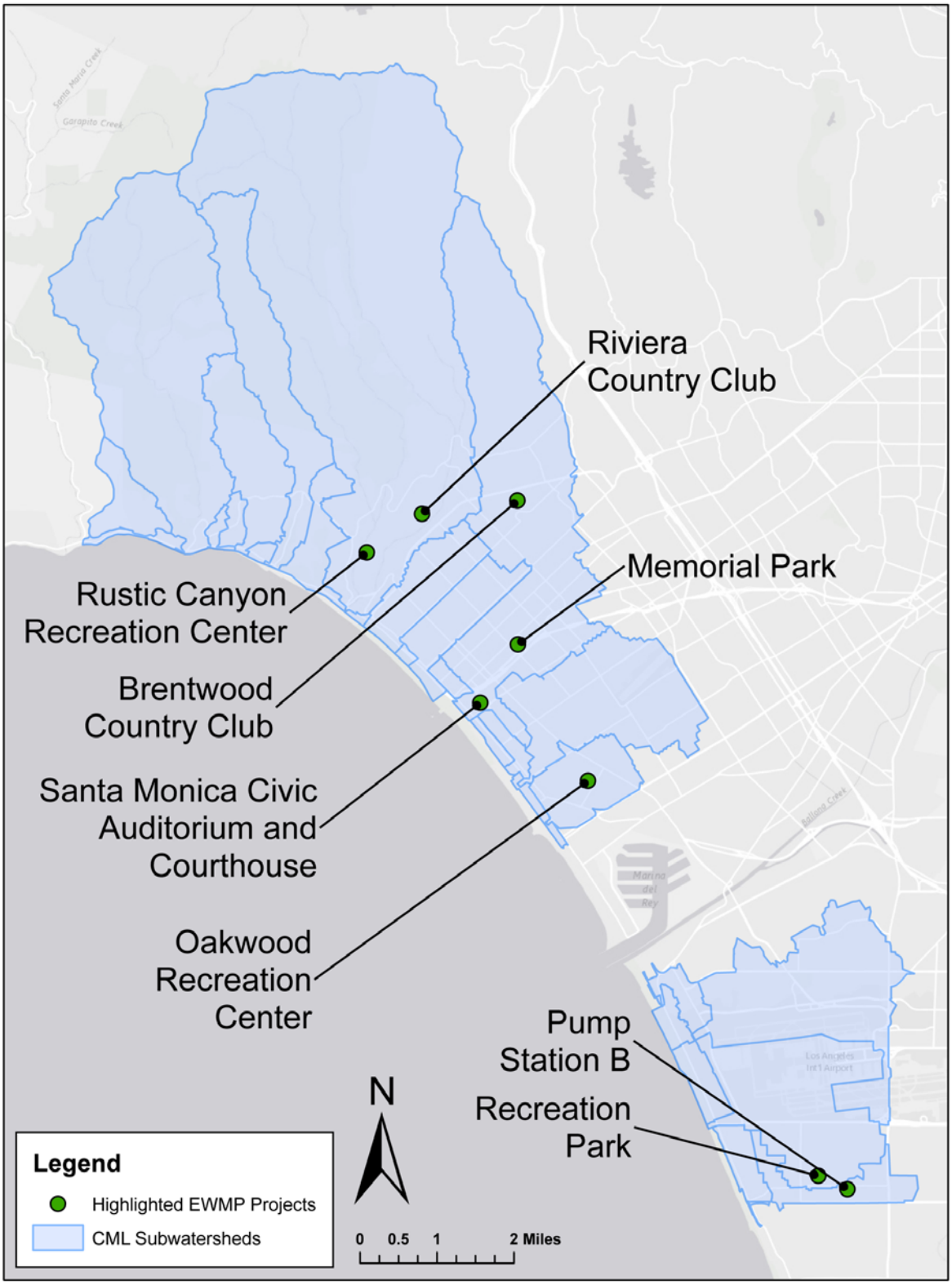
Through an extensive screening process and coordination with the SMB EWMP Group, eight proposed example regional EWMP project sites were selected for conceptual design. These eight regional projects will retain and infiltrate or beneficially reuse stormwater runoff for the drainage area tributary to the project.

The location and BMP type of the eight proposed regional EWMP projects are summarized in **Table ES-8** and shown on **Figure ES-2.** A conceptual level design was developed for each of the example regional EWMP projects that include the selection of BMP type, preliminary sizing, configuration, and diversion pipeline alignment.

Table ES-8
Summary of Regional EWMP Projects

Regional EWMP Project	BMP Type	Jurisdiction	Address / Location
Brentwood Country Club	Storage and Use	City of Los Angeles	590 S Burlingame Ave, Los Angeles, CA 90049
Oakwood Recreation Center	Storage and Use	City of Los Angeles	767 California Ave, Venice, CA 90291
Riviera Country Club	Storage and Use	City of Los Angeles	1250 Capri Dr., Pacific Palisades, CA 90272
Rustic Canyon Recreation Center	Subsurface Infiltration	City of Los Angeles	601 Latimer Rd., Santa Monica, CA 90402
Line B Pump Station	Surface Infiltration	City of El Segundo	201-223 Center St., El Segundo, CA 90245
Recreation Park	Subsurface Infiltration	City of El Segundo	401 Sheldon St., El Segundo, CA 90245
Memorial Park	Storage and Use	City of Santa Monica	1401 Olympic Blvd., Santa Monica, CA 90404
Santa Monica Civic Auditorium and Courthouse	Subsurface Infiltration	City of Santa Monica	1855 Main St, Santa Monica, CA 90401

Figure ES-2
Highlighted Regional EWMP Projects



ES-5 IMPLEMENTATION SCHEDULE

The EWMP implementation plan is the schedule for compliance for each jurisdiction to address water quality priorities and comply with the provisions of the MS4 Permit. Through the RAA, a series of quantitative analyses was used to identify the capacities of LID, green streets and regional BMPs that comprise the EWMP implementation plan and assure those control measures will address the water quality priorities per the milestones/compliance schedules. Implementation of the EWMP implementation plan will provide a BMP-based compliance pathway for each jurisdiction under the MS4 Permit.

Scheduling of control measure implementation is based on the milestones of the SMB TMDLs, as follows:

- Bacteria
    - Milestone 1: Achieve 50% of the reduction for wet weather bacteria (2018)
    - Milestone 2: Achieve 100% of the reduction for wet weather bacteria (2021)
- Debris
    - Milestone 1: Achieve 20% of the reduction for debris (2016)
    - Milestone 2: Achieve 40% of the reduction for debris (2017)
    - Milestone 3: Achieve 60% of the reduction for debris (2018)
    - Milestone 4: Achieve 80% of the reduction for debris (2019)
    - Milestone 5: Achieve 100% of the reduction for debris (2020)
- DDT and PCB
    - Compliance schedule is to be determined

Permittee actions can be categorized into three groups, implementation of projects, continued monitoring, and reporting of monitoring results and progress. Annual reporting will be completed each year as part of the CIMP. In addition to assessing the overall progress of the EWMP, the CIMP reporting will detail the implemented BMPs and demonstrate the cumulative BMP capacities achieve the interim targets. Data obtained through CIMP monitoring will be used to determine the overall effectiveness of the EWMP and will the next phases of WMP implementation during the adaptive management process.

ES-6 ADAPTIVE MANAGEMENT

The EWMP is intended to be implemented as an adaptive program. As new program elements are implemented and information is gathered over time, the EWMP will undergo modifications to reflect the most current understanding of the watershed and present a sound approach to addressing changing conditions. As such, the EWMP will employ an adaptive management process that will allow the EWMP to evolve over time.

The adaptations to the EWMP, as called for in the adaptive management process, essentially include: 1) re-characterization of water quality priorities, 2) a source assessment re-evaluation, 3) an effectiveness assessment of watershed control measures, and 4) an updated RAA. The CIMP will gather additional data on receiving water conditions and stormwater/non-stormwater quality to inform these analyses. These adaptations will be implemented and repeated every two years as part of the adaptive management process.

ES-7 IMEPLEMENTATION COSTS AND FINANCIAL STRATEGY

Based on the RAA, a set of optimal BMPs were derived, having reasonable assurance of meeting the interim and final limitation milestones set forth by the Regional Board. Total estimated BMP costs are shown in **Table ES-9**.

Table ES-9
Total Costs for Watershed ($ Millions)

Permittee	Capital	O&M
Los Angeles	$408.8	$54.2
Santa Monica	$213.2	$33.5
Uninc. LA County	$5.9	$0.53
El Segundo	$20.8	$6.42
Total	$648.7	$94.7

A financial strategy for addressing these additional costs of compliance with the 2012 MS4 permit as a result of the extensive set of BMPs or "recipe for compliance" for the SMB EWMP Group. Currently, a funding source for all of the activities described in this EWMP has not been determined, and obtaining funds for all of the activities identified in the EWMP is anticipated to take many years.

Even though the Regional Board only implemented Order No R4-2012-0175, NPDES No CAS00401 on November 2012; the co-permittees have been addressing stormwater discharge requirements for a long time prior to November 2012. Co-permittees have existing recurring costs associated with stormwater activities in excess of $50M annually.

Just as the engineering and strategic solutions for watershed management rely upon a coordinated regional approach, so too does the financial strategy. Capital and operating costs for watershed programs are large and span decades. As such, there is no single "right" way to finance these programs. Instead, the financial strategy presented in this EWMP outlines a set of multiple approaches, allowing each co-permittee to select those strategies that best fit their specific circumstances. Available financial strategies include:

- Grants
- Fees and charges
- Legislative and policy

Section 1
Introduction

The Santa Monica Bay (SMB) Jurisdictional Groups 2 and 3(JG2/JG3) Enhanced Watershed Management Program (EWMP) has been developed by the Santa Monica Bay Enhanced Watershed Management Group (SMB EWMP Group), which is comprised of City of Los Angeles, County of Los Angeles, City of Santa Monica and City of El Segundo. The EWMP is a requirement of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175 (Permit), which was adopted by the Los Angeles Regional Water Quality Control Board (Regional Board) and became effective on December 28, 2012.

The EWMP has been developed as a result of the EWMP Work Plan, which documented the water quality objectives, priorities, and the process for identifying regional projects. The EWMP contains strategies to address the water quality objectives, including the types and locations of distributed and regional best management practices (BMPs) that can be implemented to obtain the total load reduction in the SMB watershed.

Also as part of the Permit requirements, the SMB EWMP Group developed a Coordinated Integrated Monitoring Plan (CIMP) to monitor the effectiveness of the EWMP and resultant change in water quality. (MWH Team B, 2014). The CIMP is intended to serve as a guide for future adaptive management of the EWMP.

This document is organized as follows:

- **Section 1 Introduction** - provides an introduction to the EWMP and describes the applicability of the EWMP, the geographical extent of the watershed, the regulatory framework, and a discussion of the EWMP development process.
- **Section 2 Identification of Water Quality Priorities** –focuses on the identification of water quality priorities for the SMB watershed, including characterization and prioritization of water body pollutants.
- **Section 3 Reasonable Assurance Analysis** – describes the Reasonable Assurance Analysis (RAA), including the modeling system, RAA process overview, and modeling approach.
- **Section 4 Watershed Control Measures** – presents watershed control measures, with a review of institutional and structural BMPs, and concludes with a discussion of non-stormwater discharge control measures.
- **Section 5 EWMP Implementation Schedule** – presents the schedule for EWMP implementation for the watershed.
- **Section 6 Assessment and Adaptive Management Framework** – describes the framework for assessment and adaptive management, addressing topics such as re-characterization of water quality priorities, source assessment re-evaluation, effectiveness of watershed control measures, the adaptive management process, updating the RAA, and compliance reporting.
- **Section 7 EWMP Implementation Costs and Financial Strategy** – reviews the implementation costs and financial strategy associated with the EWMP.

- **Section 8 Legal Authority** -demonstrates that the Permittees have the necessary legal authority to implement the BMPs identified in the EWMP.

1.1. APPLICABILITY OF EWMP

The SMB watershed management area (WMA) EWMP Group area falls within the boundaries of JG2/ JG3, which are located within the central region of the SMB Watershed. Natural subwatersheds within the SMB EWMP Group Area include the urbanized Dockweiler and Santa Monica subwatersheds, as well as natural open space located in the Castle Rock, Pulga Canyon, Temescal Canyon, and Santa Monica Canyon subwatersheds. The JG2/JG3 area totals 34,362 acres within the SMB Watershed and illustrates the extent of the SMB EWMP Group Area.

1.2. GEOGRAPHICAL SCOPE AND CHARACTERISTICS

The SMB EWMP Group area includes land area that drains into and includes the SMB. However, the geographical scope of the SMB EWMP Group area excludes areas of land totaling 9,124 acres for which the MS4 permittees do not have jurisdiction, including land owned by the State of California, Caltrans, the United States Government, and an area of the Chevron Facility located in the City of El Segundo. Therefore, with the exclusion of these areas, the SMB EWMP Group area covers 25,238 acres.

Approximately 49 percent of the SMB EWMP Group area is open space, of which approximately 93 percent is located in the northern natural subwatersheds and approximately 7 percent is located in the Dockweiler natural subwatershed. The boundary of the SMB, as defined for the National Estuary Program, extends from the Los Angeles/Ventura County line to the northwest, southward to Point Fermin located on the Palos Verdes Peninsula to the southeast. The land area that drains into SMB follows the crest of the Santa Monica Mountains on the north to Griffith Park, then extends south and west across the Los Angeles coastal plain to include the area east of Ballona Creek and north of the Baldwin Hills. South of Ballona Creek the natural drainage is a narrow coastal strip between Playa del Rey and Palos Verdes (Regional Board, 2011). shows the SMB EWMP Group within the SMB Watershed.

According to geographical information system (GIS) data from the Los Angeles County Department of Public Works (LACDPW), approximately 67 percent of the SMB EWMP Group area is pervious, with the large majority of pervious area located in the northern-most natural subwatersheds of Castle Rock, Pulga Canyon, Temescal Canyon and Santa Monica Canyon. Approximately 95,000 acre-feet of precipitation falls on the watershed in an average year. Approximately one third of that volume becomes runoff. Natural subwatersheds and their contributing water bodies/tributaries are summarized in **.**

Figure 1-1
Santa Monica EWMP Group Area

Figure 1-2
Santa Monica Bay Natural Subwatersheds

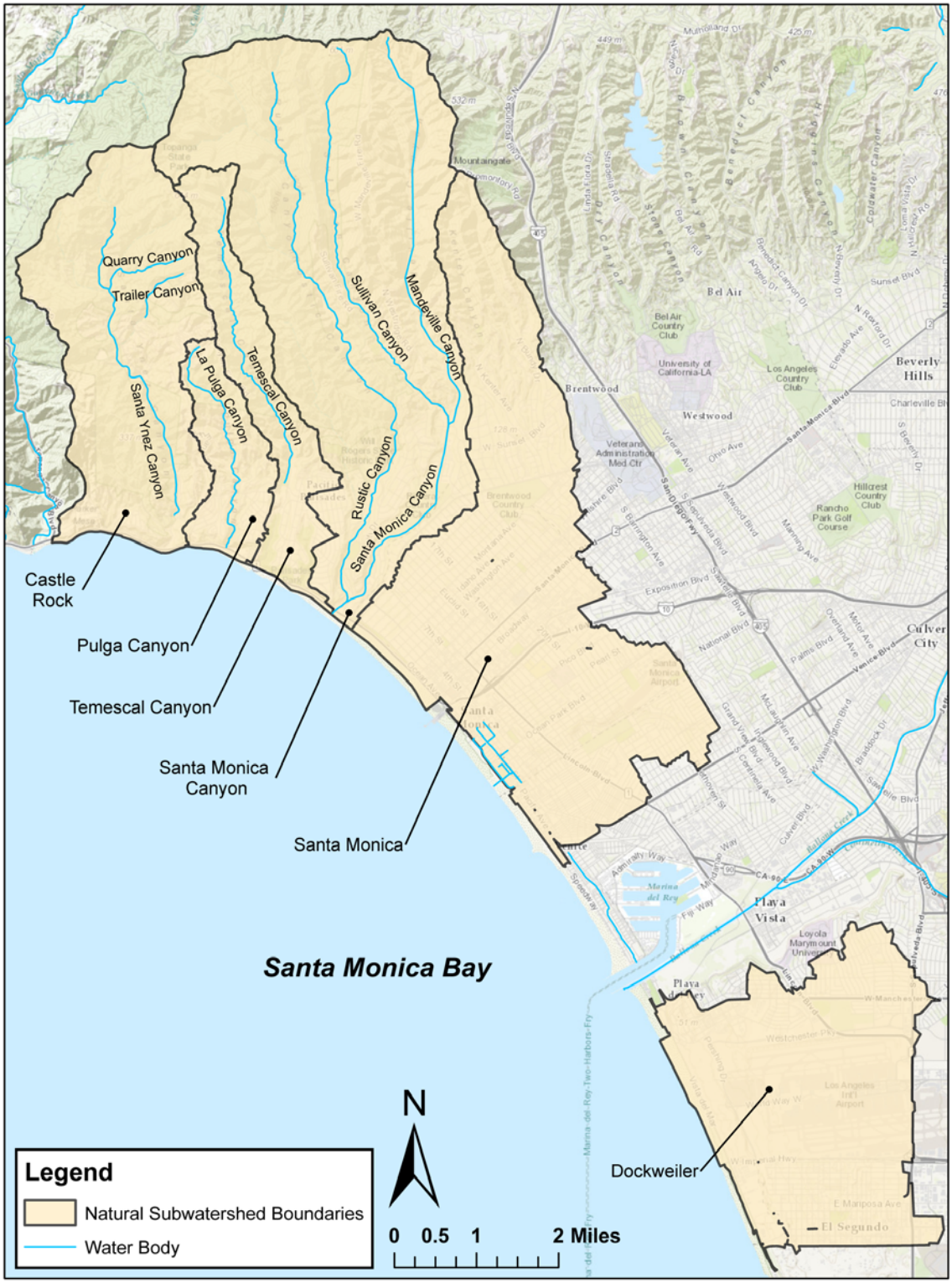


Table 1-1
Santa Monica Bay EWMP Area Natural Subwatersheds and Associated Water Bodies/Tributaries

Natural Subwatersheds	Water Body	Water Body/Tributary
Castle Rock	Santa Ynez Canyon	Quarry Canyon Trailer Canyon
Pulga Canyon	La Pulga Canyon	
Temescal Canyon	Temescal Canyon	
Santa Monica Canyon	Santa Monica Canyon	Rustic Canyon Creek Sullivan Canyon Creek Mandeville Canyon Creek
Santa Monica	Santa Monica Bay	
Dockweiler	Santa Monica Bay	

1.3. REGULATORY FRAMEWORK

The NPDES MS4 Permit No. R4-2012-0175 (Permit) was adopted November 8, 2012 by the Regional Board and became effective December 28, 2012. The purpose of the Permit is to ensure the MS4s in the County of Los Angeles are not causing or contributing to exceedances of water quality objectives set to protect the beneficial uses in the receiving waters in the Los Angeles region.

1.3.1. MS4 Permit Requirements

The Permit allows Permittees to customize their stormwater programs through the development and implementation of a Watershed Management Program (WMP) or an EWMP to achieve compliance with receiving water limitations (RWL) and water quality-based effluent limits (WQBEL). The SMB EWMP Group, submitted a notice of intent (NOI) to develop an EWMP in June of 2013 to fulfill the requirements of the Permit. This EWMP is consistent with Part VI.C.5-C.8 of the Permit, and:

1. Prioritizes water quality issues resulting from stormwater and non-stormwater discharges from the MS4 to receiving waters within the SMB EWMP Group area;

(i) Identifies strategies to implement control measures and BMPs to achieve the outcomes specified in Part VI.C.1.d of the Permit;

(ii) Provides a process to modify strategies, control measures, and BMPs as necessary based on analysis of monitoring data in order to ensure that applicable WQBELs, RWLs, and other milestones (as set forth in the EWMP Work Plan) are achieved in the required timeframes; and

2. Provides appropriate opportunity for meaningful stakeholder input, including but not limited to, a permit-wide technical advisory committee.

1.3.2 Relevant Total Maximum Daily Loads

When designated beneficial uses of a particular receiving water body are being compromised by water quality, Section 303(d) of the federal Clean Water Act (CWA) requires identifying and listing that water body as “impaired”. Once a water body has been deemed impaired, a Total Maximum Daily Load

(TMDL) must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a "factor of safety" included). Once established, the TMDL allocates the loads among current and future pollutant sources to the water body.

The CWA requires that the State Water Resources Control Board and Regional Boards conduct a water quality assessment that addresses the condition of its surface waters (required in Section 305(b) of the CWA) and provides a list of impaired waters (required in CWA Section 303(d)) which is then submitted to the United States Environmental Protection Agency (USEPA) for review and approval. The report integrates the requirements of these two CWA sections and is referred to as the Integrated Report. The 2010 Integrated Report and updated 303(d) list were approved by the State Water Resources Control Board on August 4, 2010 and by the USEPA on October 11, 2011.

The 303(d)-listed water bodies and associated pollutants within the SMB Watershed are summarized in .

Table 1-2
303(d) – Listed Water Bodies in the SMB Watershed

Water Body	Pollutant Class	Pollutant	Notes
Santa Monica Bay Beaches	Pathogens	Coliform Bacteria	Addressed by Bacteria TMDL
	Pesticides	DDT	Addressed by PCB/DDT TMDL
	Other Organics	PCBs	Addressed by PCB/DDT TMDL
Santa Monica Bay Offshore/Nearshore	Trash	Debris	Addressed by Trash TMDL
	Pesticides	DDT (tissue & sediment)	Addressed by PCB/DDT TMDL
	Other Organics	PCBs (tissue & sediment)	Addressed by PCB/DDT TMDL
	Toxicity	Sediment Toxicity	Addressed by PCB/DDT TMDL
	Miscellaneous	Fish Consumption Advisory	Addressed by PCB/DDT TMDL
Santa Monica Canyon Channel	Metals/Metalloids	Lead	TMDL does not currently exist
	Pathogens	Indicator Bacteria	Addressed by Bacteria TMDL

Notes:
DDT – dichlorodiphenyltrichloroethane
PCBs - polychlorinated biphenyls

The water bodies listed in are subject to water quality objectives in the Water Quality Control Plan, Los Angeles Region (Basin Plan) (Regional Board, 1995, Updated 2011) and its Amendments, such as those to implement TMDLs. There are currently four TMDLs in effect for the water bodies within the JG2/JG3 geographical scope as listed in Attachment M of the MS4 Permit, plus one that has not yet been approved by the USEPA and is therefore not yet effective. These TMDLs are summarized in .

Table 1-3
North Santa Monica Bay Coastal Watersheds (NSMBCW) TMDLs

TMDL Name	Agency	Effective Date
SMB Beaches (SMBB) Bacteria TMDL, Reconsideration of Certain Technical Matters of the SMBB Bacteria TMDL, Resolution R12-007[1]	Regional Board	Not yet effective
SMB TMDL for DDT and PCBs	USEPA	March 26, 2012
SMB Nearshore Debris TMDL, Resolution R10-010	Regional Board	March 20, 2012
SMB Beaches (SMBB) Bacteria TMDL, Dry Weather, Resolution 2002-004[2]	Regional Board	July 15, 2003
SMB Beaches (SMBB) Bacteria TMDL, Wet Weather, Resolution 2002-022[2]	Regional Board	July 15, 2003

[1] TMDL revision pending approved by USEPA.
[2] TMDL was revised pursuant to Resolution R12-2007.

identifies the applicable WQBELs and/or RWLs established pursuant to TMDLs included in Attachment M of the Permit. The water quality objectives as listed in the Basin Plan are also applicable to water bodies based on the designated beneficial uses. The Trash TMDL final WQBELs are effective March 20, 2020. The effective date of the PCB and DDT final WQBELs will be determined in the EWMP since this is a USEPA-developed TMDL and lacks a compliance schedule. The Bacteria TMDL final WQBELs and RWLs are currently effective for dry weather and become effective July 15, 2021 for wet weather.

Grouped RWLs for the SMBB Bacteria TMDL are also expressed in the Permit in terms of allowable exceedance days (AEDs), which vary by season and by Coordinated Shoreline Monitoring Plan (CSMP) monitoring station. These final grouped RWLs are currently effective for dry weather and will be effective July 15, 2021 for wet weather.

Table 1-4
Final Permit RWLs and WQBELs for SMB TMDLs

Reference	Parameter	Effluent Limitation/ Receiving Water Limitation
SMB Nearshore Debris TMDL	Trash – WQBEL	Zero
	Plastic Pellets – WQBEL	Zero
TMDL for PCBs/DDT (for LA County MS4)	DDT – WQBEL	27.08 g/yr (based on 3-year averaging period)[2]
	PCBs – WQBEL	140.25 g/yr (based on 3-year averaging period)
SMBB Bacteria TMDL	Total coliform (daily maximum) – WQBEL	10,000 Most Probable Number (MPN)/100 mL
	Total coliform (daily maximum), if the ratio of fecal-to-total coliform exceeds 0.1 – WQBEL	1,000 MPN/100 mL
	Fecal coliform (daily maximum) – WQBEL	400 MPN/100 mL
	Enterococcus (daily maximum) – WQBEL	104 MPN/100 mL
	Total coliform (geometric mean[1]) – WQBEL/RWL	1,000 MPN/100 mL

	Fecal coliform (geometric mean[1]) – WQBEL/RWL	200 MPN/100 mL
	Enterococcus (geometric mean[1]) – WQBEL/RWL	35 MPN/100 mL

[1]The rolling 30-day geometric mean is calculated based on the previous 30 days. The reopened 2012 TMDL, which has not yet been approved by USEPA, modified this to weekly calculation of a rolling six week geometric mean using five or more sample, starting all calculation weeks on Sunday.
[2]Group load-based WQBELs that apply to all SMB MS4 dischargers; the individual load-based WQBELs for JG2/JG3 MS4 agencies would be an area-weighted fraction of this.

1.4. ENHANCED WATERSHED MANAGEMENT PROGRAM DEVELOPMENT PROCESS

Development of the EWMP for the SMB EWMP Group included four major components:

1. **Water Quality Priorities**: The identification of water quality priorities was an important first step in the EWMP process. Water quality priorities were defined for individual constituents within a specific water body, termed as water body-pollutant combinations (WBPCs). Categories of the WBPCs are defined in the Permit. Priorities were assigned to the WBPCs based on the categorization. The water quality priorities provide the basis for prioritizing implementation activities, as well as the selection and scheduling of BMPs in the Reasonable Assurance Analysis (RAA).
2. **Watershed Control Measu**res: Development of the EWMP required identification of control measures/BMPs, as described in Section 4, expected to be sufficient to meet receiving water and effluent limitations set forth in the MS4 Permit (Regional Board, 2012). BMPs vary in function and type, with each BMP providing unique design characteristics and benefits from implementation. The overarching goal of BMPs in the EWMP is to reduce the impact of stormwater and non-stormwater on receiving water quality.
3. **Reasonable Assurance Analysis**: A key element of each EWMP is the RAA, which was used to demonstrate "…that the activities and control measures…will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term" (Section C.5.b.iv.(5), page 63). While the Permit prescribes the RAA as a quantitative demonstration that control measures, will be effective, the RAA also promotes a modeling process to identify and prioritize potential control measures to be implemented. The RAA considered the applicable compliance dates and milestones for attainment of the WQBELs and RWLs, and supports BMP scheduling.
4. **Stakeholder Investment**: The EWMP Group has been strongly committed to providing the opportunity for meaningful stakeholder input throughout the development of the EWMP. The EWMP Group participated in monthly Watershed Management Group meetings, designed to facilitate collaboration with all Permittees. Public meetings were held on April 10, 2014, November 20, 2014, and March 19, 2015, to receive feedback from stakeholders on the progress and plans. Stakeholder collaboration will continue throughout implementation of the EWMP.

Section 2
Identification of Water Quality Priorities

In accordance with the Permit Section IV.C.5(a), water quality priorities have been established for the EWMP. The water quality priorities provide the basis for prioritizing project implementation; selecting and scheduling BMPs; and focusing monitoring activities developed in the CIMP. Details on the development of the water quality priorities are included in the CIMP.

2.1. WATER QUALITY CHARACTERIZATION

identifies the receiving waters in the SMB EWMP Group area, as depicted in the Basin Plan (Regional Board, 1995, Updated 2011). Ultimately, all receiving water bodies are tributary to the Santa Monica Bay. summarizes the beneficial uses for each water body in the SMB EWMP Group area, as designated in the Basin Plan.

Figure 2-1
Receiving Waters in the SMB EWMP Group Area

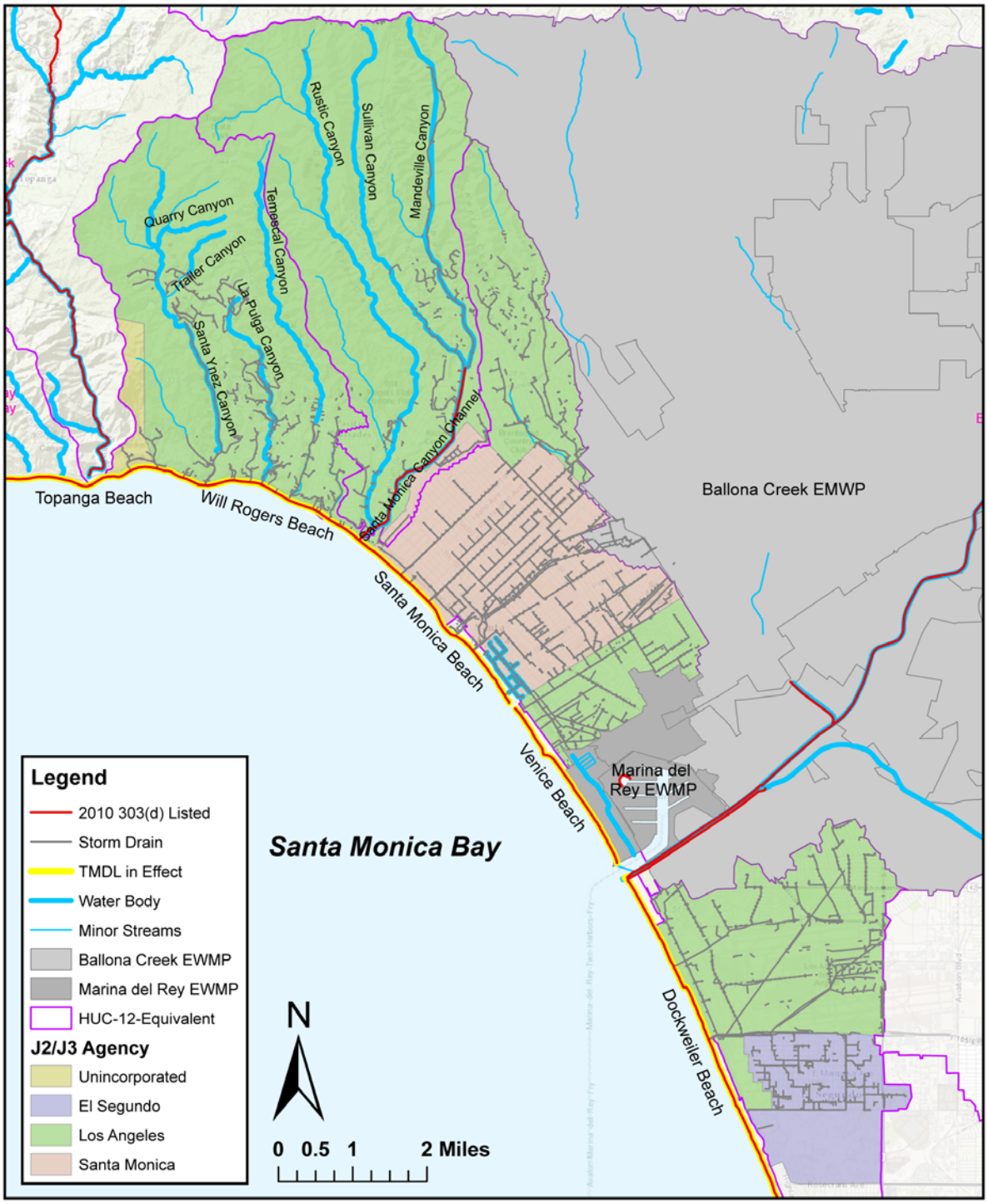


Table 2-1
Beneficial Uses of Water Bodies and Coastal Features Designed in the Basin Plan

Water Body (and Tributaries)	Beneficial Uses													
	MUN[1]	WARM	WILD	RARE	REC-1	REC-2	IND	NAV	COMM	MAR	BIOL	MIGR	SPWN	SHELL
Santa Monica Bay - Nearshore Zone^			E	Ee			E	E	E	E	Ean	Ef	Ef	Ear
La Pulga Canyon [a]			E	Ee			E	E	E	E	Ean	Ef	Ef	Ear
Temescal Canyon [a]			E	Ee			E	E	E	E	Ean	Ef	Ef	Ear
Santa Monica Canyon Channel	P*	P	P		Ps	I								
Rustic Canyon Creek	P*	I	E		I	I								
Sullivan Canyon Creek	P*	I	E		I	I								
Mandeville Canyon Creek	P*	I	E		I	I								
Santa Ynez Canyon	P*	I	E	E	Pk	E								
Quarry Canyon [a]	P*	I	E	E	Pk	E								
Trailer Canyon [a]	P*	I	E	E	Pk	E								
Will Rogers Beach			E		E	E		E	E	E			P	E
Santa Monica Beach			E		E	E		E	E	E		E	Eas	E
Venice Beach			E	E	E	E		E	E	E		E	Eas	E
Dockweiler Beach			E		E	E	E	E	E	E			P	

Notes:
Beneficial Use Designations: **MUN** = Municipal and Domestic Supply; **WARM** = Warm Freshwater Habitat; **WILD** = Wildlife Habitat; **RARE** = Preservation of Rare and Endangered Species; **REC-1** = Water Contact Recreation; **REC-2** = Noncontact Water Recreation; **IND** = Industrial Service Supply; **NAV** = Navigation; **COMM** = Commercial and Sport Fishing; **MAR** = Marine Habitat; **BIOL** = Preservation of Biological Habitats of Special Significance; **MIGR** = Fish Migration; **SPWN** = Fish Spawning; **SHELL** = Shellfish Harvesting

[1] Asterisked MUN designations are designated under State Water Resources Control Board Resolution No. 88-63 (SB 88-63) and Regional Board Resolution No. 89-03 (RB 89-03). Some designations may be considered for exemption at a later date.

P = Potential beneficial use
I = Intermittent beneficial use
E = Existing beneficial use
a = Beneficial use designations apply to all tributaries to the indicated water body, if not listed separately.
e = One or more rare species utilize all bays, estuaries, lagoons and coastal wetlands for foraging and/or nesting
f = Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.
k = Public access to reservoir and its surrounding watershed is prohibited by Los Angeles County DPW
s = Access prohibited by LACDPW)
an = Areas of Special Biological Significance (along coast from Latigo Point to Laguna Point) and Big Sycamore Canyon and Abalone Cove Ecological Reserves and Point Fermin Marine Life Refuge.
ar = Areas exhibiting large shellfish populations include Malibu, Point Dume, Point Fermin, White Point and Zuma Beach.
as = Most frequently used grunion spawning beaches. Other beaches may be used as well.
^ = Nearshore is defined as the zone bounded by the shoreline or the 30-foot depth contours, whichever is further from the shoreline. Longshore extent is from Rincon Creek to the San Gabriel River Estuary.

2.2. WATER BODY-POLLUTANT PRIORITIZATION

Based on the water quality characterization, the WBPCs were classified into one of three categories, in accordance with Section IV.C.5(a)ii of the Permit. **Table 2-2** summarizes the criteria for each category, as defined by the Permit. **Table 2-3** presents the WBPCs for the SMB EWMP.

Table 2-2
Description of Water Body-Pollutant Prioritization Categories

Category	WBPC Description
1	Category 1 (highest priority) are defined in the Permit as *"water body-pollutant combinations for which water quality-based effluent limitations and/or receiving water limitations are established in Part VI.E and Attachments L through R [of the Permit]."*
2	Category 2 (high priority) are defined as *"pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment."*
3	Category 3 (Medium Priority) designations are to be applied to "*constituents that are not 303(d)-listed, but which exceed applicable receiving water limitations contained in the Permit and for which MS4 discharges may be causing or contributing to the exceedance."*

Table 2-3
Water Body Pollutant Prioritization[1]

Category	Water Body	Pollutant	Compliance Deadline
1	SMB Beaches	Summer dry weather bacteria	7/15/2006 (Final: Single sample summer AEDs)
	SMB Beaches	Wet weather bacteria	7/15/2009 (Interim: 10% single sample ED reduction) 7/15/2013 (Interim: 25% single sample ED reduction) 7/15/2018 (Interim: 50% single sample ED reduction) 7/15/2021 (Final: Single sample AED) 7/15/2021 (Final: Geometric Mean [GM])
	SMB Beaches	Winter dry weather bacteria	11/1/2009 (Final: Single sample winter AEDs)[2]
	SMB Offshore/ Nearshore	Debris	3/20/2016 (20% load reduction) 3/20/2017 (40% load reduction) 3/20/2018 (60% load reduction) 3/20/2019 (80% load reduction) 3/20/2020 (100% load reduction)
	SMB	DDTs	Compliance schedule to be developed through EWMP[3]
	SMB	PCBs	Compliance schedule to be developed through EWMP[3]
2	Santa Monica Canyon Channel	Lead	NA
	Santa Monica Canyon Channel	Indicator bacteria	NA
3	None	None	None

[1] Listed in order of compliance deadline, interim and final are included
[2] Compliance date per 2013 reopened TMDL, which is not yet effective (i.e., USEPA and Office of Administrative Law approval is pending).
[3]Although the TMDL lacks a formal compliance schedule for the WQBEL, the TMDL Executive Summary does state, "The time frame for attainment of the TMDL targets for the rest of Santa Monica Bay (other than the Palos Verdes shelf) is 11 years for DDT and 22 years for PCBs."

As part of the adaptive management process, categorization of WBPCs may be adjusted based on data obtained from monitoring, source evaluations, and BMP implementation. Data collected as part of the approved CIMP may result in future Category 3 designations in instances when RWLs are exceeded and MS4 discharges are identified as contributing to such exceedances. Under these conditions, the appropriate agencies will adhere to Section VI.C.2.a.iii of the Permit.

2.3. SOURCE ASSESSMENT

The following data sources were reviewed as part of the source assessment for bacteria, lead, and DDT/PCBs in the SMB subwatersheds:

- Findings from the Permittees' Illicit Connections and Illicit Discharge (IC/ID) Elimination Programs;
- Findings from the Permittees' Industrial/Commercial Facilities Programs;
- Findings from the Permittees' Development Construction Programs;
- Findings from the Permittees' Public Agency Activities Programs;
- TMDL source investigations;
- Watershed model results;
- Findings from the Permittees' monitoring programs, including but not limited to TMDL compliance monitoring and receiving water monitoring; and
- Any other pertinent data, information, or studies related to pollutant sources and conditions that that contribute to the highest water quality priorities.

Because sources of pollutants for the various water bodies within the SMB watershed are essentially identical, the following source assessment is broken down by pollutant.

2.3.1. Indicator Bacteria

Wet weather runoff event mean concentrations (EMCs) for fecal coliform, based on the Southern California Coastal Water Research Project (SCCWRP) land use data for the Los Angeles region (Stein *et al*, 2007), indicate that the highest concentrations are expected from agricultural land uses, followed by commercial and educational, single family residential, multi-family residential, open space, industrial, and transportation. The SCCWRP study also found that in some cases, the levels of fecal indicator bacteria at the recreational (horse) and agricultural land use sites were as high as those found in primary wastewater effluent in the United States. Tiefenthaler *et al* (2011) also found that horse stable sites contributed to significantly higher wet weather EMCs than other land use types.

The SMBB Bacteria TMDL for both dry and wet weather was the first bacteria TMDL adopted by the Regional Board in the State of California. The SMBB Bacteria TMDL was recently opened for reconsideration, although the source assessment was not part of this update. As a result, the general findings from the original source assessment remain unchanged. These findings are summarized in the 2012 Basin Plan Amendment for the reopened SMBB Bacteria TMDL (Attachment A to Resolution No. R12-007):

> *"With the exception of isolated sewage spills, dry weather urban runoff and stormwater runoff conveyed by storm drains and creeks is the primary source of elevated bacterial indicator densities to SMB beaches. Limited natural runoff and groundwater may also potentially contribute to elevated bacterial indicator densities during winter dry weather" (Regional Board, 2012).*

The SMBB Bacteria TMDL source assessment maintains that dry weather urban runoff and stormwater runoff is the primary source of elevated bacteria concentrations at SMB beaches. Although definitive information regarding the specific sources of bacteria within the watershed is not presented, speculation provided in the dry weather staff report provides some insight into possible sources:

> *"Urban runoff from the storm drain system may have elevated levels of bacterial indicators due to sanitary sewer leaks and spills, illicit connections of sanitary lines to the storm drain system, runoff from homeless encampments, illegal discharges from recreational vehicle holding tanks, and malfunctioning septic tanks among other things. Swimmers can also be a direct source of bacteria to recreational waters. The bacteria indicators used to assess water quality are not specific to human sewage; therefore, fecal matter from animals and birds can also be a source of elevated levels of bacteria, and vegetation and food waste can be a source of elevated levels of total coliform bacteria, specifically"* (Regional Board, 2002).

The 2010-2011 and 2011-2012 Los Angeles County Municipal Stormwater Permit Individual Reports[1] for the JG2/JG3 agencies report that both sanitary sewer overflows and Illicit Connections and Illicit Discharges (IC/ID), while eliminated shortly after being reported, do sometimes occur in those jurisdictions. The 2011-2012 Annual Report for the City of Santa Monica also indicates that overspray from irrigation systems and hosing down of hardscapes contribute dry weather runoff, although this flow is diverted at or near the outfalls, where low diversions are in operation.

The 2011-2012 Santa Monica Bay MS4 Annual Report (City of Los Angeles Environmental Monitoring Division, 2012) states that high bacteria levels measured at the Santa Monica Canyon SMB 2-7 monitoring site have been attributed, at least partially, to stagnant ponded water which attracts birds and other wildlife. It should be noted that the City and LACFCD have worked together to coordinate frequent draining of the pond before it could become a major source of pollution.

Additionally, information on non-MS4 sources of surf zone bacteria were provided by the City of Malibu, based on a comprehensive review of Southern California published literature, as part of comments on the reopened Bacteria TMDL (City of Malibu, 2012):

> *"A number of recent Santa Monica Bay studies have further identified and confirmed natural (non-anthropogenic) sources of fecal indicator bacteria (FIB) including plants, algae, decaying organic matter, beach wrack and bird feces – implicating these as potentially significant contributors to exceedances (Imamura et al 2011, Izbicki 2012b). Beach sands, sediments and beach wrack have been shown to be capable of serving as reservoirs of FIB, possibly by providing shelter from ultra violet (UV) inactivation and predation by allowing for regrowth (Imamura et al 2011, Izbicki et al 2012b, Lee et al 2006, Ferguson et al 2005, Grant et al 2001, Griffith 2012, Litton et al 2010, Phillips et al 2011, Jiang et al 2004, Sabino et al 2011, and Weston Solutions 2010). In fact, enterococci include non-fecal or "natural" strains that live and grow in water, soil, plants and insects (Griffith, 2012). Thus, elevated levels of enterococci in water could be related to input from natural sources. The phenomenon of regrowth of FIB from either anthropogenic or natural sources has been suggested by several studies as a possible source of beach bacteria exceedances (Griffith 2012, Litton et al 2010, Weston Solutions 2010, Izbicki et al 2012b, Weisberg et al 2009)."*

Other sources of bacteria during wet weather are anticipated to include other non-MS4 permitted stormwater discharges such as Industrial General Permit sites, Construction General Permit sites, Phase II

[1] The available Annual Reports were reviewed for 2010-2011 and 2011-2012.

MS4 Sites (e.g., college campuses), State/Federal owned lands, non-MS4 open space areas such as wildlife habitat, and Caltrans.

2.3.2. DDT and PCBs

As stated previously, limited data are available characterizing DDT and PCBs within SMB, particularly since direct discharges of these pollutants from publically owned treatment works (POTWs) have ceased. The largest concentration of DDT and PCBs within SMB is contained within the Palos Verdes shelf, which is being addressed by the USEPA as a Comprehensive Environmental Response Compensation and Liability (CERCLA) site. Loadings from the shelf to the bay are large and have been well characterized (USEPA, 2012).

With respect to stormwater, the TMDL does not specifically characterize MS4 loadings, though it does recognize that *"DDT and PCBs are no longer detected in routine stormwater sampling from Ballona Creek or Malibu Creek."* However, the TMDL also states that current detection limits used to analyze DDT and PCB concentrations are too high to appropriately assess the water quality. Stormwater inputs are assumed to come from urban areas, as the TMDL specifically states that rural areas in NSMBCW are not likely to be a major source of PCBs or DDT (USEPA, 2012).

No other data or source information is available at this time. Once three years of water quality data are collected under the CIMP and evaluated consistent with the recommendations by USEPA in the TMDL to utilize a three-year averaging period[2], then further source assessment will be considered and the categorization and prioritization of PCB and DDTs as MS4-related pollutants of concern will be reevaluated. Therefore DDT and PCBs are not included in the WBPC evaluation for RAA compliance at this time.

2.3.3. Lead

The data used to establish the lead 303(d) listing for Santa Monica Canyon Channel are not available on the SWRCB 303(d) website, as the listing decision was made prior to 2006. There is no other data available for total lead in this water body at this time. While the available Annual Reports do not indicate a clear source of lead in this subwatershed, the Final Staff Report for the TMDL for Metals in Ballona Creek[3] states that urban runoff, or the wash-off of pollutant loads accumulated on the land surface, is likely a substantial source of metals during both wet and dry weather (Regional Board, 2005). Indirect atmospheric deposition was estimated to account for 19% of the typical annual load for lead in the Ballona Creek Watershed (Regional Board, 2005). Wet weather EMCs for lead, based on the Los Angeles County EMC dataset, show that the highest concentrations are expected from agricultural land uses, followed in order by industrial, commercial, high density single family residential, and transportation, multi-family residential, educational, and open space land uses (Geosyntec Consultants, 2012). Other Los Angeles region land use studies have found that high density single family residential has the highest EMCs, followed by industrial and commercial land uses (Stein *et al* 2007). These potential sources will be evaluated for BMP implementation as part of the RAA.

[2] The three-year averaging period is recommended in the USEPA TMDL in Section 8.2, which reads, "We recommend that stormwater waste load allocations be evaluated based on a three year averaging period" (USEPA, 2012). Additionally, Permit Attachment M states that compliance with the PCB and DDT waste load allocations shall be determined based on a three-year averaging period.

[3] Although the Ballona Creek Metals TMDL is not applicable to the Santa Monica Bay Watershed, the staff report describes sources which could be applicable to all urban watersheds.

Section 3
Reasonable Assurance Analysis

An important component of the SMB EWMP is the RAA. The RAA is a process used to demonstrate that institutional and structural control measures are expected to be sufficient for achieving applicable WQBELs and/or RWLs having compliance deadlines within the Permit term. In addition to using the RAA as a means for determining the efficacy of existing and potential control measures, the RAA also facilitates the selection of BMPs as well as the prioritization of BMP implementation. While the methodology of the RAA evolved over the course of the EWMP development, the RAA approach described herein is consistent with the applied methodology and "RAA Guidelines" as issued by the Regional Board.

3.1. MODELING SYSTEM

The RAA approach leverages the strengths of the publicly-available, Permit-approved, GIS-based model already developed for the region: the Structural BMP Prioritization and Analysis Tool (SBPAT). The rationale for utilization of this model for the RAA is described herein.

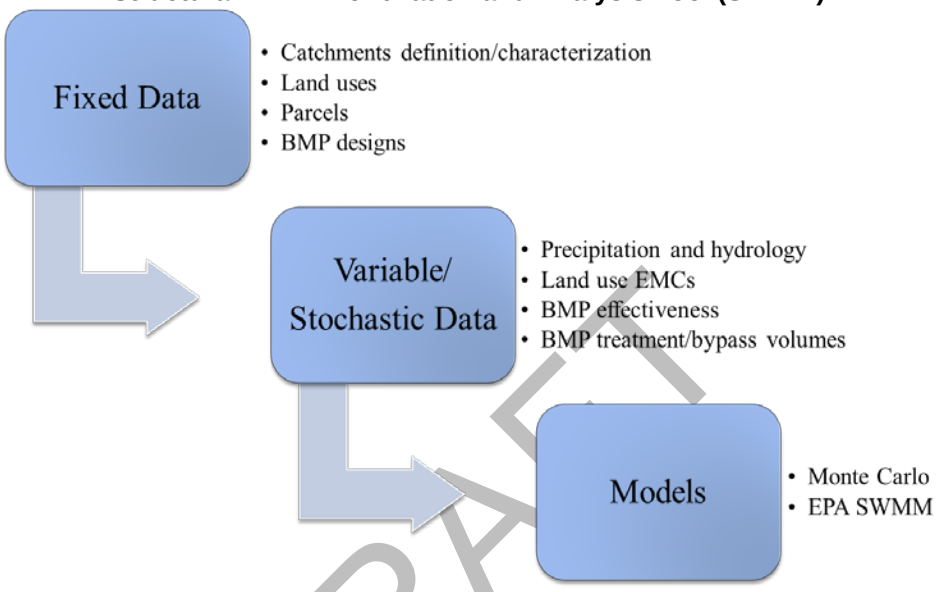
SBPAT is a public domain, "open source," GIS-based water quality analysis tool intended to: 1) facilitate the prioritization and selection of BMP project opportunities and technologies in urbanized watersheds; and 2) quantify benefits, costs, variability, and potential compliance risk associated with stormwater quality projects. The decision to use SBPAT for the SMB EWMP RAA (in the manner described herein) is based on the model capabilities and the unique characteristics of the SMB, specifically:

- **Modeling of SMB hydrologic and watershed processes** – SBPAT utilizes the USEPA's Stormwater Management Model (SWMM) as the hydrologic engine, and SBPAT has been calibrated using local rainfall and SMB stream flow gauges. Calibration results confirm the model's ability to predict stormwater runoff volumes on an annual basis.
- **SMB pollutants of concern and their compliance metric expression** – SBPAT has been utilized for planning applications related to Bacteria TMDL compliance (and specifically exceedance-day predictions, based on SMB criteria), including a demonstrated linkage of load reduction to exceedance days;
- **Availability of new open space water quality loading data** – Recently-developed EMC data are consistent with SBPAT and were also updated to reflect new data developed in SMB as part of this RAA development effort;
- **Capability to conduct opportunity and constraints investigations** – SBPAT is capable of supporting structural BMP placement, prioritization, and cost-benefit quantification, and has been applied for such purposes previously in the SMB EWMP Group area and other nearby SMB subwatersheds;

- **Characterization of water quality variability** – SBPAT is capable of quantifying model output variability and confidence levels, which is a component of the Regional Board's RAA Guidance; and
- **Supports quantification of both structural and non-structural BMPs, and demonstrates compliance at both interim and final compliance dates** – SBPAT's modeling framework is compatible with methods for addressing non-structural BMPs and provides quantitative results for multiple BMP phasing milestones.

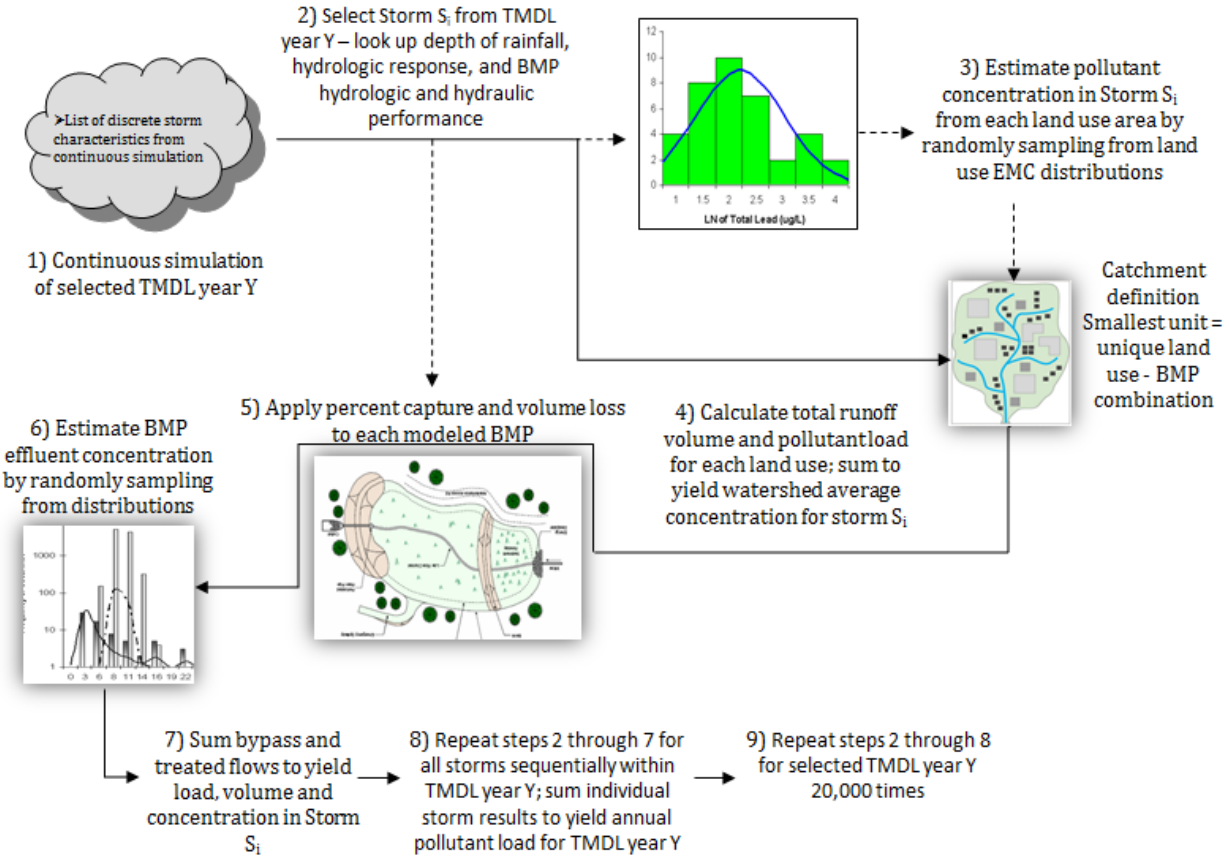
Data used for the quantification/analysis module include both fixed and stochastic parameters. The model utilizes land use based EMCs, USEPA SWMM, USEPA/American Society of Civil Engineers/Water Environment Research Foundation (USEPA/ASCE/WERF) International BMP Database (IBD) water quality concentrations, watershed/GIS data, and a Monte Carlo approach (relying on repeated random sampling) to quantify water quality benefits and uncertainties. The flow of model data is illustrated in the process flow diagram provided in **Figure 3-1**.

Figure 3-1
Structural BMP Prioritization and Analysis Tool (SBPAT)



SBPAT integrates Monte Carlo methods for random sampling analysis. Model simulations are run 20,000 times to calculate a distribution of outcomes that can support the definition of confidence levels and quantify variability. Consistent with the SBPAT usage, Monte Carlo methods are typically used in physical and mathematical problems and are most suited for applications when it is difficult to obtain a closed-form expression or when a deterministic algorithm is not desired. A schematic of SBPAT's Monte Carlo process is shown on **Figure 3-2.** Model documentation, as well as links to related technical articles and presentations, can be found on-line at www.sbpat.net.

Figure 3-2
Structural BMP Prioritization and Analysis Tool Monte Carlo Methodology



3.2. RAA PROCESS OVERVIEW

This section describes and overview of the RAA process. Model selection, data inputs, critical condition selection (90th percentile year), calibration performance criteria, and output types have all been selected for consistency with the Regional Board RAA Guidance Document (Regional Board, 2014).

3.2.1. Reasonable Assurance Analysis Approach - Dry Weather

Demonstrating reasonable assurance of compliance for the SMB Beaches Bacteria TMDL requires an accounting of many factors that cannot be modeled accurately based on urban runoff processes alone (Thoe et al, 2015). This is true despite the extensive summer-dry and winter-dry weather beach-specific monitoring datasets that are available. Therefore, to perform the SMB RAA for dry weather, a semi-quantitative methodology has been developed. This method was developed to follow a permit compliance structure in order to demonstrate how MS4 discharges could or could not be causing or contributing to receiving water exceedances at the beaches. Because fecal indicator bacteria (FIB) are considered the "controlling" pollutants of concern during dry weather in the SMB EWMP Group area (i.e., if MS4 discharges are compliant for bacteria during dry weather, then they will be compliant for all TMDL and 303(d) pollutants during dry weather), the methodology was developed to focus on bacteria. The following criteria form the proposed dry weather RAA methodology. If one criterion is met for each CSMP compliance monitoring location (CML), then reasonable assurance is considered to be

demonstrated. This methodology was presented to Regional Board staff on April 9, 2014, and verbal feedback received at the time was supportive. The RAA methodology addressing FIB consists of:

- A dry weather low flow diversion or infiltration system is located at the CML. To meet this criterion, any such system should have records to show that it is consistently operational, well maintained, and properly sized so that it is effectively eliminating all freshwater surface discharges to the surf zone during year-round dry weather days.
- There are no MS4 outfalls owned by the SMB EWMP Group agencies within the CML's drainage area; therefore, MS4 discharges could not be contributing to pollutant concentrations at the CML.
- The allowed dry weather (summer and winter) single sample exceedance days are based on an antidegradation approach at the CML. If so, this is a result of the Regional Board's TMDL analysis, which found that existing water quality conditions at this CML are acceptable and to be maintained (i.e., no exceedance day reduction needed).
- There are no non-stormwater MS4 outfall discharges within the CML's drainage area. For this criterion to be met, supporting records from the non-stormwater outfall screening program should be supplied.

3.2.2. RAA Approach – Wet Weather

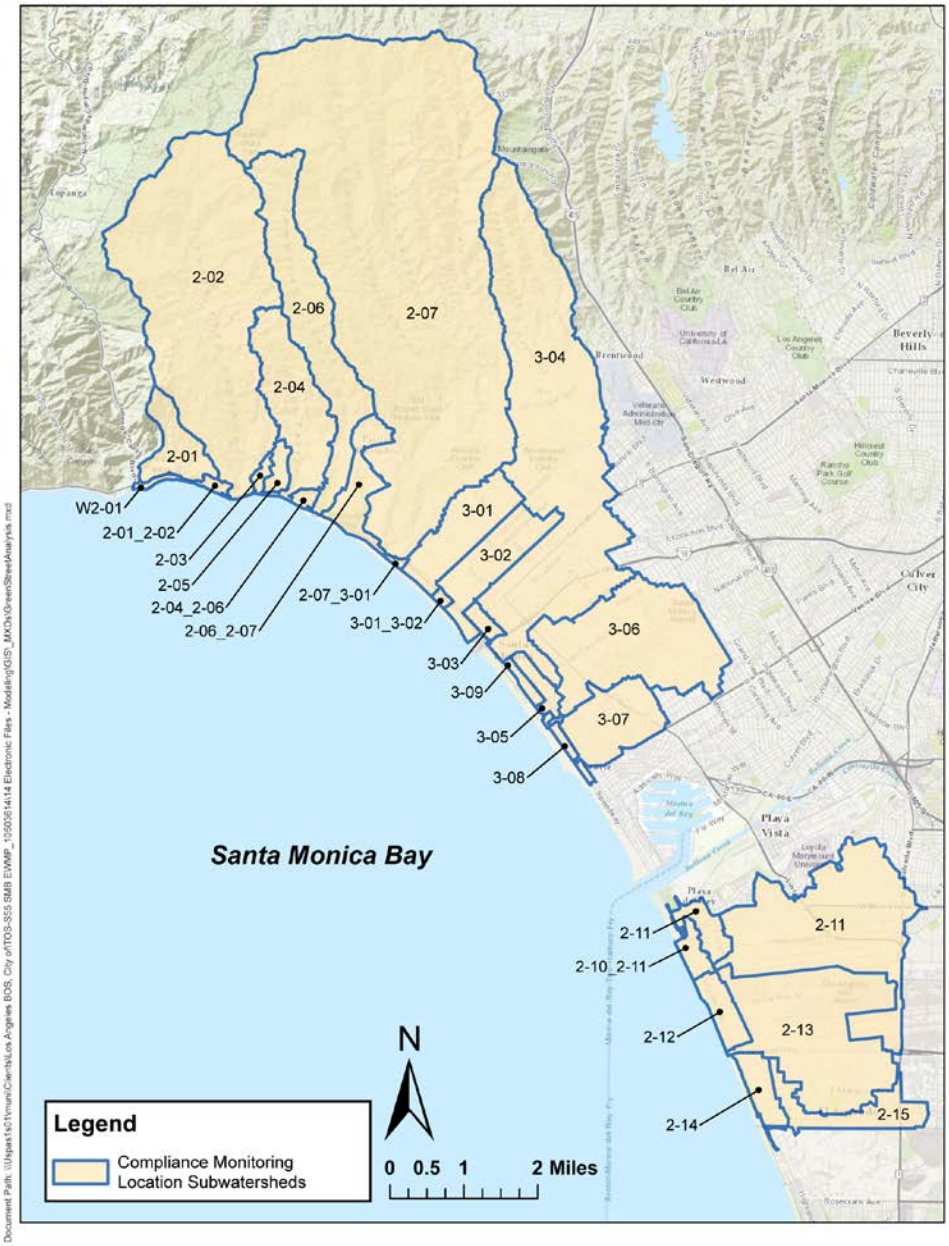
The wet-weather RAA process generally consists of the following steps:

- Identify WBPCs for which the RAA will be performed;
- Identify the MS4 service area (exclude lands of agencies not party to this EWMP such as Federal land, State land, etc.);
- For each modeled subwatershed[4] (**Figure 3-3**), develop target load reductions (TLRs) for 90th percentile year based on Permit requirements and Regional Board guidance;
- Identify structural and non-structural BMPs that either were implemented after applicable TMDL effective dates or are planned for implementation in the future;
- Evaluate the performance of these BMPs in terms of annual pollutant load reductions;
- Compare these estimates with the TLRs; and
- Revise the BMP implementation scenario until targets are met.

TLRs represent a numerical expression of the Permit compliance metrics (e.g., bacteria AEDs for wet weather) that can be modeled and can serve as a basis for confirming, with reasonable assurance, that implementation of the proposed BMPs will result in attainment of the applicable WQBELs and RWLs in the Permit.

[4] SBPAT input files represent the following subwatersheds under different IDs: Modeled 2-05 represents 2-06, modeled 2-06 represents 2-05, modeled 2-04_2-06 represents 2-04_2-05, and modeled 2-05_2-07 represents 2-06_2-07. Subwatershed results were post-processed and attributed to the correct subwatershed.

Figure 3-3
Modeled Subwatersheds within the SMB EWMP Group Area



3.2.3. Methods to Identify and Prioritize BMP Opportunities

In order to demonstrate reasonable assurance, BMPs opportunities were identified in a prioritized manner. Prioritization was based on cost (low cost BMPs were prioritized highest); BMP effectiveness for the pollutants of concern (BMPs that had greater treatment efficiency for the pollutants of concern in a particular analysis region were prioritized higher than other BMPs); and implementation feasibility (as determined by desktop screening evaluation). In general, non-structural BMPs were prioritized over structural BMPs due to their lower relative cost. Next, structural BMPs were identified that would result in the least cost per load removed. This was accomplished by targeting land uses with the highest pollutant loads for bacteria.

The RAA was performed according to the following steps:

- Assume non-modeled non-structural BMP load reduction (2.5-7.5 percent of baseline pollutant load);
- Calculate public retrofit incentives (e.g., downspout disconnects) and redevelopment load reductions;
- Calculate load reductions attributable to anticipated new permit compliance activities of non-MS4 entities (e.g., Industrial General Permit holders and Caltrans);
- Calculate planned and proposed regional/centralized BMP load reductions based on existing plans and parcel screening analysis;
- Meet the TLR by backfilling the remaining load reduction with specific regional/centralized BMP projects or distributed BMPs assumed treat a percentage of developed land uses.

3.3. MODELING APPROACH

This section discusses the modeling approach, including the general BMP planning objectives, methods used to identify and prioritize BMP opportunities, and inputs and assumptions for the modeled non-structural and structural (regional, centralized, and distributed) BMPs.

3.3.1. BMP Objectives

The primary objectives of the non-structural and structural BMPs are to meet the TLRs in each subwatershed in order to demonstrate reasonable assurance that compliance with the TMDL WQBELs and RWLs from the Permit will be achieved. Additional goals include reduction of other pollutants to downstream waterbodies, decreased reliance on potable water and replacement with non-potable water of for irrigation due to on-site harvest/use and infiltration basin projects, increase in groundwater recharge due to infiltration, and reduction in dry weather runoff.

3.3.2. Non-Structural BMPs

Analyzed non-structural BMPs were categorized as follows. Specific model inputs for modeled non-structural BMPs, including redevelopment, public retrofit incentives, and non-MS4 parcels/areas are summarized in tabular format along with model inputs for distributed green streets BMPs in Section 3.

3.3.3. Non-Modeled Non-Structural BMPs

Non-structural BMPs that were not modeled include a combination of bacteria-targeted, wet weather source control BMPs; such as pet waste controls (ordinance, signage, education/outreach, mutt mitts, etc.), human waste source tracking and remediation (e.g., homeless controls, leaking sewer investigations,

etc.), enhanced street sweeping (e.g., 100 percent vacuum sweepers, increased frequency, etc.), increased catch basin and storm drain cleaning, and other new or enhanced non-structural BMPs that target the pollutants addressed in this EWMP. A combined credit of 2.5 – 7.5 percent load reduction (assuming a mean of 5 percent) was applied for all pollutants to represent the cumulative benefit from all non-modeled non-structural BMPs.

3.3.4. Modeling Redevelopment Projects

Beginning in 2001, redevelopment projects were required by the Permit (via the Standard Urban Stormwater Management Program (SUSMP)) to incorporate stormwater treatment BMPs if a project size exceeded specified thresholds. The 2012 MS4 Permit established new criteria for redevelopment projects, requiring certain sized projects to capture, retain, or infiltrate the 85th percentile design storm or the 0.75-inch design storm, whichever is greater, via the implementation of LID BMPs. To account for these redevelopment requirements, BMPs were modeled in SBPAT assuming land use-specific annual redevelopment rates for projects that triggered former SUSMP requirements or will trigger the Permit's LID BMP requirements (). Assumed rates were based on redevelopment data collected in the Los Angeles region.

Table 3-1
Assumed Annual Redevelopment Rates

Land Use	Annual Redevelopment Rate (% of total land use area)
Residential	0.18
Commercial	0.15
Industrial	0.34
Education	0.16
Transportation	2.7

The rates for redevelopment rates across two distinct time periods consist of:

- **TMDL Effective Date - 2015:** The SUSMP requirements, based on the 2001 MS4 Permit, were assumed to be implemented over this period as flow-through media filters at a 0.2 in/hr design intensity (LACDPW, 2002).
- **2015 - Final Compliance Deadline (2021):** The 2012 MS4 Permit post-construction requirements were assumed to be implemented over this period as 50 percent biofiltration and 50 percent bioretention. Biofiltration (bioretention with underdrains) were modeled using bioswale BMP types (to account for a small amount of volume reduction) with bioretention effluent EMCs and sized to treat 150 percent of the 1-year, 1-hour design storm (approximately 0.3 in/hr)[5] because flow-through systems do not retain all the design storm volume on site, while bioretention units were sized to retain 100 percent of the 85th percentile, 24-hour design storm depth, calculated as the mean for each subwatershed.

2015 is used as a transition date since the LID post-construction requirements from the 2012 MS4 Permit are required to be in full effect via local LID ordinances by this time.

[5] 150% of the 1-year, 1-hour design storm was used per Section VI.D.7.c.iii of the Permit.

In order to estimate load reductions associated with these redevelopment BMPs, the land use percentages shown in were multiplied by the respective land use areas in each analysis region, resulting in an assumed area treated by LID BMPs each year. This area was multiplied by the applicable number of years during each time period noted above, since new BMPs are assumed to be implemented each year. The total land use area assumed to be redeveloped for each analysis region was then modeled as being treated by the BMPs described above and the total load reduction was quantified.

3.3.5. Modeling Public Retrofit Incentives

There are a variety of programs directed at incentivizing the public to decrease the amount of stormwater runoff from their property, specifically via downspout disconnects. Public incentives for retrofitting existing development through the downspout disconnection program, was modeled as bioswales sized to a design storm intensity of 0.2 in/hr. Assumptions were: 1) 10 percent of all single family residential areas would be converted to disconnected downspout systems over the 2015 (EWMP implementation start date) to 2021 (TMDL final compliance deadline) time period; and 2) based on GIS analysis, 38 percent of the single family residential area consists of rooftops that can be effectively disconnected. Therefore, 3.8 percent of all single family residential neighborhoods were modeled as treated by bioswales in order to account for public retrofit incentive programs.

3.3.6. Modeling Inspection of Non-MS4 Permitted Parcels or Areas

SBPAT was used to quantify the load reduction in runoff from non-MS4 areas assuming that regulated parcels/areas would be in compliance with the NPDES Statewide Stormwater Permit Waste Discharge Requirements (WDRs) from State of California Department of Transportation (Order No. 2012-0011-DWQ, NPDES No. CAS000003) and the California NPDES General Permit for Stormwater Discharges Associated with Industrial Activities (Industrial General Permit [IGP], Order 2014-0057-DWQ). Load reduction was obtained from these areas by simulating treatment plants sized to treat the IGP's design storm requirement, the 85th percentile, 24-hour storm event (0.2 in/hr), with an effluent concentration set equal to the water quality standard. For fecal coliform, 400 MPN/100mL was used.

3.3.7. Modeling Distributed Green Street BMPs

Distributed BMPs, including green streets, were modeled by assuming 25 percent of the MS4 area can be treated in the right-of-way, and this would be met by 50/50 use of biofilters and bioretention. Biofilters were sized to 150 percent of the 85th percentile, 24-hour design storm (0.3 in/hr) consistent with the Permit's post-construction sizing requirements for flow-through systems, while bioretention units were sized to 100 percent of the 85th percentile, 24-hour design storm depth, calculated as the mean for each subwatershed. Biofilters were modeled using bioswale volume reduction and bioretention effluent EMCs. Distributed BMPs were applied at levels unique to each subwatershed, based on need, after accounting for load reductions attributable to non-structural and regional/centralized BMPs. Furthermore, BMPs were applied by assuming treatment of stormwater from subwatershed-specified percentages of single family and commercial land use areas and subwatershed-specified percentages of multi-family land use areas, until TLRs are met. These land use and BMP type combinations were chosen based on their ability to result in maximum bacteria load reduction.

Specific model inputs for public retrofit incentives, redevelopment, and distributed BMPs are summarized in **Table 16** and **Table 17.** Model input for quantifying load reductions attributable to compliance with non-MS4 permits are summarized in **Table 18.**

Table 3-2
Redevelopment, Public Retrofit Incentives, and Distributed Green Street BMP Model Assumptions

Implementation Level	BMP Type	Design Storm (in/hr)	Longitudinal Slope (ft/ft)	Manning's n (-)	Hydraulic Residence Time (min)	Water Quality Flow Depth (in)	Effective Retention Depth (in)	Infiltration Rate (in/hr)
Redevelopment (2003-2015)	Media Filter	0.2	-	-	-	-	-	-
Redevelopment (2015-2021)	Biofilters[1]	0.3	0.03	0.25	10	4	2	Based on subwatershed-specific soil type
	Bioretention	Varies by subwatershed, see	-	-	-	-	12	0.15
Public Retrofit Incentives (2015-2021)	Bioswales representing downspout disconnects	0.2	0.03	0.25	10	4	2	Based on subwatershed-specific soil type
Distributed Green Street BMPs (2015-2021)	Biofilters[1]	0.3	0.03	0.25	10	4	2	Based on subwatershed-specific soil type
	Bioretention	Varies by subwatershed, see	-	-	-	-	12	0.15

[1] Modeled as bioswales using bioretention effluent EMCs

Table 3-3
Subwatershed-Specific 85th Percentile, 24-Hour Design Storm Depths

Subwatershed	Design Storm (in)	Subwatershed	Design Storm (in)	Subwatershed	Design Storm (in)
West of 2-01	0.82	SMB-2-07	1.11	SMB-3-07	1.06
SMB-2-01	0.86	Between 2-07 and 3-01	0.89	SMB-3-08	1.04
Between 2-01 and 2-02	0.82	SMB-3-01	0.98	SMB-2-10	0.98
SMB-2-02	1.04	Between 3-01 and 3-02	0.95	Between 2-10 and 2-11	0.96
SMB-2-03	0.84	SMB-3-02	1.01	SMB-2-11	1.03
SMB-2-04	0.83	SMB-3-03	0.99	SMB-2-12	1.06
Between 2-04 and 2-06	0.83	SMB-3-04	1.06	SMB-2-13	0.95
SMB-2-05	0.92	SMB-3-09	1.03	SMB-2-14	0.88
SMB-2-06	1.02	SMB-3-05	1.03	SMB-2-15	0.92
Between 2-06 and 2-07	0.88	SMB-3-06	1.10	South of 2-15	0.85

Table 3-4
Non-MS4 Parcels – Modeled as Treated by Treatment Plants
(i.e, BMPs that will treat stormwater to the Water Quality Objectives)

Implementation Level	Subwatershed	Treatment Flowrate (cfs)	Design Storm (in/hr)	Average Basin Depth (ft)	Equalization Volume (cu-ft)	Diversion Flowrate (cfs)	Infiltration Rate (in/hr)
NonMS4 Parcels	All	10,000	0.20	100	1,000	10,000	0.00001

3.3.8. Regional/Centralized Design Parameters and Criteria

Existing BMPs that were constructed after 2003; and, planned and proposed regional/centralized BMPs are modeled in SBPAT as closely as possible to their actual conceptual designs. The following sections outline the regional/centralized BMPs that were modeled as well as their drainage areas, design details in SBPAT, and any relevant assumptions. The load reduction attributable to multiple regional/centralized BMPs in series is assumed to be additive unless the BMPs are not volume-capture BMPs. In those cases, the load reductions were adjusted so as to void double counting.

The RAA included 31 BMPs modeled as infiltration basins. Model inputs for the regional/centralized BMPs are summarized in **Appendix A**. Individual BMPs, as currently proposed, and associated assumptions are described in more detail by subwatershed below. In some cases, projects which function as harvest and use systems were modeled as infiltration basins to allow for the quantification of losses. The project descriptions following the model input table provide such operational details.

Section 4
Watershed Control Measures

As part of the development of the EWMP, the Permit specifies that watershed control measures (or BMPs) shall be identified to: 1) ensure that stormwater discharges meet receiving water and effluent limits as established in the Permit, and 2) reduce overall impacts to receiving waters from stormwater and non-stormwater runoff.

BMPs are grouped into two broad categories, structural and institutional. Structural BMPs are physically-constructed control measures that alter the hydrology or water quality of stormwater or non-stormwater. Institutional BMPs are source control measures that prevent the release of flow/pollutants or transport of pollutants, but do not involve construction of physical facilities. Minimum control measures (MCMs), such as street sweeping, are a subset of institutional BMPs.

This section summarizes watershed control measures, including BMP types and existing BMPs, which reduce the current pollutant load to meet past and future compliance requirements. In addition, this section summarizes future BMPs to that will be implemented to meet 2018 and 2021 Permit compliance requirements. The 2018 and 2021 BMPs were developed as a result of the RAA analysis in combination with feedback from the SMB EWMP Group. Of the proposed/future BMPs, eight were selected as example projects wherein conceptual design, feasibility, and costs were evaluated. Detailed conceptual designs of these 8 highlighted projects can be found in Appendix B.

4.1. INSTITUTIONAL BMPS

This section summarizes existing MCMs that are in place in the SMB EWMP Group area along with an outline for modifying MCMs and measuring the effectiveness of customized programs.

Required future MCMs are similar to programs that were required under the previous MS4 Permit (Order No. 01-182). The previous Permit requires continuation of existing MCMs until the SMB EWMP is approved by the Regional Board. Existing implementation summaries of the Program MCM tasks identified are available in the Unified Annual Stormwater Report. A comparison between program requirements of the previous and current MS4 Permit is shown in **Table 19**. MCMs are grouped into six categories as shown below:

- **Public Information and Participation Program (PIPP)**
  The objectives of the PIPP are to measurably increase public knowledge, change waste disposal and runoff pollution generation behavior, and involve/engage target populations in stormwater pollution mitigation.

- **Industrial/Commercial Facilities Program**
  The goal of the Industrial/Commercial Facilities Program is to track, inspect, and ensure compliance at industrial and commercial facilities that are critical sources of constituents in stormwater.

- **Development Planning Program**
  The Development Planning Program implements a set of requirements for development and redevelopment projects to minimize impacts from stormwater and urban runoff, maximize amount of pervious surfaces, minimize the quantity of stormwater directed to impervious

surfaces, minimize parking lot pollution through BMPs, and reduce stormwater pollutant loads in general.

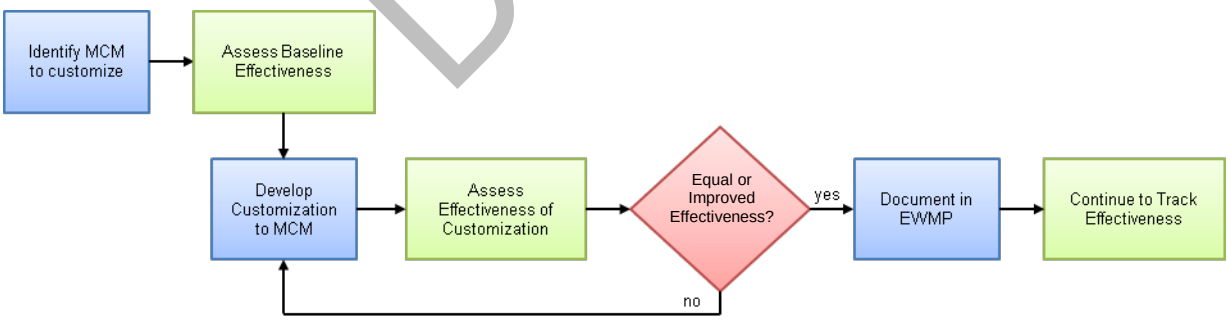
- **Development Construction Program**
  Similar to the Development Planning Program, the Development Construction Program aims to control stormwater pollution from active construction sites. This program is implemented through sediment control measures, retention and recycling of construction-related materials and wastes, containment of non-stormwater runoff from washing and other activity, and erosion/slope controls.

- **Public Agency Activities Program**
  The activities under the Public Agency Activities Program include sewage system maintenance and overflow/spill prevention, public yards management, streets and roads maintenance, storm drain operation and management, emergency procedures, and other essential Permittee activities.

- **Illicit Connections and Illicit Discharges Elimination Program**
  The final program under the existing MCMs is the Illicit Connections (ICs) and Illicit Discharges (IDs) Elimination Program (IC/ID). The program requires Permittees to document, track, and report all cases of IC/ID and implement a response procedure and methods for public reporting.

The opportunity for customization may provide benefits by allowing the SMB EWMP Group to assess the effectiveness of their current programs and to modify their programs to better serve local conditions and objectives. If an effectiveness assessment is conducted on a specific MCM activity and it can be reasonably shown that customization of the MCM would result in equal or improved effectiveness on attitudes or knowledge, behavior or implementation, load reduction, or water quality, then a defensible recommendation for modification of that activity can be made, resulting in greater resources available for more effective activities. **Figure 4-1** shows the process for identifying and implementing MCM customization.

Figure 4-1
Process for Minimum Control Measure Customization



The SMB EWMP Group is interested in customizing MCM activities, with the first step being development of a framework to assess the effectiveness of each MCM currently being implemented. For each MCM that can be assessed in this manner, recommendations for customizations can be developed with reasonable assurance of impact to effectiveness.

Table 4-1
Comparison of Stormwater Management Program MCMs

Program Element	Activity	Order No. 01-182	Order No. R4-2012-0175
Public Information and Participation Program	Public Education Program - Advisory committee meeting (once per year)	x	
	"No Dumping" message on storm drain inlets (by 2/2/2004)	x	
	Reporting hotline for the public (e.g., 888-CLEAN-LA)	x	x
	Outreach and Education	x	
	Make reporting info available to public	x	x
	Public service announcements, advertising, and media relations	x (4.B.1.c.1)	x
	Public education materials - Proper handling	x (4.B.1.c.3)	x
	Public education materials - Activity specific	x	x
	Educational activities and countywide events	x	x
	Quarterly public outreach strategy meetings (by 5/1/2002)	x	
	Constituent-specific outreach information made available to public	x	x
	Business Assistance Program	x	
	Educate and inform corporate managers about stormwater regulations	x	
	Maintain storm water websites		x
	Provide education materials to schools (50 percent of all K-12 children every two years)	x	x
	Provide principle permittee with contact information for staff responsible for storm water public educational activities (by 4/1/2002)	x	x
	Principle permittee shall develop a strategy to measure the effectiveness of in-school education programs	x	
	Principle permittee shall develop a behavioral change assessment strategy (by 5/1/2002)	x	
	Educate and involve ethnic communities and businesses (by 2/3/2003)	x (4.B.1.c.2)	x
	Reporting hotline for the public (e.g., 888-CLEAN-LA)	x	x
Industrial/Commercial Facilities Program Industrial/Commercial Facilities Program	Track critical sources - Restaurants	x	x
	Track critical sources - Automotive service facilities	x	x
	Track critical sources - RGOs	x	x
	Track critical sources - Nurseries and nursery centers		x
	Track critical sources - USEPA Phase I facilities	x	x
	Track critical sources - Other federally-mandated facilities [40 CFR 122.26(d)(2)(iv)(C)]	x	x
	Track critical sources - Other commercial/industrial facilities that Permittee determines may contribute substantial constituent load to MS4		x
	Facility information - Name of facility	x	x
	Facility information - Contact information of owner/operator	name only	x
	Facility information - Address	x	x
	Facility information - NAICS code		x
	Facility information - SIC code	x	x
	Facility information - Narrative description of the activities performed and/or principal products produced	x	x
	Facility information - Status of exposure of materials to storm water		x
	Facility information - Name of receiving water		x
	Facility information - ID whether tributary to 303(d) listed water and generates constituents for which water is impaired		x
	Facility information - NPDES/general industrial permit status	x	x
	Facility information - No Exposure Certification status		x
	Update inventory of critical sources annually	x	x
	Business Assistance Program	optional	x
	Notify inventoried industrial/commercial sites on BMP requirement		once in 5 years
	Inspect critical commercial sources (restaurants, automotive service facilities, retail gasoline outlets and automotive dealerships)	twice in 5 years	twice in 5 years
	Inspect critical industrial sources (phase 1 facilities and federally-mandated facilities)	twice in 5 years[1]	twice in 5 years[2]
	Verify No Exposure Certifications of applicable facilities		x
	Verify WDID of applicable facilities	x	x
	Source Control BMPs	x	x
	Provisions for Significant Ecological Areas (SEAs) (Environmentally Sensitive Areas (ESAs)	x[3]	x
	Progressive enforcement of compliance with stormwater requirements	x	x
	Interagency coordination	x	

Table 4-1 continued

Program Element	Activity	Order No. 01-182	Order No. R4-2012-0175
Planning and Land Development Program	Peak flow control (post-development stormwater runoff rates, velocities, and duration)	x	x[4]
	Hydromodification Control Plan	in lieu of countywide peak flow control	
	SUSMP (by 3/3/03)	x	
	Volumetric Treatment Control (SWQDv) BMPs	x	x
	Flow-based Treatment Control BMPs	x	x
	Require implementation of post-construction Planning Priority Projects as treatment controls to mitigate storm water pollution (by 3/10/2003)	x	x
	Require verification of maintenance provisions for BMPs	x	x
	CEQA process update to include consideration of potential stormwater quality impacts	x	
	General Plan Update to include stormwater quality and quantity management considerations and policies	x	
	Targeted Employee training of Development planning employees	x	
	Bioretention and biofiltration systems		x
	SUSMP guidance document	x	
	Annual reporting of mitigation project descriptions		x
Development Construction Program	Erosion control BMPs	x	x
	Sediment control BMPs	x	x
	Non-storm water containment on project site	x	x
	Waste containment on project site	x	x
	Require preparation of a Local SWPPP for approval of permitted sites	x	x
	Inspect construction sites on as-needed basis		x
	Inspect construction sites equal to or greater than one acre	once during wet season	once every two weeks[5], monthly
	Electronic tracking system (database and/or GIS)		x
	Required documents prior to issuance of building/grading permit	L-SWPPP	ESCP/SWPPP
	Implement technical BMP standards		x
	Progressive enforcement	x	x
	Permittee staff training	x	x
Public Agency Activities Program	Public construction activities management	x	x
	Public facility inventory		x
	Inventory of existing development for retrofitting opportunities		x
	Public facility and activity management	x	x
	Vehicle maintenance, material storage facilities, corporation yard management	x	x
	Landscape, park, and recreational facilities management	x	x
	Storm drain operation and maintenance	x	x
	Streets, roads, and parking facilities maintenance	x	x
	Parking Facilities Management	x	x
	Emergency procedures	x	x
	Alternative treatment control BMPs feasibility study	x	
	Municipal employee and contractor training		x
	Sewage system maintenance, overflow, and spill prevention	x	
IC/ID Elimination Program	Implementation program	x	x
	MS4 Tracking (mapping) of permitted connections and illicit connections and discharges	x	x
	Procedures for conducting source investigations for IC/IDs	x	x
	Procedures for eliminating IC/IDs	x	x
	Procedures for public reporting of ID		x
	IC/ID response plan	x	x
	IC/IDs education and training for staff	x	x

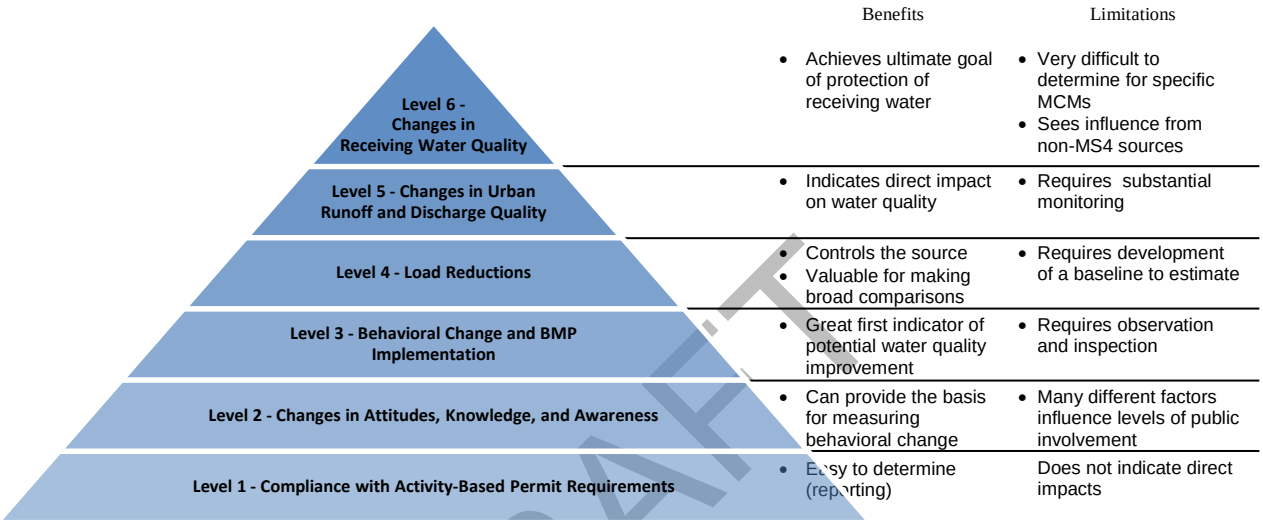
[1] Tier 2 facilities may be inspected less frequently if they meet certain criteria
[2] Subject to change based on approved EWMP strategy
[3] For environmentally sensitive areas and impaired waters
[4] Maintain pre-project runoff flow rates via hydrologic control measures
[5] Sites of threat to water quality or discharging to impaired water; frequency dependent on chance of rainfall

The California Stormwater Quality Association (CASQA) provides a framework for the effectiveness assessment of Stormwater Management Programs. The outcome is a hierarchy that categorizes the

classification of outcome types (levels) that allows MCMs to be placed into one or more categories for subsequent outcome assessment. The outcome levels, Level 1 through Level 6, are shown in **Figure 4-2**.

An assessment of required MCMs was conducted and resulted in no proposed modifications for the SMB EWMP Group Area. As a result, required MCMs shall be implemented without modifications; however, the SMB EWMP Group may consider modifications in the future using the prescribed process.

Figure 4-2
General Classification of Outcome types (adapted from CASQA)



4.2. STRUCTURAL BMPS

Structural BMPs are anticipated to perform the majority of required pollutant reduction within the SMB EWMP Group area. To implement control measures efficiently at the watershed-scale and to support compliance tracking, structural BMP programs will be an important element of EWMP implementation. This section describes the necessary structural BMP programs for EWMP implementation.

Structural BMPs are categorized as either distributed or regional. Distributed BMPs are designed to treat runoff from small drainage areas that are comprised of a single to a few parcels. Regional BMPs are designed to treat runoff from a large drainage that includes multiple parcels and various land uses. A subset of regional BMPs capable of capturing runoff from the 85th percentile, 24-hour storm are herein referred to as "Regional EWMP Projects"

There are several existing regional and distributed structural BMPs within the SMB EWMP Group Area, as summarized in the following subsection.

4.2.1. Existing Regional BMPs

Existing regional BMPs were identified and characterized into BMP categories through a data request and literature review process, wherein a total of 27 regional BMPs were identified. The 27 regional BMPs are summarized in **Table 20**, with locations shown on **Figure 4-3**. Three of these regional BMPs are joint projects between multiple agencies. Of the 27 existing regional projects, 23 are low-flow diversions (LFDs), two are infiltration BMPs, one is a constructed wetland, and another is a treatment facility.

Table 4-2
Summary of Existing Regional Best Management Practices by Permittee and Type

Permittee	Total BMPs Reported[1]	Number of Existing Regional BMPs Reported by Permittee			
		Infiltration	Constructed Wetland	Treatment Facility	Low-Flow Diversion (LFD)[2]
El Segundo	-	-	-	-	-
Los Angeles	12	2	1	1[3]	8
Santa Monica	5	-	-	1[3]	4
County	-	-	-	-	-
LACFCD	11	-	-	-	11

[1] This column shows the number of BMPs for which each Permittee has ownership/partial ownership. As double counting occurs when multiple permittees have ownership of a project, the numbers in each column should not be added to determine the total number of physical BMPs.
[2] LFDs capture and divert 100% of dry flow.
[3] The Santa Monica Urban Runoff Recycling Facility (SMURRF) is a joint project between the City of Los Angeles and City of Santa Monica.

4.2.2. Existing Distributed BMPs

Existing distributed BMPs were characterized through a data request process that identified a total 2,212 BMPs in the SMB EWMP Group Area. Of these distributed BMPs, 340 exist within the City of Los Angeles, and 1,872 exist within the City of Santa Monica. None are location within the City of El Segundo or the County of Los Angeles areas. The BMPs identified in the City of Santa Monica reflect both city-owned and privately-owned BMPs. Existing distributed BMPs within the SMB EWMP Group area are summarized by type in **Table 21.**

Figure 4-3
Location of Existing Regional BMPs

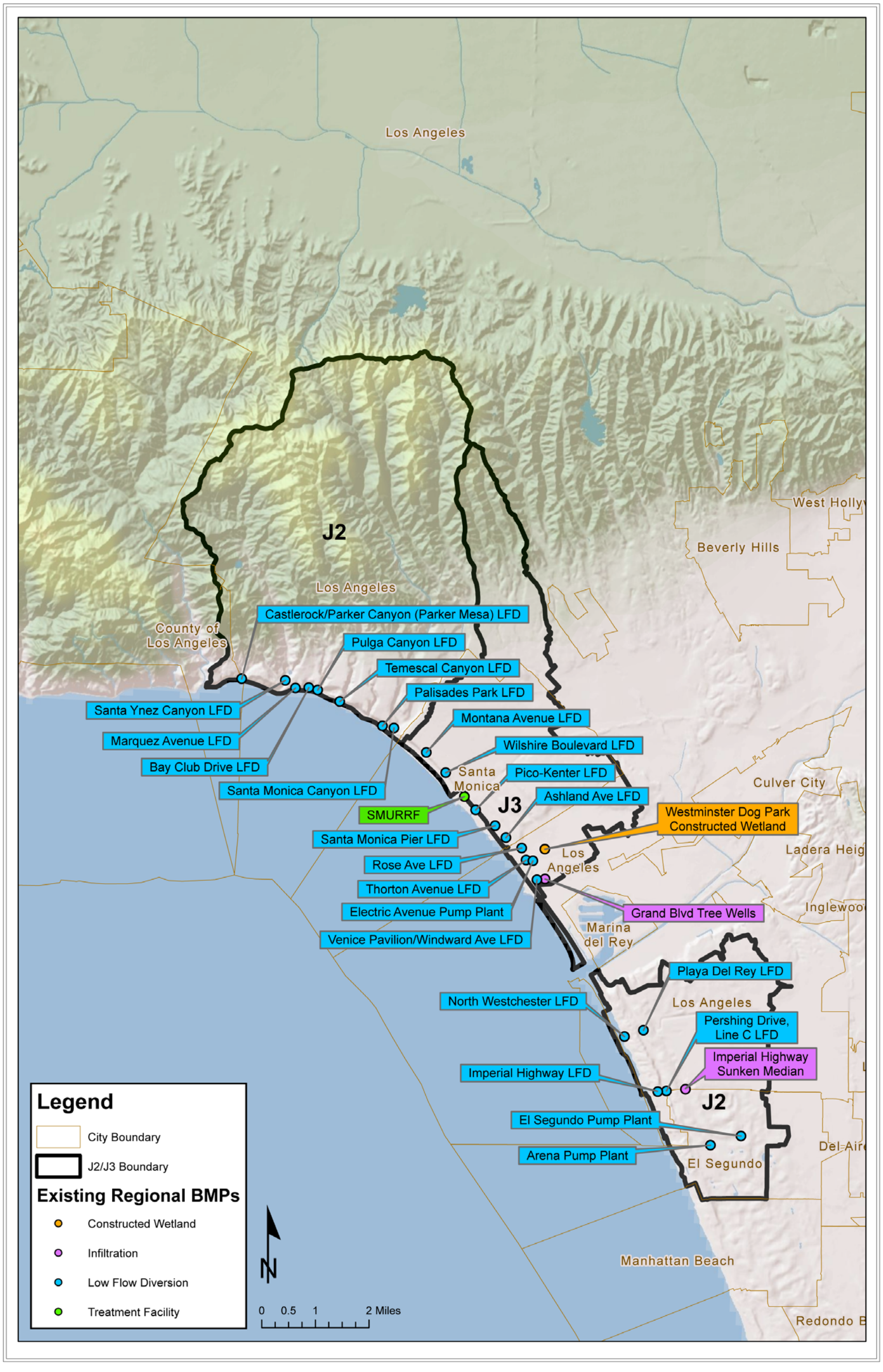


Table 4-3
Existing Distributed Best Management Practices by Permittee and Type

Permittee[2]	Number of Existing Distributed BMPs by Type Reported by Permittee										
			Green Infrastructure								
	Total BMPs Reported	Site-Scale Detention	Bioretention	Biofiltration	Permeable Pavement	Bioswale	Infiltration	Rainfall Harvest	Flow Through	Source Control	Unknown[1]
El Segundo[3]	-	-	-	-	-	-	-	-	-	-	-
Los Angeles	340	14	168	-	51	11	9	44	11	31	-
Santa Monica	1872	-	1	230	89	-	1,329	1	101	-	67
County[3]	-	-	-	-	-	-	-	-	-	-	-
LACFCD[3]	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**2212**	**14**	**169**	**230**	**140**	**11**	**1,338**	**45**	**112**	**31**	**67**

[1] BMPs listed as "unknown" are those for which a BMP category was not specified in the data request.
[2] BMPs were assigned to Permittee by geographic location in the instance that ownership information was not available.
[3] Distributed BMPs have not been implemented by El Segundo, the County, or LACFCD in the JG2JG2/JG3 area.

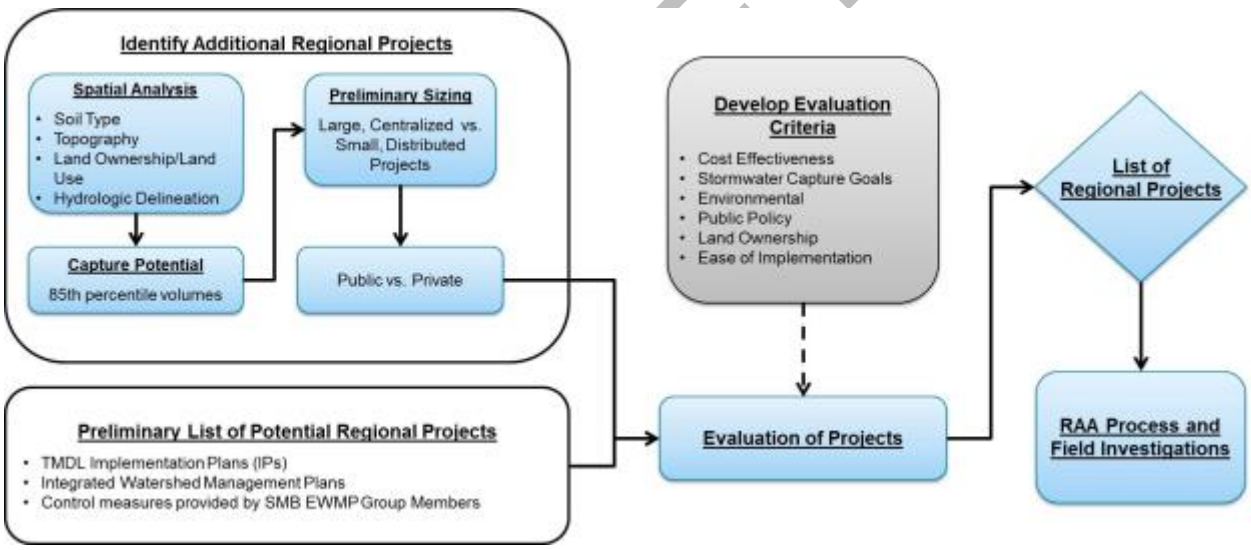
4.2.3. Planned Structural BMPs for Compliance

The Regional Projects Initial Screening Technical Memorandum (MWH Team, 2014) documents the methods used for identifying how the parcels within the SMB EWMP Group Area were narrowed to 36 high potential regional project sites (see **Figure 4-5**). The SMB EWMP will also include multi-benefit regional projects that retain the stormwater volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects. Through a screening process and coordination with the SMB EWMP Group, eight highlighted regional EWMP project sites were selected for conceptual design, cost estimation, and inclusion in the EWMP plan. The conceptual designs include preliminary sizing, BMP type, configuration, environmental constraints, construction feasibility review, preliminary cost, and schedules.

Process for Identifying and Selecting Multi-Benefit Projects

The EWMP process emphasizes identifying Regional EWMP projects that are individually or collectively able to capture runoff from the 85th percentile, 24-hour storm. Existing and planned BMPs and additional BMPs were considered as part of the EWMP process. This section presents the process used to identify additional potential regional EWMP projects, as illustrated schematically in **Figure 4-4**.

Figure 4-4
Process for Evaluating Regional EWMP Projects



This section presents the regional projects conceptualized and modeled in the RAA analysis to meet compliance requirements. A summary of BMP capacity in acre-feet (AF) required for TMDL compliance by Permittee is shown in **Table 22** for regional projects and in **Table 23** for distributed projects.

Figure 4-5
High Potential Regional Sites

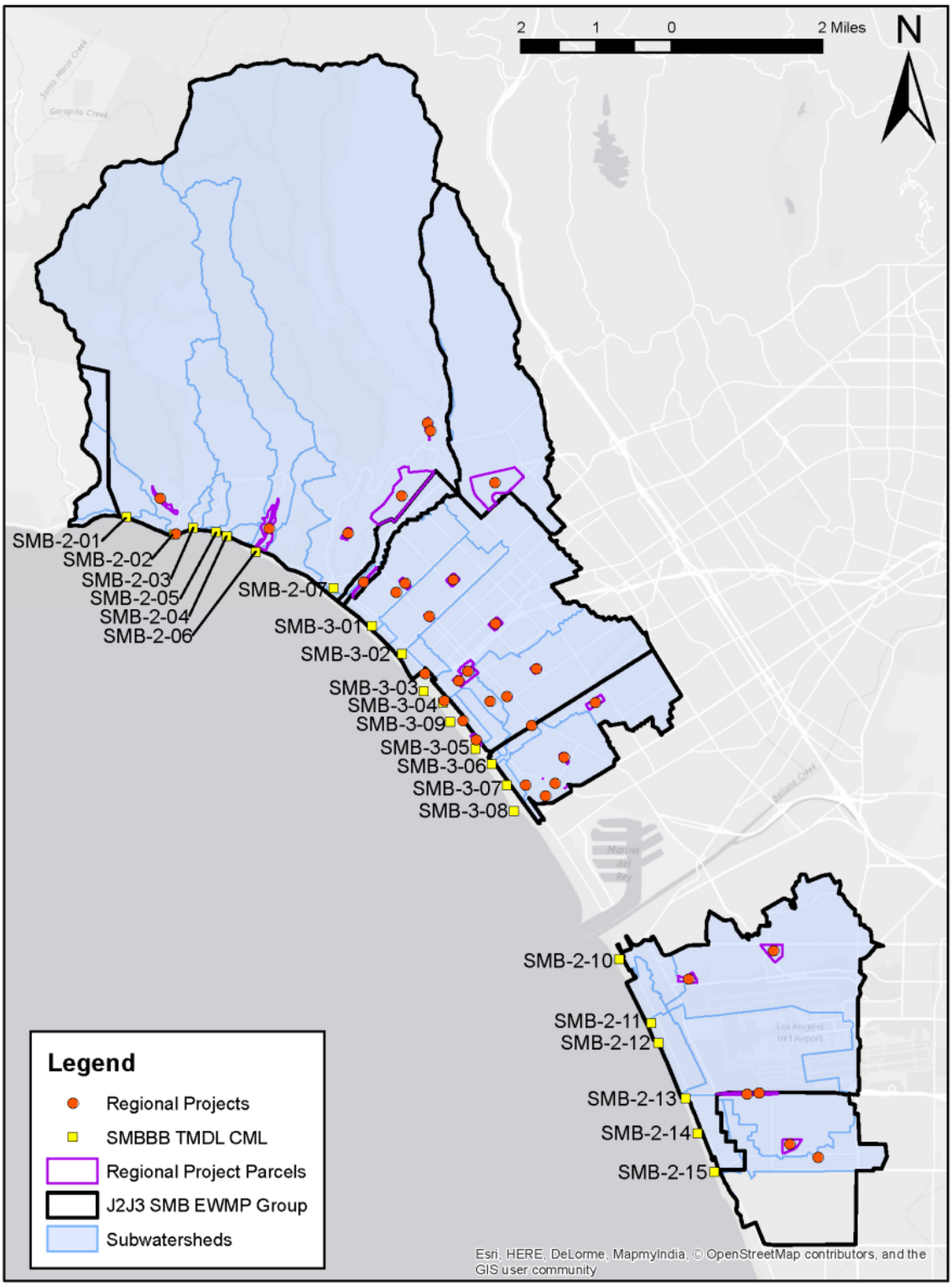


Table 4-4
Summary of Regional Structural Capacity Required by Permittee for Compliance

Implementation Date for Compliance	Regional BMP Capacity Required for Compliance (AF)				
	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo	Total
2018	0.0	30.1	29.0	30.6	89.7
2021	0.2	105.4	21.3	0.0	126.8
Total	0.2	135.4	50.3	30.6	216.5

Table 4-5
Summary of Distributed BMP Capacity Required by Permittee for Compliance

Implementation Date for Compliance	Green Street BMP Capacity Required for Compliance (AF)				
	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo	Total
2018	0.5	35.1	20.2	0.0	55.8
2021	0.5	25.3	15.1	0.0	40.9
Total	1.0	60.3	35.4	0.0	96.7

For interim compliance (2018) the SMBBB TMDL requires a 50 percent reduction in exceedance days; this will be met by achieving 50 percent of the TLR in each subwatershed, through a combination of non-structural, distributed green streets BMPs, and existing and fast-tracked centralized/regional BMPs. These centralized/regional BMP projects are address by subwatershed. It was assumed that 50 percent of the proposed distributed green streets BMPs would be implemented in all subwatersheds between 2015 and 2018, and 50 percent would be implemented between 2018 and 2021. In subwatersheds where no distributed green streets BMPs are necessary to meet the final compliance deadlines, regional BMPs were prioritized to reduce redundant load reductions. However, in subwatershed 2-11, a small number of distributed green streets BMPs (5 percent of single family and commercial areas) were added rather than fast-tracking the large-scale regional projects, which would meet the interim and final targets if constructed alone.

Table 24 lists regional and centralized BMPs required for compliance by subwatershed. At the time of the interim compliance deadline (2018), a 22 percent load reduction is estimated watershed-wide, which is greater than the total load reduction of 18 percent required by the Permit. At the time of the final compliance deadline (2021), a 42 percent load reduction is estimated to be achieved, which is greater than the total load reduction of 35 percent required by the Permit. The load reduction within the subwatersheds is primarily attributable to individual regional BMPs in each subwatershed.

Table 4-6
Summary of Regional and Centralized BMPs Required for Compliance

Sub-watershed	Modeled Regional/Centralized BMP Identifier	Lead Agency[1]	BMP Status	Implementation Date for Compliance	
				2018 (Interim)[2]	2021 (Final)[3]
2-02	RBMP20_SantaYnez	LA	Planned		X
	RBMP23_2-2ParkingLot	LA	Proposed		X
2-06	RBMP08_Temescal	LA	Planned		X
2-07	RBMP47_RivieraLg85	LA	Planned	X	
	RMBP40b_RivieraBarranca	LA	Proposed		X
	RBMP17_Mandeville	LA	Planned		X
	RBMP43_OldOakRd	LA	Existing	X	
	RBMP48_Rustic85	LA	Proposed		X
3-01	RBMP30_GooseEggPark	SM	Proposed		X
	RBMP31_RooseveltElem	SM	Proposed	X	
	RBMP29_SanVicenteMedia	SM	Proposed		X
3-02	RBMP32_ReedPark	SM	Proposed	X	
	RBMP33_LincolnMiddleSch	SM	Proposed		X
3-03	RBMP16a_CleanBeachesP	SM	Planned	X	
3-04	RBMP44_Brentwood85	LA	Planned		X
	RBMP51_Memorial85	SM	Proposed		X
	RBMP52_SMCivicAud85	SM	Proposed		X
	RBMP16b_CleanBeachesP	SM	Planned		X
	RBMP11_LosAmigos	SM	Proposed		X
	RBMP53_SMHSBuilt	SM	Existing	X	
3-05	RBMP37_3-5ParkingLot	SM	Proposed	X	
3-06	RMBP38_OlympicHigh	SM	Proposed		X
	RBMP13_Ozone	SM	Proposed	X	
	RBMP10_PenmarPh2*	LA	Planned	X	
	RMBP39_WillRodgersElem	SM	Proposed		X
3-07	RBMP01b_GrandBlvdIMF	LA	Existing	X	
	RBMP21b_GrandBlvdIIMF	LA	Existing	X	
	RBMP03_Westminster	LA	Existing	X	
	RBMP45_Oakwood85	LA	Planned		X
3-09	RBMP18_CrescentBay	LA	Proposed	X	
2-11	RBMP19_WestchesterPark	LA	Planned		X
	RBMP09_WestchesterLAX	LA	Planned		X
2-13	RBMP02_ImperialHwy	ES	Existing	X	
	RBMP42_ImperialStrip	ES	Planned	X	
	RBMP50_Recreation85	ES	Proposed	X	
2-15	RBMP49_PumpStationB85	ES	Proposed	X	

[1] LA = Los Angeles, SM = Santa Monica, ES = El Segundo
[2] Load reduction credit applied/project implemented within RAA model to meet 2018 interim compliance deadline.
[3] Load reduction credit applied/project implemented within RAA model to meet 2021 interim compliance deadline.

It is noted that if at any time specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, alternative BMPs or operational changes will be planned within the same subwatershed and within the same timeline, so as to meet an equivalent subwatershed pollutant load reduction.

Compliance with the Debris TMDL will be met through a phased retrofit of all catch basins throughout the SMB EWMP Group area to meet each interim compliance deadline (20% load reduction per year between 2016 and 2019) as well as the final compliance deadline (100% load reduction) in 2020. Consistent with the City's Trash Monitoring and Reporting Plan (City of Los Angeles Department of Public Works, 2012), *"vertical insert[s] with 5-mm openings and flow activated opening screen covers are the best suited for implementation within the City to achieve compliance with Trash TMDLs"*. No additional BMPs were identified to meet the debris TMDL.

Existing (constructed after 2003), planned, and proposed regional/centralized BMPs were modeled to evaluate reasonable assurance in meeting compliance requirements. Project descriptions for the regional/centralized BMPs that were modeled as well as their drainage areas, design details, and any relevant assumptions are summarize below by subwatershed. The pollutant load reduction attributable to multiple regional/centralized BMPs in series is assumed to be additive unless the BMPs are not volume-capture BMPs. In those cases, the pollutant load reductions were adjusted so as to void double counting.

The modeled BMPs for each subwatershed are described in the following sections.

Subwatershed 2-02 Regional/Centralized BMPs

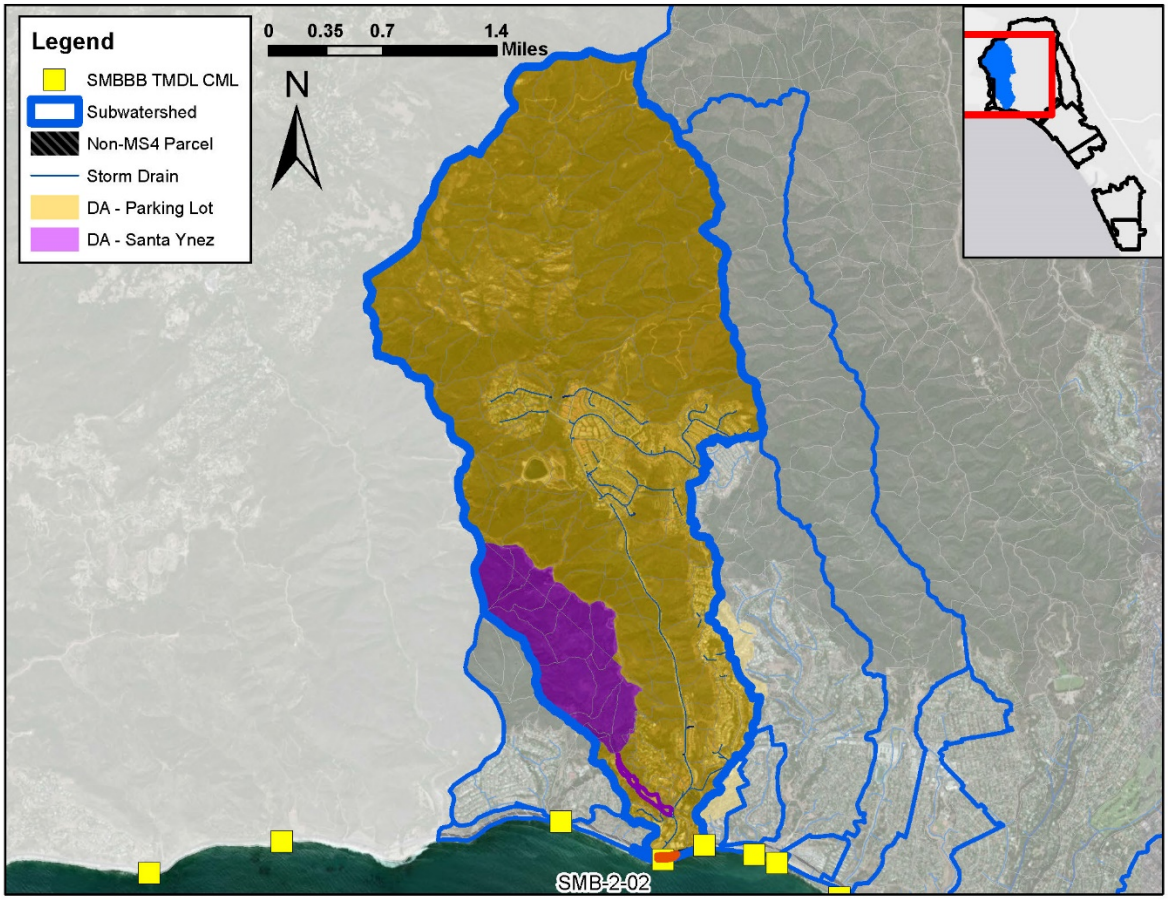
Two centralized BMPs are proposed and are modeled within Subwatershed 2-02 (see **Figure 4-6**):

- **RBMP20 Santa Ynez (City of Los Angeles).** RBMP20 is a proposed debris basin and bioswale project located within Los Liones Park in Los Angeles. It will be constructed as a debris basin formed by a dike that houses the inlet to a City of Los Angeles concrete box storm drain. The existing rustic bioswale currently only collects local storm flows, but it provides an opportunity for integration into the Santa Ynez BMP. It is modeled as an infiltration basin to best reflect capture rates and volume losses. Multiple benefits include pollutant load reduction and groundwater recharge.
  Status: Planned; construction by 2021

- **RBMP23 2-2 Parking Lot (City of Los Angeles).** RBMP23 is a proposed subsurface infiltration basin located south of Pacific Coast Highway, adjacent to Will Rogers Beach, in Los Angeles. It is modeled as an infiltration basin to best reflect capture rates and volume losses; however, it is assumed that all harvested stormwater will be used for either irrigation purposes or pumped to the existing low-flow diversion. The depth of the basin was determined assuming a 96-hr drawdown time for vector control purposes[6].
  Status: Proposed; construction by 2021

[6] A 96-hour drawdown time was assumed based on Attachment H of the MS4 Permit which states, *"Harvested rainwater must be stored in a manner that precludes the breeding of mosquitoes or other vectors or with a draw down not to exceed 96 hours."*

Figure 4-6
Modeled Regional/Centralized BMPs within Subwatershed 2-02

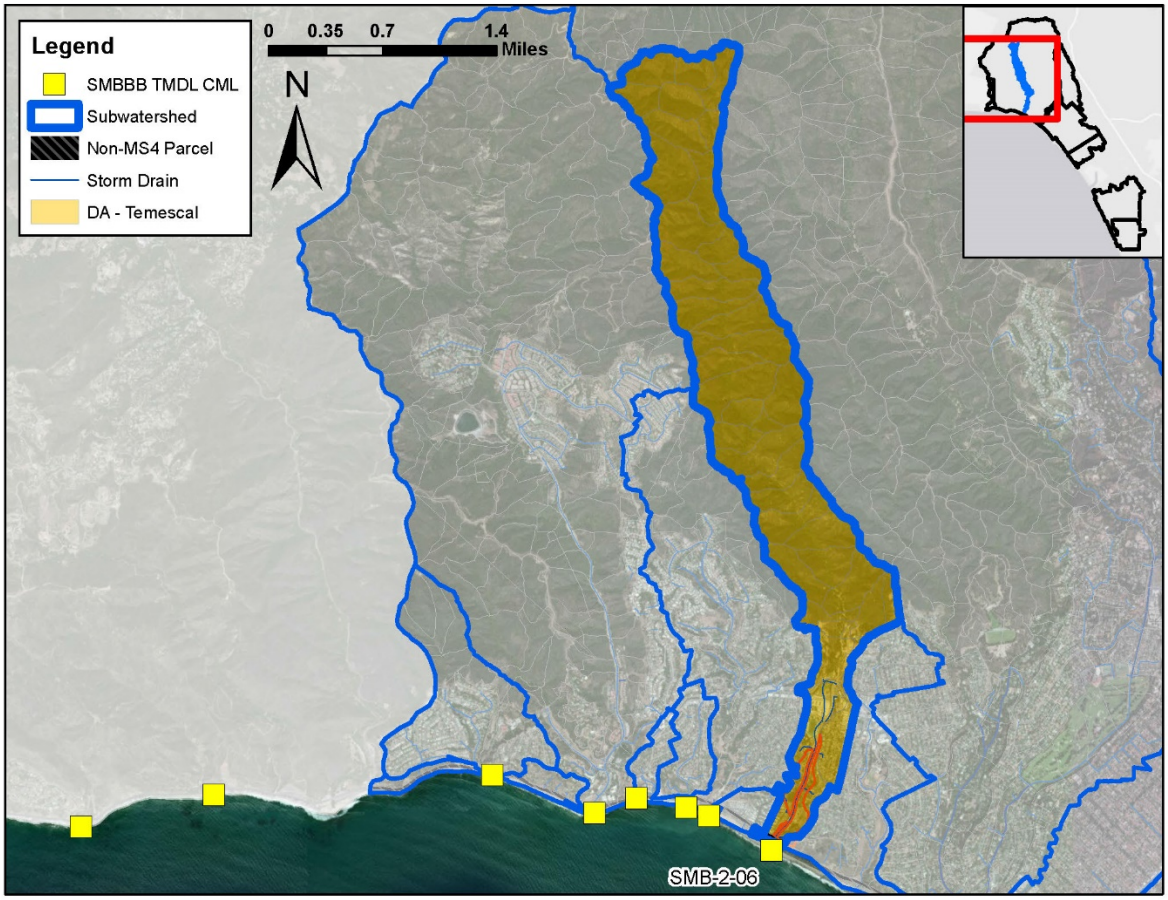


Subwatershed 2-06 Regional/Centralized BMPs

One centralized BMP is modeled within Subwatershed 2-06 (see **Figure 4-7**):

- **RBMP08 Temescal (City of Los Angeles).** The Temescal Canyon Project is a large-scale storage, treatment and diversion project located within Temescal Canyon Park, in Los Angeles. It is modeled as an infiltration basin to best reflect capture rates and volume losses however all captured stormwater will be pumped at the dewatering rate (5 cubic feet per second) to the wastewater treatment plant.
  Status: Planned; concept report completed; construction by 2021

Figure 4-7
Modeled Regional/Centralized BMPs within Subwatershed 2-06

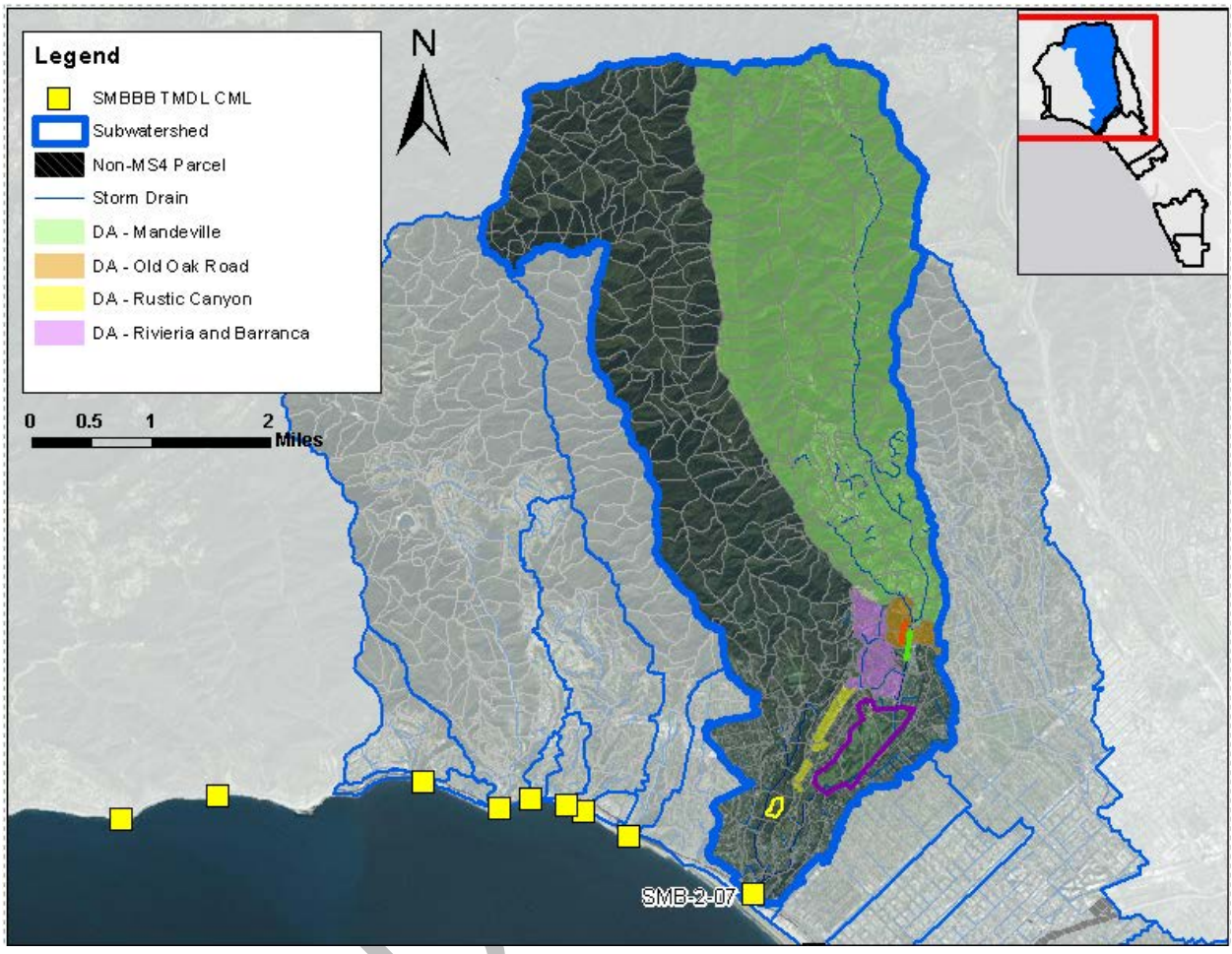


Subwatershed 2-07 Regional/Centralized BMPs

Three regional and two centralized BMPs are modeled within Subwatershed 2-07 (see **Figure 4-8**):

- **RBMP47 RivieraLg85 (City of Los Angeles).** The Riviera project is a planned large-scale storage, treatment and use regional BMP (capturing the 85th percentile storm) located at the Riviera Country Club that would divert runoff from the storm channel to the north. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, harvested stormwater will be used for both golf course irrigation purposes as well as infiltration. The average depth of the basin was determined assuming a 96-hr drawdown time. Multiple benefits include pollutant load reduction, reduced potable water demand, and some groundwater recharge. *Status: Planned; in concept development; construction by 2018*

Figure 4-8
Modeled Regional/Centralized BMPs within Subwatershed 2-07



- **RBMP48 Rustic85 (City of Los Angeles).** The Rustic Canyon regional BMP (capturing the 85th percentile storm) is a proposed 5-ft deep infiltration basin located at the Rustic Canyon Recreation Center in Los Angeles, designed to collect runoff from local neighborhoods to the north. Harvest and use may also be an option to potentially supplement or replace landscape irrigation at the park. Multiple benefits include pollutant load reduction, potential reduced potable water demands, and groundwater recharge.
  Status: Proposed; in concept development; construction by 2021

- **RBMP40b RivieraBarrancaSW (City of Los Angeles).** The Riviera barranca is a proposed centralized BMP that would treat stormwater runoff from the adjacent channel in a 4,800-ft long bioswale running in a north-south direction through the Riviera Country Club. Multiple benefits include pollutant load reduction, aesthetic enhancements, and minor groundwater recharge.
  Status: Proposed; in concept development; construction by 2021

- **RBMP17 Mandeville (City of Los Angeles).** Mandeville Canyon is a planned centralized BMP, consisting of a roadside bioswale with underground storage capacity. Harvested stormwater will be treated via bioswale, stored within a subsurface tank and then used for park irrigation

purposes. In order to account for the capture and use components of the project, this BMP was modeled as an infiltration basin. Multiple benefits include pollutant load reduction, reduced potable water demands, and minor groundwater recharge.
Status: Planned; concept report completed; construction by 2021

- **RBMP43 OldOakRoad (City of Los Angeles).** RBMP43 is a recently constructed regional BMP (treating the 85th percentile storm), wherein a series of bioswales located along Old Oak Road (one block west of Sunset Boulevard) extend slightly beyond the intersection with Riviera Ranch Road.
Status: Existing; construction completed in 2014

Subwatershed 3-01 Regional/Centralized BMPs

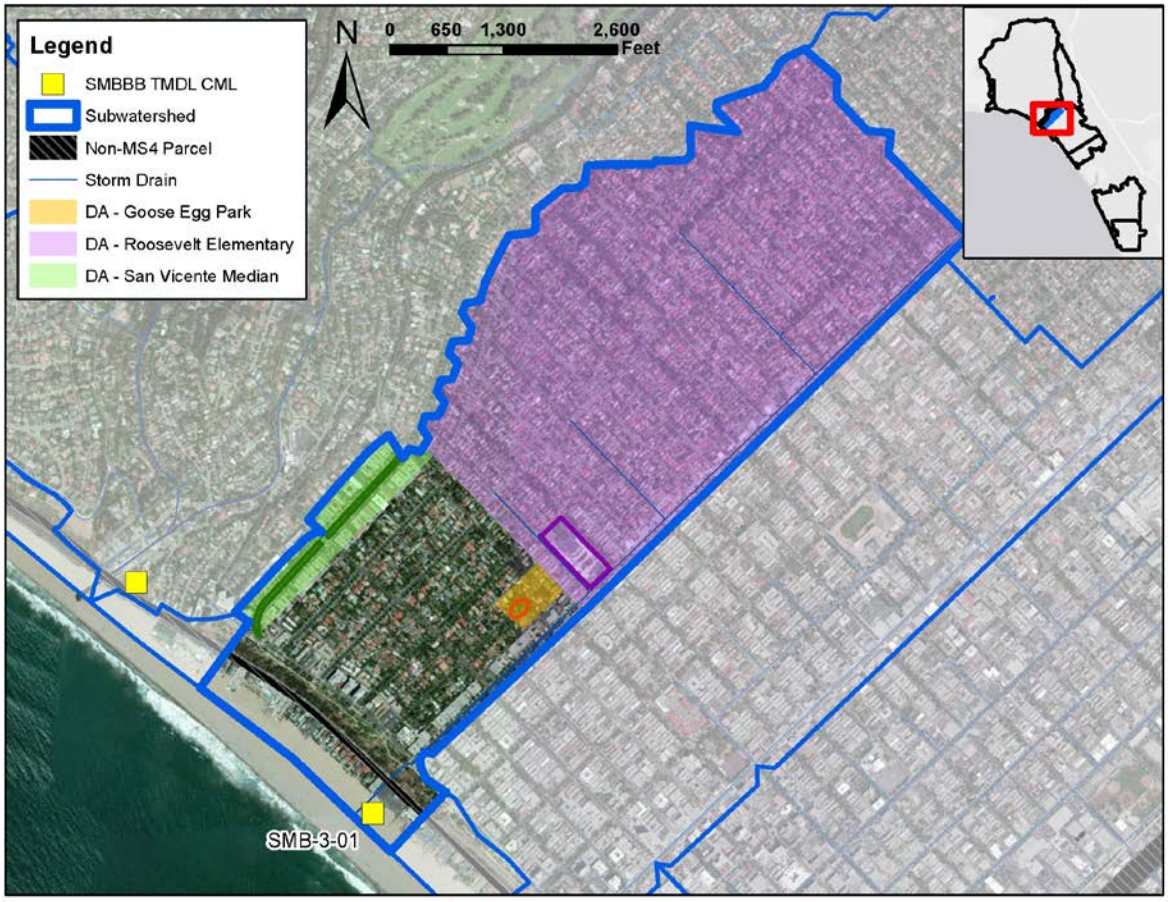
Three centralized BMPs are modeled within Subwatershed 3-01 (see **Figure 4-9**):

- **RBMP30 GooseEggPark (Lead Agency: City of Santa Monica).** RBMP30 is a proposed centralized BMP, consisting of an infiltration basin located in Goose Egg Park. A shallow 2-ft depth was selected for the model to allow for sizing adjustments if, based on site specific utility information, the full footprint is not found to be feasible. Multiple benefits include pollutant load reduction and groundwater recharge.
Status: Proposed; construction by 2021

- **RBMP31 RooseveltElemen (Lead Agency: City of Santa Monica).** RBMP31 is a proposed centralized BMP, consisting of a cistern located under the Roosevelt Elementary School athletic field and open green space on the front lawn. It is assumed that both areas can be used for direct onsite use and/or subsurface infiltration. A 96-hour drawdown time was assumed. Multiple benefits include pollutant load reduction and decreased reliance on potable water.
Status: Proposed; construction by 2018

- **RBMP29 SanVicenteMedian (Lead Agency: City of Santa Monica).** RBMP29 is a proposed centralized BMP, consisting of an infiltration basin located in the median of San Vicente Boulevard. A depth of 1-ft was assumed in order to reflect the potential for surface infiltration, modeled after a bioswale or bioretention-type BMP, and to allow for sizing adjustments if, based on site specific utility information, the full footprint is not found to be feasible. Harvest and use may also be an option to potentially supplement or replace landscape irrigation along the median. Multiple benefits include pollutant load reduction and potentially reduced reliance on potable water.
Status: Proposed; construction by 2021

Figure 4-9
Modeled Regional/Centralized BMPs within Subwatershed 3-01



- **RBMP30 GooseEggPark (Lead Agency: City of Santa Monica).** RBMP30 is a proposed centralized BMP, consisting of an infiltration basin located in Goose Egg Park. A shallow 2-ft depth was selected for the model to allow for sizing adjustments if, based on site specific utility information, the full footprint is not found to be feasible. Multiple benefits include pollutant load reduction and groundwater recharge.
  Status: Proposed; construction by 2021

- **RBMP31 RooseveltElemen (Lead Agency: City of Santa Monica).** RBMP31 is a proposed centralized BMP, consisting of a cistern located under the Roosevelt Elementary School athletic field and open green space on the front lawn. It is assumed that both areas can be used for direct onsite use and/or subsurface infiltration. A 96-hour drawdown time was assumed. Multiple benefits include pollutant load reduction and decreased reliance on potable water.
  Status: Proposed; construction by 2018

- **RBMP29 SanVicenteMedian (Lead Agency: City of Santa Monica).** RBMP29 is a proposed centralized BMP, consisting of an infiltration basin located in the median of San Vicente

Boulevard. A depth of 1-ft was assumed in order to reflect the potential for surface infiltration, modeled after a bioswale or bioretention-type BMP, and to allow for sizing adjustments if, based on site specific utility information, the full footprint is not found to be feasible. Harvest and use may also be an option to potentially supplement or replace landscape irrigation along the median. Multiple benefits include pollutant load reduction and potentially reduced reliance on potable water.
Status: Proposed; construction by 2021

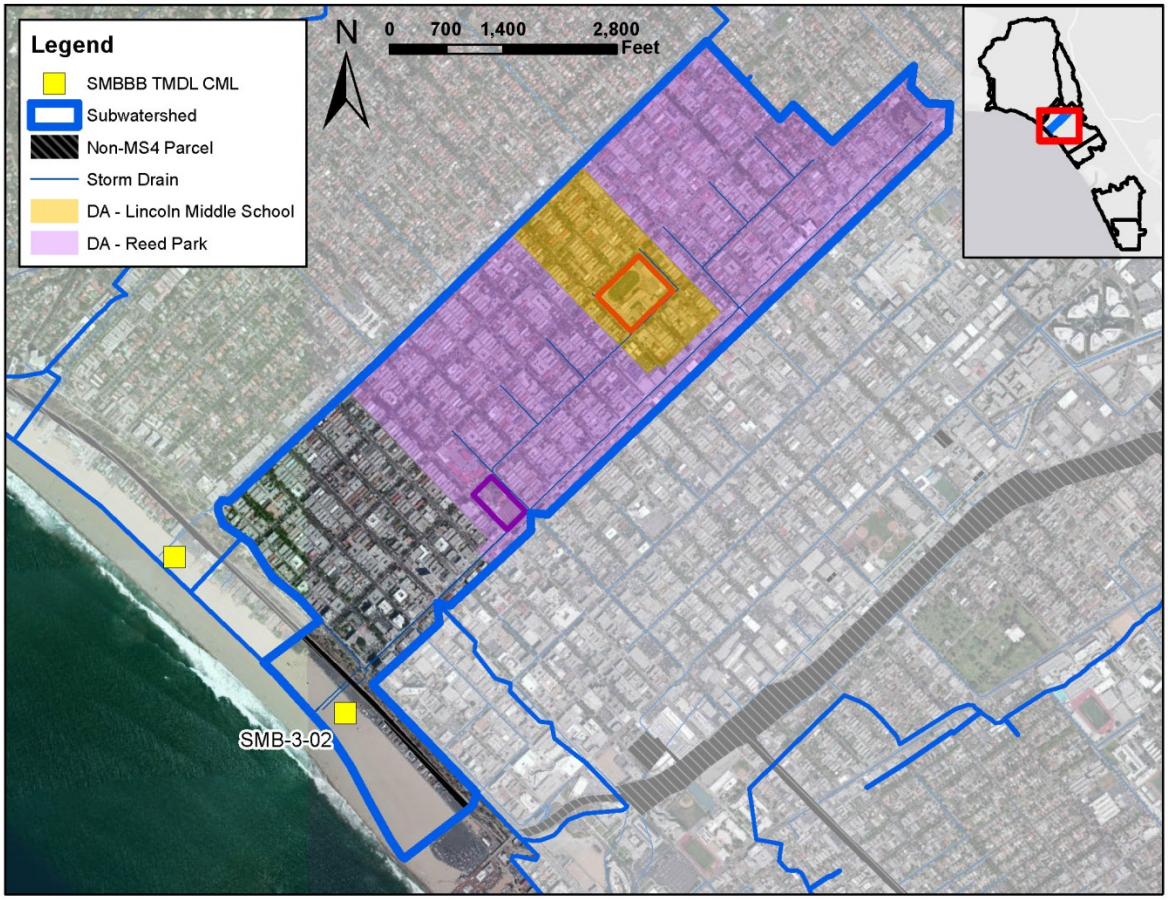
Subwatershed 3-02 Regional/Centralized BMPs

Two centralized BMPs are modeled within Subwatershed 3-02 (see **Figure 4-10**):

- **RBMP32 ReedPark (Lead Agency: City of Santa Monica).** RBMP32 is a proposed centralized BMP, consisting of a cistern located under the tennis courts intended to be used for irrigation and green space at Reed Park in Santa Monica. It is modeled as a shallow infiltration basin to best reflect capture rates and volume losses. A portion of captured stormwater could also be infiltrated in addition to the harvest and use plan. Multiple benefits include pollutant load reduction and reduced potable water demand.
  Status: Proposed; construction by 2018

- **RBMP33 LincolnMiddleSch (Lead Agency: City of Santa Monica).** RBMP33 is a proposed centralized BMP, consisting of a cistern located under the Lincoln Middle School athletic field, intended to be used for irrigation. It is modeled as a shallow infiltration basin to best reflect capture rates and volume losses, and a portion of captured stormwater could also be infiltrated in addition to the harvest and use plan. Multiple benefits include pollutant load reduction and potential for reduced potable water demand.
  Status: Proposed; construction by 2021

Figure 4-10
Modeled Regional/Centralized BMPs within Subwatershed 3-02

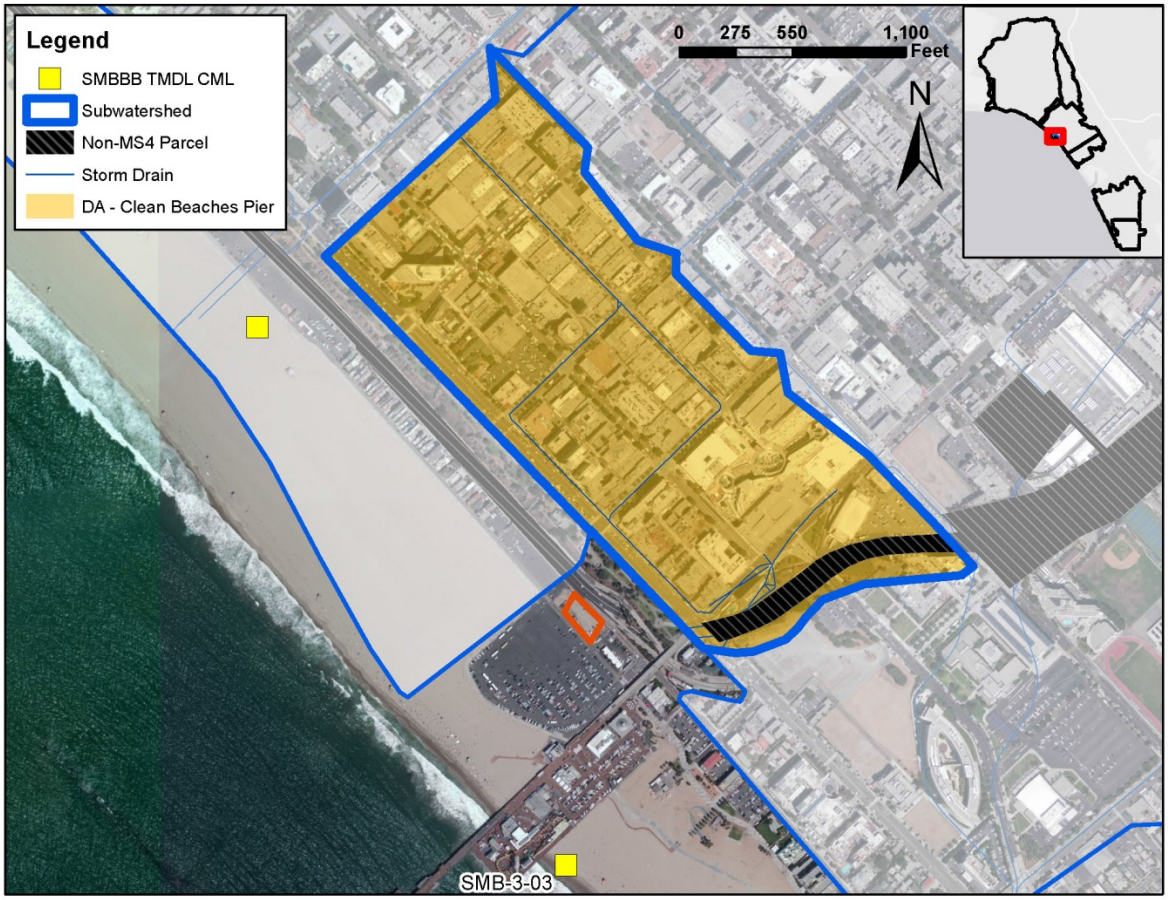


Subwatershed 3-03 Regional/Centralized BMPs

One centralized BMP is modeled within Subwatershed 3-03 (see **Figure 4-11**):

- **RBMP16a CleanBeachesPier (Lead Agency: City of Santa Monica).** RBMP16a is a planned centralized BMP, consisting of a storage, treatment, and use project located immediately north of the Santa Monica Pier, adjacent to the City Beach Maintenance Yard. This project will divert runoff stormwater runoff to modular storage tanks for treatment and use via the existing SMURRF plant. It is modeled as an infiltration basin to best reflect capture rates and volume losses. The average depth of the basin was determined assuming a 96-hr drawdown time.
  Status: Planned; concept developed; construction by 2018

Figure 4-11
Modeled Regional/Centralized BMPs within Subwatershed 3-03



Subwatershed 3-04 Regional/Centralized BMPs

Six regional/centralized BMPs are modeled within Subwatershed 3-04 (see **Figure 4-12**):

- **RBMP44 Brentwood85 (Lead Agency: City of Los Angeles).** RBMP44 is a planned regional BMP (designed to capture the 85th percentile storm), consisting of a large-scale storage, treatment and use project located at the Brentwood Golf Course. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, all harvested stormwater will be used for golf course irrigation purposes. The assumed depth of the basin was determined assuming a 96-hr drawdown time. Multiple benefits include pollutant load reduction and reduced potable water demand.
  Status: Planned; concept report developed; construction by 2021

- **RBMP55 Memorial85 (Lead Agency: City of Santa Monica).** RBMP44 is a proposed regional BMP (designed to capture the 85th percentile storm), consisting of a storage tank located within Memorial Park and designed to capture the 85th percentile, 24-hour volume. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, the harvested stormwater would be used for irrigation and flushing purposes. The assumed depth of the basin

was determined assuming a 96-hr drawdown time. Multiple benefits include pollutant load reduction and reduced potable water demand.
Status: Proposed; construction by 2021

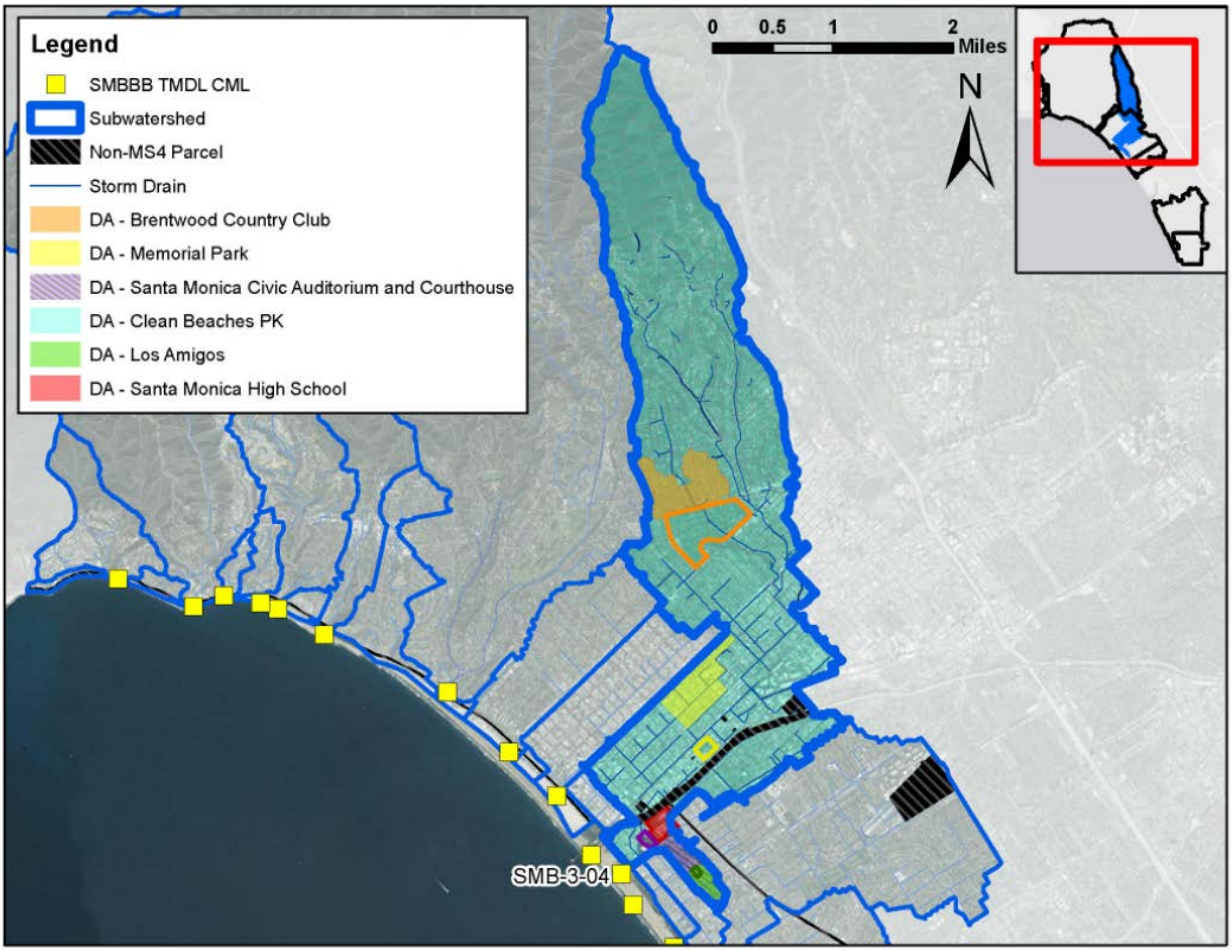
- **RBMP52 SMCivicAud85 (Lead Agency: City of Santa Monica).** RBMP52 is a proposed regional BMP (designed to capture the 85th percentile storm), consisting of a subsurface storage tank located under the parking lot for the Santa Monica Civic Center Auditorium. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, harvested stormwater would be used for irrigation and flushing purposes. Multiple benefits include pollutant load reduction and potential for reduced potable water demand.
Status: Proposed; construction by 2021

- **RBMP16b CleanBeachesPK (Lead Agency: City of Santa Monica).** RBMP16b is a planned centralized BMP, consisting of a large-scale storage, treatment and use project located at the existing Pico-Kenter Pump Station area, on the beach adjacent to the outfall channel. The storage tanks would allow captured stormwater to be transferred to the SMURRF for treatment and use. It is modeled as an infiltration basin to best reflect capture rates and volume losses. The assumed depth of the basin was determined assuming a 96-hr drawdown time.
Status: Planned; concept report developed; construction by 2021

- **RBMP11 LosAmigos (Lead Agency: City of Santa Monica).** RBMP11 is a proposed centralized BMP, consisting of a large-scale storage, treatment, and use project located within Los Amigos Park. It would be constructed as a cistern but is represented as an infiltration basin for the RAA to best reflect capture rates and volume losses. All stormwater harvested by this project would be used for indoor flushing and irrigation purposes. The assumed depth of the basin was determined assuming a 96-hr drawdown time. Multiple benefits include pollutant load reduction and reduced potable water demand.
Status: Proposed; construction by 2021

- **RBMP53 SMHSBuilt (Lead Agency: City of Santa Monica).** RBMP34 is a recently constructed centralized BMP, consisting of an infiltration and permeable pavement project located at Santa Monica High School. It is modeled as both an infiltration basin as well as permeable pavement.
Status: Existing; construction completed YYYY

Figure 4-12
Modeled Regional/Centralized BMPs within Subwatershed 3-04

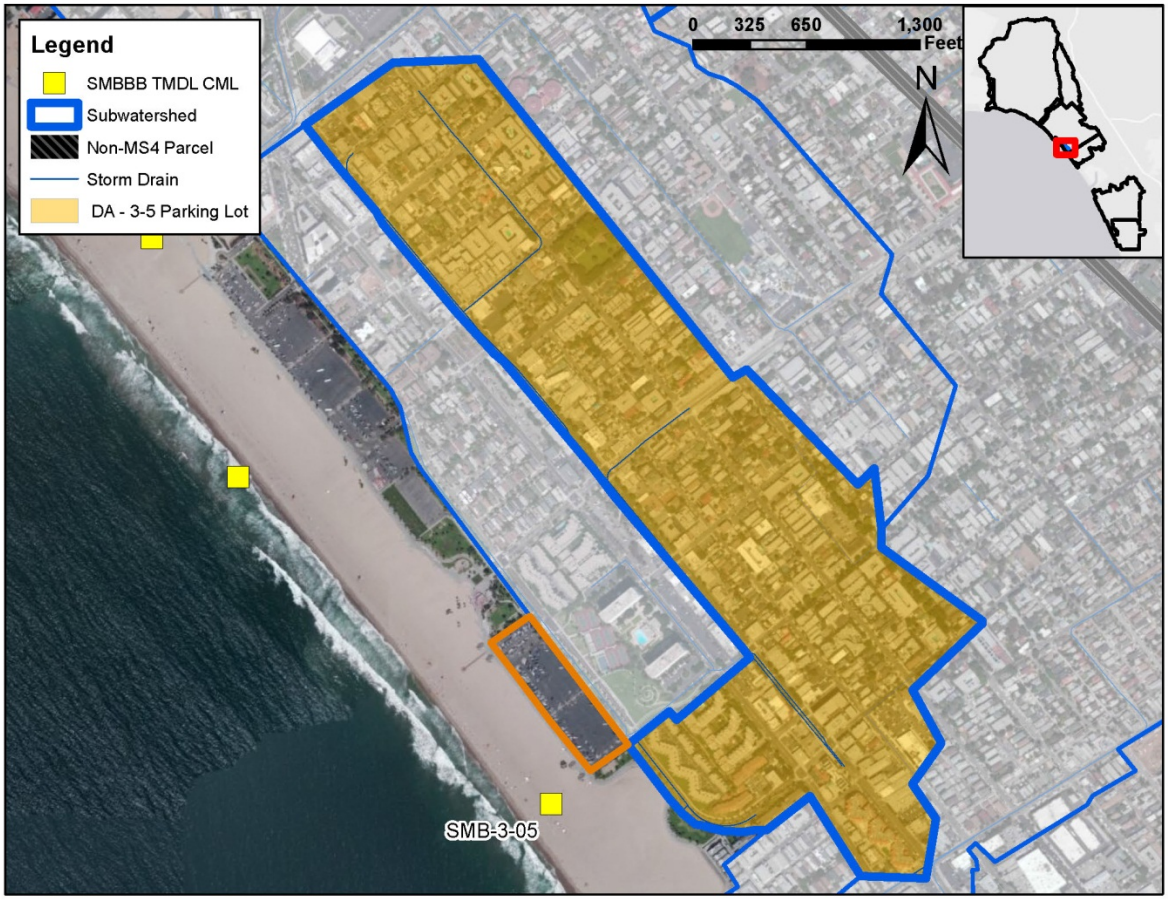


Subwatershed 3-05 Regional/Centralized BMPs

One centralized BMP is modeled within Subwatershed 3-05 (see **Figure 4-13**):

- **RBMP37 3-5ParkingLot (Lead Agency: City of Santa Monica).** RBMP37 is a proposed centralized BMP, consisting of a subsurface infiltration basin located under the parking lot adjacent to Ocean Beach Park in between Ocean Front Walk and Barnard Way. A shallow 2-ft depth was assumed in order to minimize the potential impacts due to tidal influences, although this should be evaluated in further stages of design. This parcel is state-owned and related permissions would need to be obtained.
  Status: Proposed; construction by 2018

Figure 4-13
Modeled Regional/Centralized BMPs within Subwatershed 3-05



Subwatershed 3-06 Regional/Centralized BMPs

Four centralized BMPs are modeled within the Subwatershed 3-06 (see **Figure 4-14**):

- **RBMP38 OlympicHigh (Lead Agency: City of Santa Monica).** RBMP38 is a proposed centralized BMP, consisting of an infiltration basin located under the parking lot at Olympic Continuation High School. A shallow 2-ft depth was assumed to allow for the same volume capture, but with a smaller footprint, if further stages of design indicate that such and adjustment is necessary. This project is modeled as an infiltration basin to best reflect capture rates and volume losses, however, a portion of the harvested stormwater may be used for irrigation purposes. Multiple benefits include pollutant load reduction and potential for reduced potable water demand.
  Status: Proposed; construction by 2021

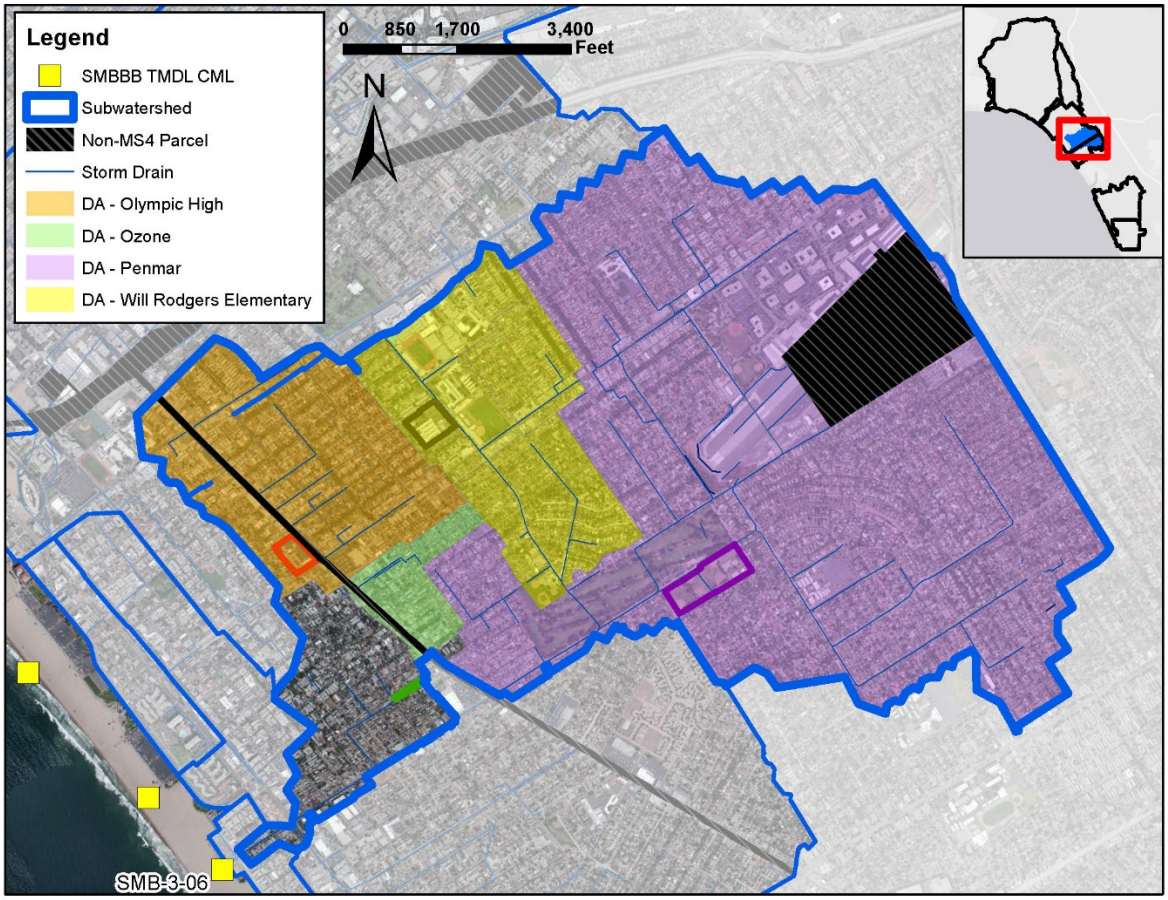
- **RBMP13 Ozone (Lead Agency: City of Santa Monica).** RBMP13a is a proposed centralized BMP, consisting of a large-scale storage, treatment and use project located within Ozone Park. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, all harvested stormwater would be used for irrigation purposes. The modeled infiltration rate is

intended to reflect a discharge rate of 1.2 cubic feet per second. Multiple benefits include pollutant load reduction and reduced potable water demand.
Status: Proposed; construction by 2018

- **RBMP10 PenmarPh2 (Lead Agency: City of Los Angeles).** RBMP10 is a planned centralized BMP, which would include an expansion to the recently constructed large-scale storage, treatment and diversion project (adding 3,300 cubic feet of storage volume to the existing 367,000 cubic feet). It is modeled as an infiltration basin to best reflect capture rates and volume losses, however, all harvested stormwater will be pumped at the discharge rate, assumed based on a 96-hour drawdown time, to the wastewater treatment plant. Harvested stormwater may potentially be used at Santa Monica's Marine Park.
Status: Planned; construction by 2021

- **RBMP39 WillRodgersElem (Lead Agency: City of Santa Monica).** RBMP39 is a proposed centralized BMP, consisting of a subsurface infiltration basin located under the field and paved play areas at Will Rogers Elementary School. It is modeled as an infiltration basin to best reflect capture rates and volume losses, however a portion of the captured stormwater may be used for irrigation and flushing purposes. Multiple benefits include pollutant load reduction and potential for reduced potable water demand.
Status: Proposed; construction by 2021

Figure 4-14
Modeled Regional/Centralized BMPs within Subwatershed 3-06



Subwatershed 3-07 Regional/Centralized BMPs

Four regional BMPs are modeled within Subwatershed 3-07 (see **Figure 4-15**):

- **RBMP01b GrandBlvdIMF (Lead Agency: City of Los Angeles).** RBMP01b includes four existing tree wells located at the intersection of Grand Boulevard and Riviera Avenue. The tree boxes filter stormwater through soil filter media and treated flows are captured in an underdrain connected to the adjacent downstream catch basin. It is modeled as media filters to best reflect pollutant concentration and volume reductions. Multiple benefits include pollutant load reduction, and street greening.
  Status: Existing; construction completed YYYY

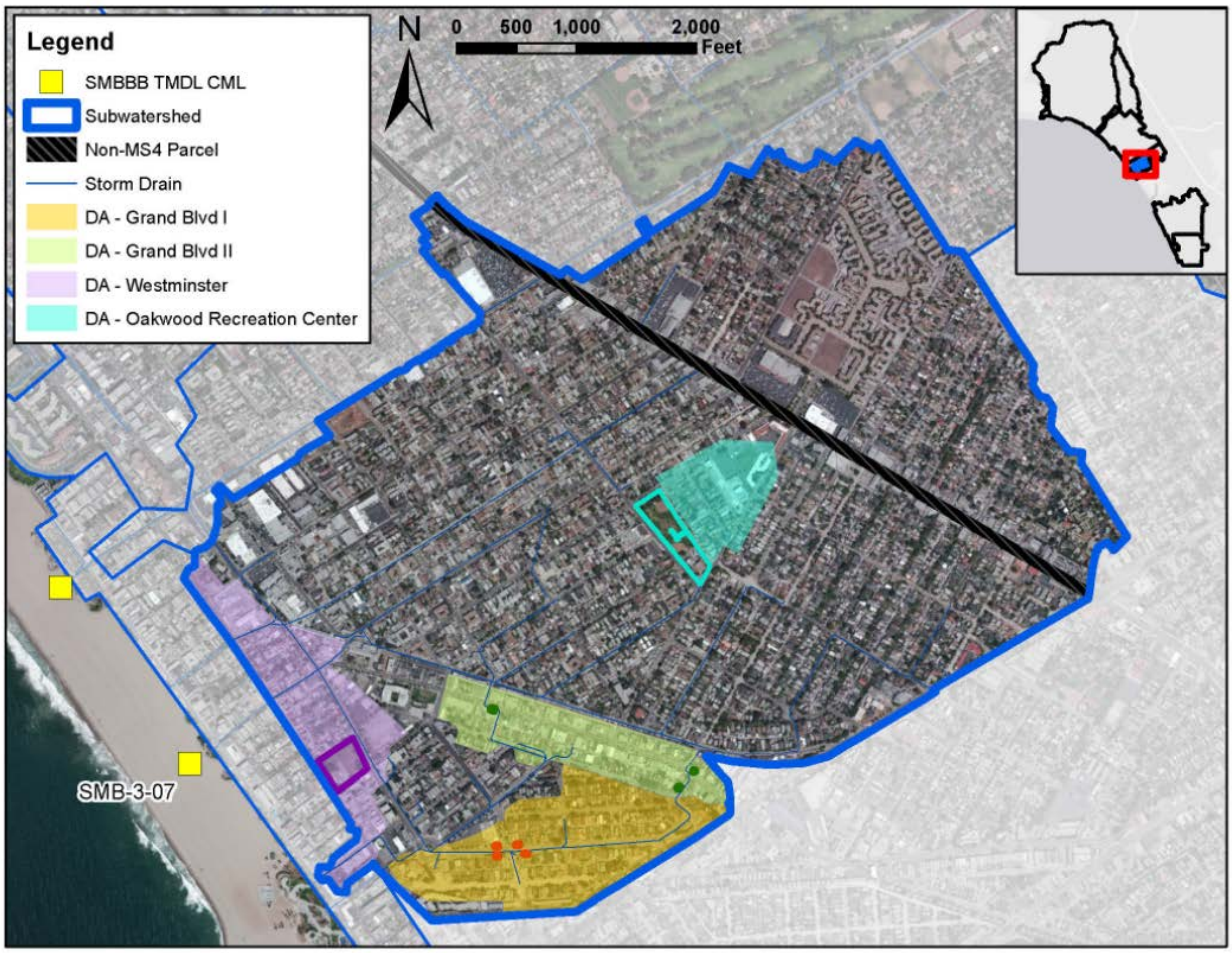
- **RBMP21b GrandBlvdIIMF (Lead Agency: City of Los Angeles).** RBMP21b includes four existing tree wells located along Abbot Kinney Boulevard between Rialto Avenue and Santa Clara Avenue. The tree boxes filter stormwater through soil filter media and treated flows are captured in an underdrain connected to the adjacent downstream catch basin. It is modeled as media filters to best reflect pollutant concentration and volume reductions. Multiple benefits include pollutant load reduction and street greening.

Status: Existing; construction completed YYYY

- **RBMP03 Westminster (Lead Agency: City of Los Angeles).** RBMP03 is an existing centralized BMP, consisting of a bioswale, constructed wetland, and diversion to sewer located within the Westminster Dog Park. It is represented as an infiltration basin for the RAA to best reflect capture rates and volume losses. The diversion rate to the sewer assumes a 96-hr drawdown time.
  Status: Existing; construction completed YYYY

- **RBMP06 Oakwood85 (Lead Agency: City of Los Angeles).** RBMP06 is a planned regional BMP (capturing the 85th percentile storm), consisting of an infiltration basin located at the Oakwood Recreation Center. It is modeled as an infiltration basin to best reflect capture rates and volume losses however a portion of harvested stormwater may be used for park irrigation purposes. Multiple benefits include pollutant load reduction, groundwater recharge, and potential for reduced potable water demand.
  Status: Planned; concept report completed; construction by 2021

Figure 4-15
Modeled Regional/Centralized BMPs within Subwatershed 3-07

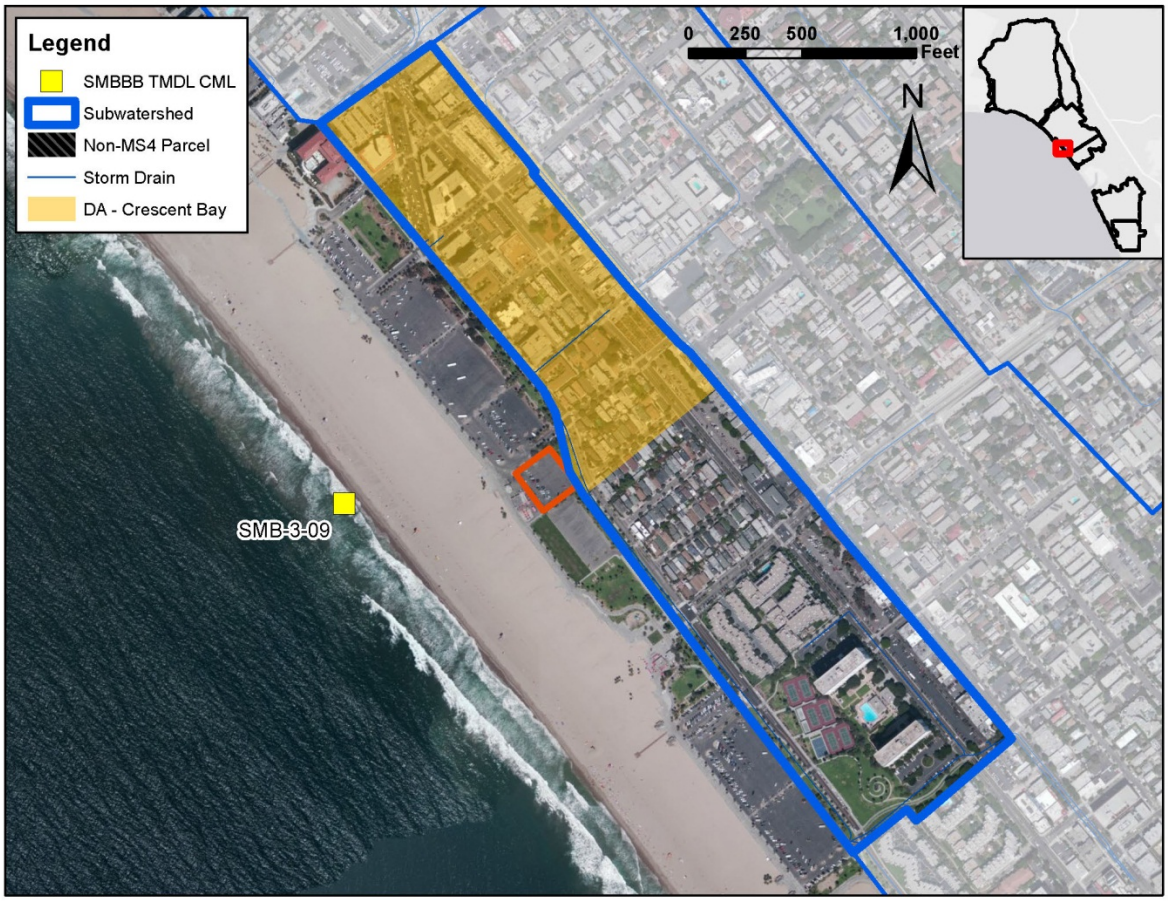


Subwatershed 3-09 Regional/Centralized BMPs

One regional BMP is modeled within Subwatershed 3-09 (see **Figure 4-16**):

- **RBMP18 CrescentBay (Lead Agency: City of Los Angeles).** RBMP18 is a proposed regional BMP, consisting of a subsurface permeable pavement infiltration basin located under the parking lot near Crescent Park. This green beach parking lot is modeled as an infiltration basin to best reflect capture rates and volume losses. The average depth was set to reflect a reasonable permeable pavement depth of three feet of sub-base with a 40 percent void ratio. Multiple benefits include pollutant load reduction and groundwater recharge.
  Status: Proposed; construction by 2018

Figure 4-16
Modeled Regional/Centralized BMPs within Subwatershed 3-09



Subwatershed 2-11 Regional/Centralized BMPs

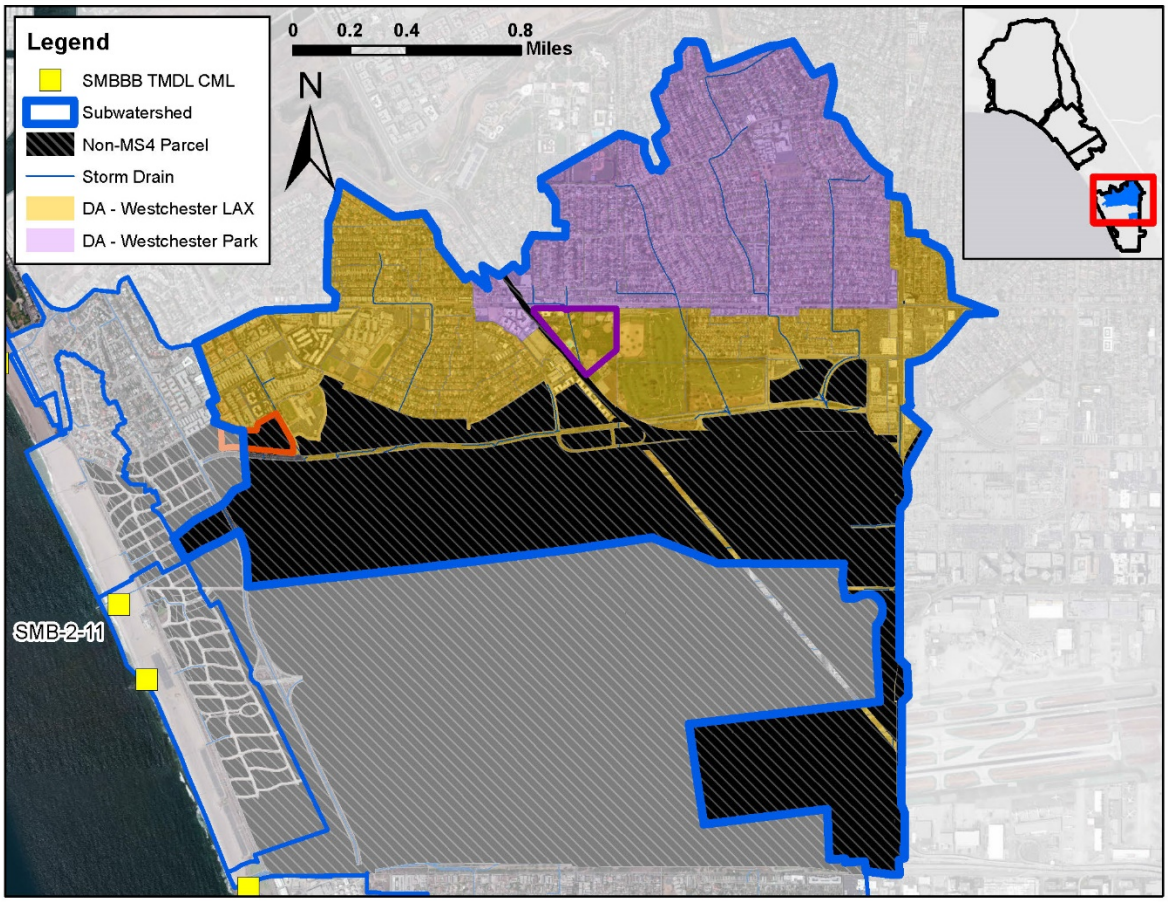
Two regional BMPs are modeled within Subwatershed 2-11 (see **Figure 4-17**):

- **RBMP19 WestchesterPark (Lead Agency: City of Los Angeles).** RBMP19 is a planned regional BMP, consisting of an infiltration basin located in Westchester Park. A Corrugated

Metal Pipe (CMP) laid above a layer of stone will be used as the detention and infiltration system. It is modeled as an infiltration basin to best reflect capture rates and volume losses however a portion of the harvested stormwater may be treated and used to irrigate Westchester Park. Multiple benefits include pollutant load reduction, groundwater recharge, and potential for reduced potable water demand.
Status: Planned; concept report completed; construction by 2021

- **RBMP09 Westchester LAX (Lead Agency: City of Los Angeles).** RBMP09 is a planned regional BMP, consisting of a large-scale subsurface infiltration basin located in Westchester adjacent to LAX airport. This project is modeled to reflect preliminary designs to divert stormwater into a subsurface tank, where it will be stored and pumped at the dewatering rate (20 cubic feet per second) to a separate subsurface infiltration gallery. Multiple benefits include pollutant load reduction and groundwater recharge.
Status: Planned; concept in development; construction by 2021

Figure 4-17
Modeled Regional/Centralized BMPs within Subwatershed 2-11



Subwatershed 2-13 Regional/Centralized BMPs

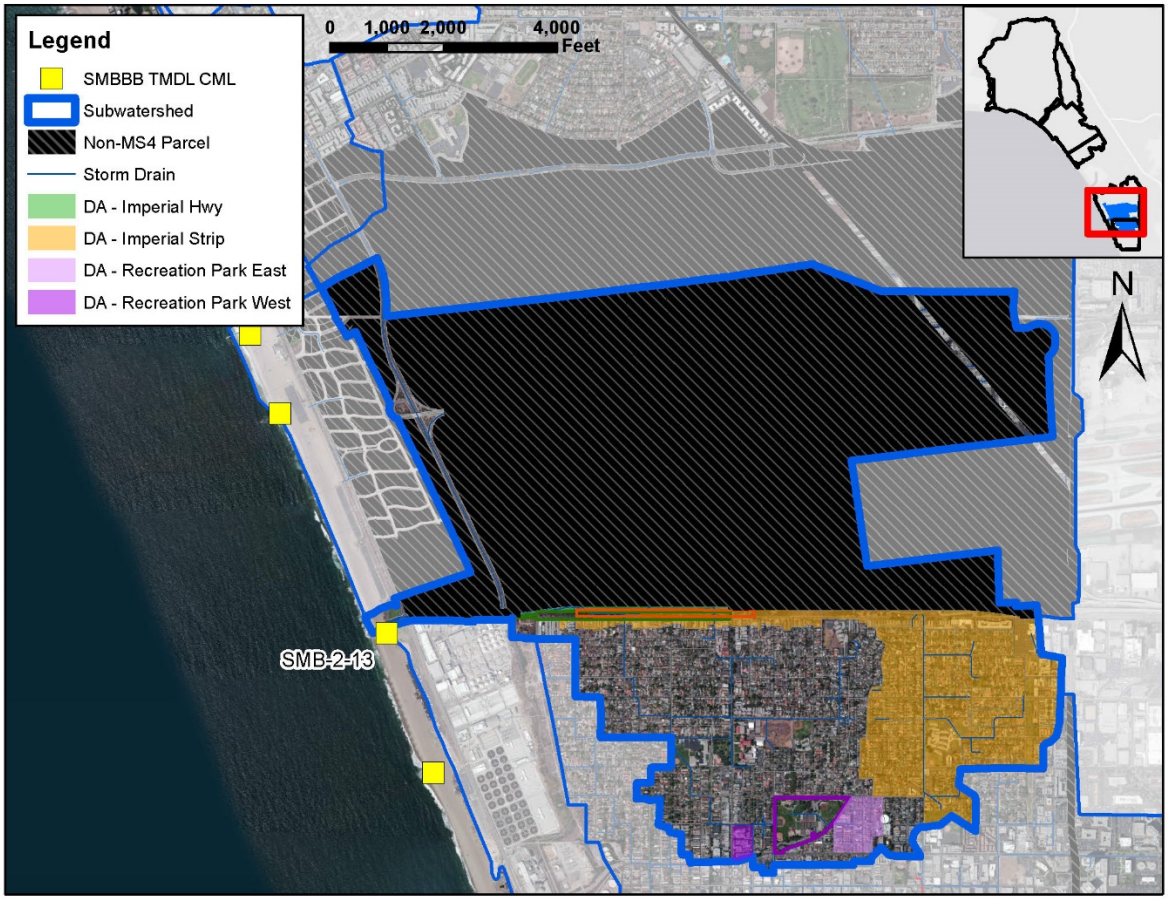
Three regional/centralized BMPs are modeled within Subwatershed 2-13 (see Figure 4-18)

- **RBMP02 ImperialHwy (Lead Agency: City of El Segundo).** RBMP02 is an existing centralized BMP, consisting of a bioswale and dry well located within the median along Imperial Highway. This BMP was modeled as an infiltration basin to account for volume losses. Multiple benefits include pollutant load reduction and groundwater recharge.
  Status: Existing; construction completed YYYY

- **RBMP42 ImperialStrip (Lead Agency: City of El Segundo).** RBMP42 is a planned centralized BMP, consisting of a series of two 350-ft long roadside bioswales located in the area between Imperial Highway and Imperial Avenue, from Main Street to Hillcrest Street. Pressurized flow from Pump Station 17 is directed to these bioswales and conveyed back to the storm drain in Imperial Highway after treatment. It is modeled as a bioswale to best reflect pollutant filtration and some volume losses.
  Status: Planned; construction by 2018

- **RBMP42 ImperialStrip (Lead Agency: City of El Segundo).** RBMP42 is a planned centralized BMP, consisting of a series of two 350-ft long roadside bioswales located in the area between Imperial Highway and Imperial Avenue, from Main Street to Hillcrest Street. Pressurized flow from Pump Station 17 is directed to these bioswales and conveyed back to the storm drain in Imperial Highway after treatment. It is modeled as a bioswale to best reflect pollutant filtration and some volume losses.
  Status: Planned; construction by 2018

Figure 4-18
Modeled Regional/Centralized BMPs within Subwatershed 2-13

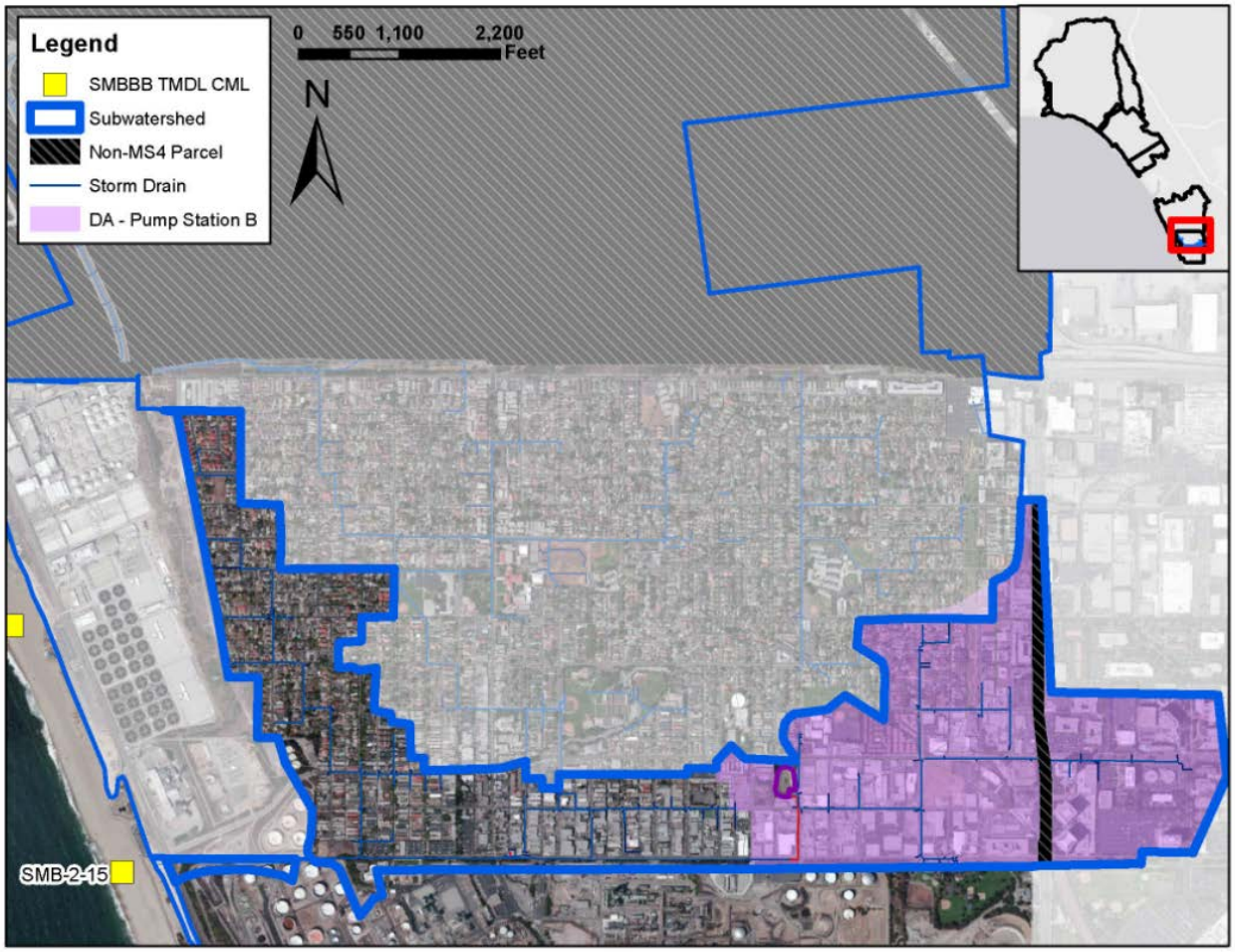


Subwatershed 2-15 Regional/Centralized BMPs

One regional BMP is modeled within Subwatershed 2-15 (see **Figure 4-19**):

- **RBMP41 PumpStationB85 (Lead Agency: City of El Segundo).** RBMP41 is a proposed regional BMP (caturing the 85th percentile storm), consisting of an infiltration basin located at the existing LA County Line B Pump Station. The basin floor will be replaced with a pervious structural section below the basin invert and sized to capture the 85th percentile, 24-hour design event. It is modeled as an infiltration basin to best reflect capture rates and volume losses. Multiple benefits include pollutant load reduction and groundwater recharge.
  Status: Proposed; brief concept report developed; construction by 2018

Figure 4-19
Modeled Regional/Centralized BMPs within Subwatershed 2-15



Regional Projects

Through an extensive screening process and coordination with the SMB EWMP Group, eight proposed regional EWMP project sites were selected for conceptual design. These eight regional projects will retain and infiltrate or beneficially reuse stormwater runoff for the drainage area tributary to the project.

The location and BMP type of the eight proposed regional EWMP projects are summarized in **Table** 25 and shown on **Figure 4-20**.

Table 4-7
Summary of Regional EWMP Projects

Regional EWMP Project	BMP Type	Jurisdiction	Address / Location
Brentwood Country Club	Storage and Use	City of Los Angeles	590 S Burlingame Ave, Los Angeles, CA 90049
Oakwood Recreation Center	Storage and Use	City of Los Angeles	767 California Ave, Venice, CA 90291
Riviera Country Club	Storage and Use	City of Los Angeles	1250 Capri Dr., Pacific Palisades, CA 90272
Rustic Canyon Recreation Center	Subsurface Infiltration	City of Los Angeles	601 Latimer Rd., Santa Monica, CA 90402
Line B Pump Station	Surface Infiltration	City of El Segundo	201-223 Center St., El Segundo, CA 90245
Recreation Park	Subsurface Infiltration	City of El Segundo	401 Sheldon St., El Segundo, CA 90245
Memorial Park	Storage and Use	City of Santa Monica	1401 Olympic Blvd., Santa Monica, CA 90404
Santa Monica Civic Auditorium and Courthouse	Subsurface Infiltration	City of Santa Monica	1855 Main St, Santa Monica, CA 90401

Project Design Criteria

A conceptual level design was developed for each of the example regional EWMP projects that include the selection of BMP type, preliminary sizing, configuration, and diversion pipeline alignment. Based on discussions with the SMB EWMP Group and industry standards, the criteria and assumptions presented provided the basis for the conceptual designs. During the final design process and implementation phase of the projects, these assumptions should be reevaluated.

Figure 4-20
Highlighted Regional EWMP Projects

4.2.4. Additional Structural BMPs

A list of planned regional projects has been developed for the EWMP based on a review of existing watershed planning documents, including TMDL Implementation Plans, Integrated Regional Water Management Plans, and other documents provided by the SMB EWMP Group. Along with this preliminary list, additional distributed structural BMPs were considered. Detailed descriptions of BMP types can be found in the EWMP Work Plan. (MWH Team A, 2014).

Green streets were the primary form of distributed structural BMP considered. This type of BMP is designed to capture and infiltrate stormwater runoff from nearby areas through the use of biofiltration and bioretention. Bioretention stormwater treatment facilities are landscaped shallow depressions that slow capture and filter stormwater runoff. These facilities function as a soil- and plant-based filtration device that removes pollutants through a variety of natural physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plantings. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. An optional gravel layer can be added below the planting soil to provide additional storage volume for infiltration. Bioretention is typically designed without an underdrain to serve as a retention BMP in areas of high soil permeability – runoff treated via filtration would infiltrate to the underlying soils after leaving the unit. Bioretention with an underdrain (or "biofiltration") is a treatment control measure that can be used for areas with low permeability native soils or steep slopes, to allow for the treatment of runoff through filtration despite impermeable underlying soils. Bioretention can also be designed with a raised underdrain (or "bioinfiltration"), and would function more as an infiltration / full-capture BMP. **Figure 4-21** through **Figure 4-23** below show a potential green street project.

Bioswales were also considered as an additional structural BMP. Bioswales (also known as vegetated swales) are open, shallow channels with low-lying vegetation covering the side slopes and bottom topography that collect and slowly convey runoff to downstream discharge points. Bioswales provide pollutant removal through settling and filtration in the vegetation (usually grasses) lining the channels, thereby allowing for stormwater volume reduction through infiltration and evapotranspiration, reduction in the flow velocity, and conveyance of stormwater runoff. The vegetation in the bioswale can vary depending on its location, depending on the design criteria outlined in this section.

Figure 4-21
Potential Green Streets Project in Pacific Palisades

Figure 4-22
Potential Green Streets Project in Pacific Palisades

Figure 4-23
Section View of Bioretention with Underdrain

4.3. NON-STORM WATER DISCHARGE CONTROL MEASURES

The overarching goal of BMPs in the EWMP is to reduce the impact of stormwater and non-stormwater on receiving water quality. The MS4 permit effectively prohibits non-stormwater discharges, and the SMB TMDL includes dry weather compliance requirements for bacteria in 2006. The SMB EWMP Group's dry weather compliance approach is to eliminate 100 percent of non-exempt dry weather MS4 discharges through a combination of existing LFDs and a suite of non-structural source controls (e.g., water conservation incentives, enhanced IDDE efforts, and enhanced education/outreach and inspection/enforcement to address sources of non-stormwater flow) and source investigations following dry weather outfall screening. The primary mechanism to maintain compliance is the use of LFDs. These diversions are effectively eliminating non-stormwater surface discharges to the surf zone during dry weather days. By eliminating flows, this is equivalent to 100 percent load reduction for all pollutants, thereby demonstrating reasonable assurance of meeting all applicable Permit limitations during dry weather. Elimination of discharges is a pathway for compliance with RWLs and WQBELs in the MS4 permit (per section VI.E.2.e.i.(3)); without discharges there can be no "cause or contribute" to receiving water issues.

Section 5
EWMP Implementation Schedule

The EWMP Implementation Plan is the schedule for compliance for each jurisdiction to address water quality priorities and comply with the provisions of the MS4 Permit. Through the RAA, a series of quantitative analyses were used to identify the capacities of LID, green streets and regional BMPs that comprise the EWMP Implementation Plan and assure those control measures will address the Water Quality Priorities per the milestones/compliance schedules. EWMP Implementation Plan provides a BMP-based compliance pathway for each jurisdiction under the MS4 Permit. This section describes the EWMP Implementation Plan and the pace of its implementation to achieve applicable milestones, through the following subsections:

- Compliance Schedule of Stormwater Control Measures
- Stormwater Control Measures to be Implemented by 2018 for Bacteria Milestone Compliance
- Stormwater Control Measures to be Implemented by 2021 for Bacteria TMDL Compliance
- Other Constituents and TMDL Compliance
- Summary of Permittee Actions

5.1. COMPLIANCE SCHEDULE OF STORMWATER CONTROL MEASURES

As described in Section 2 of the EWMP, scheduling of control measure implementation is based on the milestones of the SMB Beaches TMDLs, as follows:

- Bacteria
    - Milestone 1: Achieve 50% of the reduction for wet weather bacteria (2018)
    - Milestone 2: Achieve 100% of the reduction for wet weather bacteria (2021)
- Debris
    - Milestone 1: Achieve 20% of the reduction for debris (2016)
    - Milestone 2: Achieve 40% of the reduction for debris (2017)
    - Milestone 3: Achieve 60% of the reduction for debris (2018)
    - Milestone 4: Achieve 80% of the reduction for debris (2019)
    - Milestone 5: Achieve 100% of the reduction for debris (2020)
- DDT
    - Compliance schedule is to be determined
- PCB
    - Compliance schedule is to be determined

5.2. STORMWATER CONTROL MEASURES TO BE IMPLEMENTED BY 2018 FOR BACTERIA MILESTONE COMPLIANCE

In order to demonstrate reasonable assurance, BMPs were identified in a prioritized manner. Prioritization was based on cost (low cost BMPs were prioritized); BMP effectiveness for the pollutants of concern, and implementation feasibility as determined by desktop screening. Non-structural BMPs typically were prioritized over structural BMPs due to their lower relative cost.

The interim compliance deadline for the SMB Beaches TMDL requires a 50 percent reduction in exceedance days; this will be met by achieving 50 percent of the TLR in each subwatershed, through a combination of non-structural, distributed green streets BMPs, existing centralized/regional BMPs and fast-tracked centralized/regional BMPs. Assuming a phased implementation, that can be controlled by the Permittee, it was assumed that 50 percent of the proposed distributed green streets BMPs would be implemented in all subwatersheds between 2015 and 2018, and 50 percent would be implemented between 2018 and 2021.

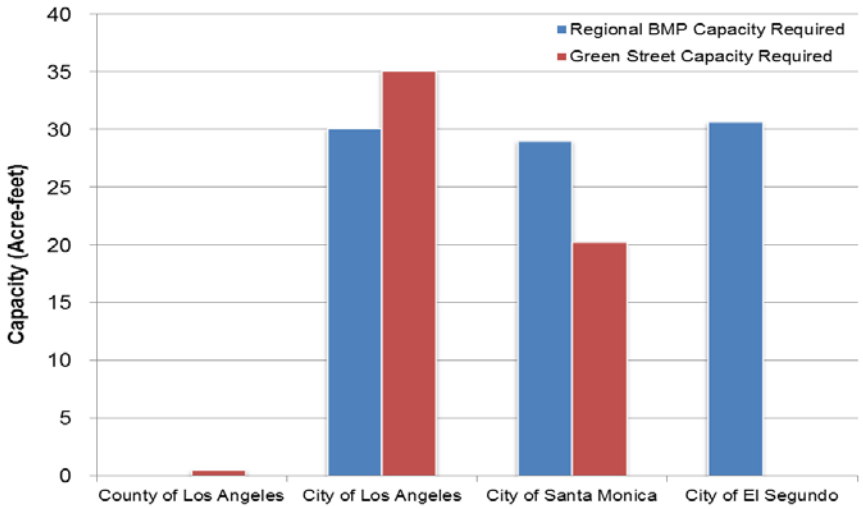
In subwatershed that needed additional load reductions beyond the default to meet the interim targets, the implementation of a higher relative percentage (greater than 50 percent) of distributed BMPs before 2018 was prioritized first, and fast-tracking specific planned or proposed regional BMPs was prioritized second. In subwatersheds where no distributed green streets BMPs are necessary to meet the final compliance deadlines, regional BMPs were prioritized to reduce redundant load reductions. However, in subwatershed 2-11, a small number of distributed green streets BMPs (5 percent of single family and commercial areas) were added rather than fast-tracking the large-scale regional projects, which would meet the interim and final targets is constructed alone. Alternatively, if the regional projects can be fast-tracked to be operable by 2018, then no distributed green streets BMPs would be required. The incremental load reduction between Penmar Phase I (existing) and Penmar Phase II (planned) can be considered is negligible. Therefore, the full load reduction applicable to Penmar Phase II has been applied to the interim compliance deadline/target. **Table 26** lists projects that must be completed by 2018 to meet the milestone TLRs in all subwatersheds. **Figure 5-1** illustrates the required capacity in 2018 to meet be in compliance with the SMB Beaches TMDL. On a SMB EWMP Group watershed-wide basis, at the time of the interim compliance deadline (2018), a 22 percent load reduction is estimated. Further detailed scheduling for each jurisdiction including volumes of stormwater to be managed and control measure capacities, volumes of stormwater (compliance targets) to be managed are presented in **Appendix A**. Each jurisdiction has a standalone recipe for each assessment area/watershed.

Table 5-1
Summary of Regional and Centralized BMPs Required Compliance in 2018

Sub-watershed	Regional/Centralized BMP Identifier	Permittee[1]	BMP Status	Type	Volume (ft^3)
2-07	RBMP47 – Riviera	LA	Planned	Infiltration	2,600,000
2-07	*RBMP43 – Old Oak Rd*	*LA*	*Existing*	*Bioswale*	*NA*
3-01	RBMP31 - Roosevelt Elem	SM	Proposed	Infiltration	196,000
3-02	RBMP32 – Reed Park	SM	Proposed	Infiltration	192,000
3-03	RBMP16a - Clean Beaches Pier	SM	Planned	Infiltration	160,000
3-04	*RBMP53 – SMHS Built*	*SM*	*Existing*	*Infiltration*	*40,000*
3-05	RBMP37 - 3-5 Parking Lot	SM	Proposed	Infiltration	409,000
3-06	RBMP13 - Ozone	SM	Proposed	Infiltration	105,000
3-06	RBMP10 – Penmar Ph2	LA	Planned	Infiltration	371,000
3-07	*RBMP01b – Grand Blvd IMF*	*LA*	*Existing*	*Media Filter*	*NA*
3-07	*RBMP21b – Grand Blvd IIMF*	*LA*	*Existing*	*Media Filter*	*NA*
3-07	*RBMP03 - Westminster*	*LA*	*Existing*	*Infiltration*	*1,460*
3-09	RBMP18 – Crescent Bay	LA	Proposed	Infiltration	34,300
2-13	*RBMP02 – Imperial Hwy*	*ES*	*Existing*	*Infiltration*	*54,800*
2-13	RBMP42 – Imperial Strip	ES	Planned	Bioswale	NA
2-13	RBMP50 - Recreation85	ES	Proposed	Infiltration	94,400
2-15	RBMP49 - PumpStationB85	ES	Proposed	Infiltration	1,290,000

[1] LA = Los Angeles, SM = Santa Monica, ES = El Segundo

Figure 5-1
BMP Capacity Required by Permittee for 2018 Milestone Compliance



5.3. STORMWATER CONTROL MEASURES TO BE IMPLEMENTED BY 2021 FOR BACTERIA MILESTONE COMPLIANCE

At the time of the final compliance deadline in 2021, a 42 percent load reduction is estimated, which is greater than the TLR of 35 percent. The load reduction attributable to individual regional BMPs in each subwatershed are provided in **Appendix A** (Attachment E). The 2021 compliance deadline will be met by achieving 100 percent of the TLR in each subwatershed, through a combination of non-structural, distributed green streets BMPs, existing centralized/regional BMPs and fast-tracked centralized/regional BMPs.

Table 27 lists projects that must be completed by 2021 to meet the milestone TLRs in all subwatersheds. **Figure 5-2** illustrates the required capacity in 2021 to meet be in compliance with the SMB Beaches TMDL. On a SMB EWMP Group watershed-wide basis, at the time of the interim compliance deadline (2018), a 22 percent load reduction is estimated. Further detailed scheduling for each jurisdiction including volumes of stormwater to be managed and control measure capacities, volumes of stormwater (compliance targets) to be managed are presented in **Appendix A**. Each jurisdiction has a standalone recipe for each assessment area/watershed.

It should be noted that if at any time-specific distributed green streets or regional/centralized BMPs are found to be infeasible for implementation, alternative BMPs or operational changes will be planned within the same subwatershed and within the same timeline, to meet an equivalent subwatershed load reduction. **Table 28** and **Table 29** present a summary of the regional and Green Street BMP capacity required for compliance.

Figure 5-2
BMP Capacity Required by Permittee for 2021 Milestone Compliance

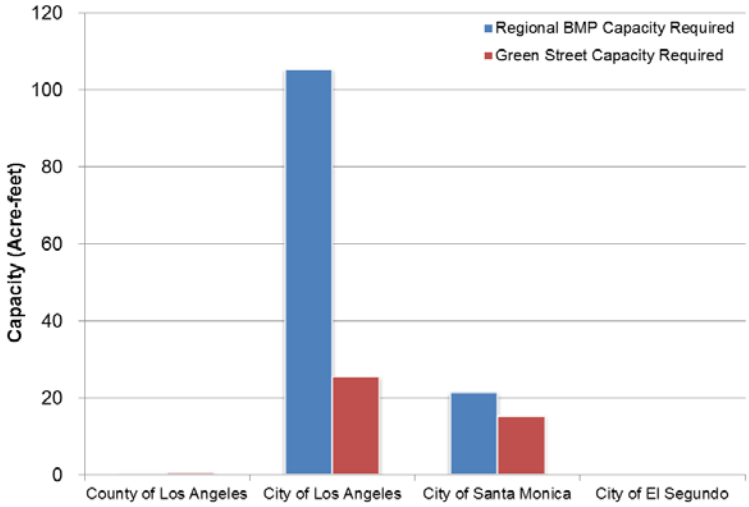


Table 5-2
Summary of Regional and Centralized BMPs Required Compliance in 2021

Sub-watershed	Regional/Centralized BMP Identifier	Permittee[1]	BMP Status	Type	Volume (ft^3)
2-02	RBMP20 – Santa Ynez	LA	Planned	Infiltration	131,000
2-02	RBMP23 - 2-2 Parking Lot	LA	Proposed	Infiltration	134,000
2-06	RBMP08 - Temescal	LA	Planned	Infiltration	241,000
2-07	RMBP40b – Riviera Barranca SW	LA	Proposed	Bioswale	NA
2-07	RBMP17 - Mandeville	LA	Planned	Infiltration	136,000
2-07	RBMP48 – Rustic Canyon	LA	Proposed	Infiltration	40,400
3-01	RBMP29 – San Vicente Median	SM	Proposed	Infiltration	144,000
3-01	RBMP30 - Goose Egg Park	SM	Proposed	Infiltration	29,400
3-02	RBMP33 – Lincoln Middle School	SM	Proposed	Infiltration	128,000
3-04	RBMP44_Brentwood CC	LA	Planned	Infiltration	184,000
3-04	RBMP51_Memorial Park	SM	Proposed	Infiltration	402,000
3-04	RBMP52_SM Civic Auditorium	SM	Proposed	Infiltration	197,000
3-04	RBMP16b - Clean Beaches Park	SM	Planned	Infiltration	10,700
3-04	RBMP11 – Los Amigos	SM	Proposed	Infiltration	261,000
3-06	RMBP38 – Olympic High	SM	Proposed	Infiltration	86,000
3-06	RMBP39_Will Rodgers Elem	SM	Proposed	Infiltration	103,000
3-07	RBMP45 – Oakwood 85	LA	Planned	Infiltration	34,300
2-11	RBMP19 – Westchester Park	LA	Planned	Infiltration	823,000
2-11	RBMP09 – Westchester LAX	LA	Planned	Infiltration	802,000

[1] LA = Los Angeles, SM = Santa Monica, ES = El Segundo

Table 5-3
Regional BMP Capacity Required for Compliance (Acre-feet)

Milestone	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo
2018	0.0	30.1	29.0	30.6
2021	0.2	105.4	21.3	0.0
Total	0.2	135.4	50.3	30.6

Table 5-4
Green Street BMP Capacity Required for Compliance (Acre-feet)

Milestone	County of Los Angeles	City of Los Angeles	City of Santa Monica	City of El Segundo
2018	0.5	35.1	20.2	0.0
2021	0.5	25.3	15.1	0.0
Total	1.0	60.3	35.4	0.0

5.3.1. Non-Structural BMPs

Non-Structural BMPs include a combination of bacteria-targeted, wet weather source control BMPs that the SMB EWMP agencies are committed to implementing, such as pet waste controls, human waste source tracking and, enhanced street sweeping, increased catch basin and storm drain cleaning, and other new or enhanced non-structural BMPs that target the pollutants addressed in this EWMP. Permittees are responsible for continued development, execution, enforcement, and reporting of the progress of these programs in their annual reports.

5.3.2. Public Retrofit Incentives

These programs are directed at incentivizing the public to decrease the amount of stormwater runoff from their property. Permittees are responsible for continued development, execution, enforcement, and reporting of the progress of these programs in their annual reports.

5.3.3. Non-stormwater Control Measures

The objective of the EWMP is to reduce the impact of stormwater and non-stormwater on receiving water quality. The Permit effectively prohibits non-stormwater discharges and the SMB TMDL includes dry weather compliance requirements for bacteria since 2006. Consistent with the Permit, The SMB EWMP Group's dry weather compliance approach is to eliminate 100 percent of non-exempt dry weather MS4 discharges through a combination of existing LFDs and a suite of non-structural source controls and source investigations when needed.

The primary mechanism to maintain compliance is the use of LFDs. These diversions are effectively eliminating non-stormwater surface discharges to the surf zone during dry weather days (MWH Team B, 2014). By eliminating flows, this is equivalent to 100 percent load reduction for all pollutants, thereby demonstrating reasonable assurance of meeting all applicable Permit limitations during dry weather. Elimination of discharges is a pathway for compliance with RWLs and WQBELs in the MS4 permit (per section VI.E.2.e.i.(3)); without discharges there can be no "cause or contribute" to receiving water issues. Implementaiton of additional non-storm water disharge is not applicable at this time.

5.4. OTHER CONSTITUENTS AND TMDL COMPLIANCE

Compliance with the debris TMDL will be met through a phased retrofit of all catch basins throughout the SMB EWMP area to meet each interim compliance milestones deadline (20% load reduction per year between 2016 and 2019) as well as the final compliance deadline (100% load reduction) in 2020. Consistent with the City's Trash Monitoring and Reporting Plan (TMRP) (City of Los Angeles Department of Public Works, 2012), "vertical insert[s] with 5-mm openings and flow activated opening screen covers are the best suited for implementation within the City to achieve compliance with Trash TMDLs".

The SMB TMDL for DDTs and PCBs developed waste load allocations (WLAs) for stormwater throughout the SMB watershed. Because the SMB EWMP group area contribution is not distinctly defined in the TMDL, the WLAs assigned to the entire SMB WMA as a whole are being used for this discussion. The existing TMDL-estimated loads for all of SMB and most of the individual watersheds are lower than the maximum allowable loads. Therefore, consistent with the TMDL, it is assumed that there is a zero required load reduction for PCBs and DDTs in MS4 discharges, and reasonable assurance is demonstrated.

As part of the adaptive management process based on monitoring data collected through the approved CIMP, additional structural and/or non-structural BMPs may be proposed if needed. Additionally, if the loads are found to be higher than estimated, but still less than the maximum allowable loads, there may be potential for the WLA to be revised.

5.5. SUMMARY OF PERMITTEE ACTIONS

Permittee actions can be categorized into three groups, implementation of projects, continued monitoring, and reporting of monitoring results and progress.

Project Implementation: The rate of project implementation required for milestone and TMDL compliance is rapid. Permittees must implement the projects within the RAA, listed in **Table 26** and **Table 27**, by their associated construction date. Implementation of EWMP projects will have numerous actions, too many to list, associated project planning, funding, permitting, design, construction, and operation.

Water Quality Monitoring: Permittees shall continue TMDL monitoring as specified in the TMDLs. Monitoring and reporting of the results requirements are currently a Permittee action. The monitoring will be primarily be used to ensure compliance. Although it may also assist in the development of adaptive management in unforeseen water quality changes occur.

Reporting: Permittees shall continue TMDL reporting. Preparation of an annual report for compliance with TMDLs is currently a Permittee action, although this action will be expanded to include progress towards implementation of projects for milestone and TMDL compliance. Annual reports shall be amended to include the following:

- Non-Structural BMPs – update on program development, execution, and enforcement
- Public Retrofit Incentives – update in development, execution, and enforcement
- Green Street BMP Project Implementation – provide an update on the Green Street BMP projects in planning, design, and construction. Each project should have an associated capacity. The current and planned green street BMP shall be reported and reconciled with the RAA modeled required green street BMP capacity for compliance.
- Regional BMP Project Implementation – provide an update on the regional BMP projects in planning, design, and construction. Each project should have an associated capacity. The current and planned regional BMP capacity shall be reported and reconciled with the RAA modeled required capacity for compliance. Deviations from the planned projects will be reported and the calculated BMP capacity documented.

Section 6
Assessment and Adaptive Management Framework

6.1 ADAPTIVE MANAGEMENT PROCESS

The EWMP is intended to be implemented as an adaptive program. As new program elements are implemented and information is gathered over time, the EWMP will undergo modifications to reflect the most current understanding of the watershed and present a sound approach to addressing changing conditions. As such, the EWMP will employ an adaptive management process that will allow the EWMP to evolve over time.

Part VI.C.8 of the Permit details the adaptive management process to be included in the EWMP that includes the following requirements:

i. Permittees shall adapt the EWMP to become more effective every two years from the date of program approval based on, but not limited to a consideration of:
   (1) progress toward achieving WQBELs and/or RWLs;
   (2) Permittee monitoring data;
   (3) achievement of interim milestones;
   (4) re-evaluation of water quality priorities and source assessment;
   (5) non-Permittee monitoring data;
   (6) Regional Board recommendations; and
   (7) Recommendations through a public participation process.

ii. Permittees shall report any modifications to the EWMP in the annual report.

iii. Permittees shall implement any modifications to the EWMP upon approval by the Regional Board or within 60 days of submittal if the Regional Board expresses no objections.

The adaptations to the EWMP, as called for in the adaptive management process, essentially include: 1) re-characterization of water quality priorities, 2) a source assessment re-evaluation, 3) an effectiveness assessment of watershed control measures, and 4) an updated RAA. The CIMP will gather additional data on receiving water conditions and stormwater/non-stormwater quality to inform these analyses. These adaptations will be implemented and repeated every two years as part of the adaptive management process. Each of these adaptations are described in the following subsections.

6.1.1. Re-characterization of Water Quality Priorities

Water quality within the SMB EWMP Group area will be re-characterized using data collected as a result of the CIMP implementation to include the most recent data available. WBPC classifications may be updated as a result of changing water quality conditions. These WBPCs will be important for refocusing water quality improvement efforts and informing the selection of future watershed control measures.

6.1.2. Source Assessment Re-evaluation

The assessment of possible sources of water quality pollutants will be re-evaluated based on new information from the CIMP implementation. The identification of non-MS4 and MS4 pollutant sources is an essential component of the EWMP because it determines whether the source can be controlled by watershed control measures. As further monitoring is conducted and potential sources are better understood, the source assessment becomes more accurate and informed.

6.1.3. Effectiveness Assessment of Watershed Control Measures

The evaluation of BMP effectiveness is an important part of the EWMP adaptive management process. Implementation of the CIMP will provide a quantitative assessment of structural BMP effectiveness as it relates to actual pollutant load reduction to determine how selected BMPs have performed at addressing established water quality priorities. The effectiveness assessment of watershed control measures becomes important for the selection of future control measures to be considered.

6.1.4. Update of Reasonable Assurance Analysis

The data gathered as a result of the CIMP will support adaptive management at multiple levels, including (1) generating data not previously available to support model updates; and, (2) tracking improvements in water quality over the course of EWMP implementation. As described in **Section 5**, the RAA is an iterative process that depends on the continuous refinement and calibration of the watershed model used.

6.2 REPORTING

Annual reporting will be completed each year as part of the CIMP. In additional to assessing the overall progress of the WMP, the CIMP reporting will detail the implemented BMPs and demonstrate the cumulative BMP capacities achieve the interim targets. Data obtained through CIMP monitoring will be used to determine the overall effectiveness of the EWMP and will the next phases of EWMP implementation during the adaptive management process.

Section 7
EWMP Implementation Costs and Financial Strategy

The purpose of this section is to present the financial strategy for addressing the additional costs of compliance with the 2012 MS4 permit as a result of the extensive set of BMPs or "recipe for compliance" identified in **Appendix A**. Although the definition of a financial strategy varies across industries, within the context of the EWMP, the financial strategy is interpreted to represent the strategic options available to the permittees for financing the program costs associated with the new MS4 Permit.

Currently, a funding source for all of the activities described in this EWMP has not been determined, and obtaining funds for all of the activities identified in the EWMP is anticipated to take many years. Nevertheless, this section identifies the estimated order-of-magnitude cost of the activities, the amount of funding currently available to meet the needs described in the EWMP, and potential funding sources that may be available. This section is intended to serve as high-level financial strategy by addressing the following items:

- Documentation of estimated program costs by BMPs;
- Assessment of Impact of program costs on permittees;
- Review of existing policies, revenues, and costs affecting stormwater;
- Identification of financial strategies for financing program costs; and
- Identification of future steps needed to implement the financial strategy.

7.1. EWMP COSTS

The purpose of this section is to present order-of-magnitude cost estimates to implement the EWMP. Estimated program costs were developed using the methodology described in **Appendix B**. Program costs consist of expenses that must be borne by the co-permittees in order to comply with the permit requirements. Costs associated with debris compliance are not included in estimated program costs.

The costs were derived using an RAA that includes the identification and evaluation of BMPs that will be used to achieve applicable WQBELS and RWLs. This approach identifies a variety of watershed BMPs including LID, green streets, and regional projects. Costs were developed using unit costs of similar stormwater BMPs described in the *Multi-Pollutant TMDL Implementation Plan for the Unincorporated County Area of Los Angeles River Watershed* (LACDPW, 2010). Select unit costs were modified based on recent construction experience for similar projects.

For structural BMP projects, costs are included for planning, design, permits, construction, operation and maintenance (O&M), and post-construction monitoring, where applicable. The O&M costs represent present value of the estimated costs over a 20-year period. Unit costs for major construction components are presented in . To the extent possible, BMPs have been located on publicly-owned land to reduce land acquisition costs.

Table 7-1
Conceptual Design Major Components Unit Cost

Construction Component	Unit Cost
Mobilization[1]	10% of construction total
Site Preparation[1]	$6,000 per acre
Excavation and Removal	$30.00 per cubic yard
Asphalt/Base Removal	$9.60 per cubic yard
Reinforced Concrete Pipe[1]	$16.00 per diameter (inch) per length (foot)
Gravel Sub-base	$63.00 per cubic yard
Backfill Material[1]	$20.00 per cubic yard
Landscaping[1]	$5.00 - $25.00 per square foot
60-inch Corrugated Metal Pipe[2]	$150,000 per acre-foot
Planning/Project Management[1]	20% of total construction costs
Design and Permitting (Centralized)[1]	15% of total construction costs
Contingency for Planning Estimate (Centralized)	25% of total construction costs

Notes:
[1] Unit costs have been modified from TMDL Implementation Plan based on recent construction experience for similar projects.
[2] Material costs for the 60-inch CMP used in subsurface infiltration basins were provided by Contech Engineering Solutions. Costs include CDS pretreatment.

The costs for structural BMPs are considered to be planning level only (order of magnitude), and can be refined as implementation of the EWMP progresses, using actual BMP implementation costs. Costs for enhanced minimum control measures and other institutional BMPs have not been included because they will vary by jurisdiction and are estimated to be a small percentage of the overall program costs.

7.1.1. EWMP Costs by BMP and TMDL Milestones

Based on the RAA, a set of optimal BMPs were derived, having reasonable assurance of meeting the interim and final limitation milestones set forth by the Regional Board. Total estimated BMP costs are shown in **Table 31**. Capital costs and O&M costs are based on a 20-year implementation cost schedule. The 20-year implementation cost schedule relies on initial capital costs and recurring annual O&M costs for each specific type of BMP over a 20-year time frame. Additionally, estimated capital costs have been developed for each TMDL milestone and are presented along with the expected annual O&M costs for that milestone in **Table 31**.

Table 7-2
Total Costs by Milestone ($ Millions)[1]

Agency	Program	Present to Milestone 1[2]		Milestone 1 to Milestone 2[3]	
		Capital	O&M/year	Capital	O&M/year
Los Angeles	Streets	$188.4		$140.2	
	Regional	$5.7	$6.2	$74.5	$9.0
Santa Monica	Streets	$85.5		$63.1	
	Regional	$22.3	$4.9	$42.4	$5.6
Uninc. LA County	Streets	$3.1		$2.7	
	Regional	-	$0.09	-	$0.09
El Segundo	Streets	$0.0016		-	
	Regional	$20.8	$0.96	-	$1.1
Total		$325.8	$12.2	$322.9	$15.8

[1]O&M costs for each milestone includes cost from previous milestone (i.e. the costs are cumulative)
[2] Milestone 1 represents the 2018 Interim TLR deadline
[3] Milestone 2 represents the 2021 Final TLR deadline

7.1.2. EWMP Costs by Watershed

Similar to EWMP costs described in **Section 7.1.1**, the total BMP costs were identified by jurisdiction (City or Agency) and watershed as shown in **Table 32.**

Table 7-3
Total Costs for Watershed ($ Millions)

Agency	Capital	O&M
Los Angeles	$408.8	$54.2
Santa Monica	$213.2	$33.5
Uninc. LA County	$5.9	$0.53
El Segundo	$20.8	$6.42
Total	$648.7	$94.7

7.2. IMPACT OF EWMP COSTS

The EWMP costs will have a significant financial impact on each the permittees. In order to determine the financial impact to each permittee, a high-level calculation was conducted by dividing the costs by the number of parcels within each jurisdiction. Because stormwater impacts all parcels within the watershed, all jurisdictions will be liable for the costs. Preliminary costs by parcel for each jurisdiction are shown in **Table 33**.

Table 7-4
Total Cost Per Parcel by Jurisdiction

Agency	No. of Parcels	Present to Milestone 1[2]		Milestone 1 to Milestone 2[3]		Total at Final	
		Total Costs	Yearly Cost	Total Costs	Yearly Costs	Total Costs	Yearly Costs
Los Angeles	37,103	$5,700	$1,900	$6,700	$2,200	$12,500	$2,100
Santa Monica	22,231	$5,500	$1,800	$5,600	$1,900	$11,100	$1,900
Uninc. LA County	628	$5,400	$1,800	$4,800	$1,600	$10,200	$1700
El Segundo	4,829	$4,900	$1,600	$730	$200	$5,600	$940
Total		$21,500	$7,100	$17,830	$5,900	$39,400	$6,640

7.3. EXISTING STORMWATER PROGRAMS

Even though the RWQCB only implemented Order No R4-2012-0175, NPDES No CAS00401 on November 2012; the SMB EWMP Group have been addressing stormwater discharge prior to November 2012with existing recurring costs associated with these activities in excess of $50 million annually. **Table 34** provides a summary of existing costs and associated revenue source by jurisdiction. It is assumed that these recurring costs will continue into the future and the costs for implementing the activities outlined in this Plan are in addition to these costs.

Table 7-5
Existing Stormwater Costs

Jurisdiction	Existing Utility?	Funding Source	Description of Costs	Total Costs
	(Yes/No)			($)
Los Angeles	Yes	Stormwater Fund	O&M and Capital, Planning, Enforcement and Monitoring	~$30M/yr (City Wide; not including Prop O)
Santa Monica	Yes	Stormwater Fund/General Fund	O&M and Capital, Outreach, Inspections, Management	~$13.7M/yr
Unincorporated LA County	Yes	General Fund	Management, Outreach, inspection, enforcement, monitoring	~80M/yr (County-wide)
El Segundo	No	To Be Determined	To Be Determined	To Be Determined

7.4. FINANCIAL STRATEGIES

The financial strategy in this section is focused on developing a set of options to address the expected additional costs associated with compliance with the new MS4 permit, and is not intended to incorporate the costs associated with existing stormwater activities identified above. Just as the engineering and strategic solutions for watershed management rely upon a coordinated regional approach, so too does the financial strategy. Capital and operating costs for watershed programs are large and span decades. As such, there is no single "right" way to finance these programs. Instead, the financial strategy presented in this EWMP outlines a set of multiple approaches, allowing each jurisdiction to select those strategies that best fit their specific circumstances.

The detailed financial strategies for the EWMP costs will be highly dependent and vary by jurisdiction. Each permittee has different resources; therefore, each permittee will use a different set of options at its disposal. High-level alternatives that can be examined as each permittee moved forward as a group or as individuals are described below. Acknowledgement is given to Stormwater Funding Options – Providing Sustainable Water Quality Funding in Los Angeles County, a report authored by Ken Farfsing and Richard Watson dated May 21, 2014.

7.4.1. Grants

Financial strategies available to the permittees associated with grants include:

- Apply for grants through the recently passed Prop 1 – 2014 Water Bond. Over $400M is available for stormwater capture, Integrated Regional Watershed Management Plans (IRWMP), and urban creek restoration projects.
- Apply for grants under Section 319 of Clean Water Act, which authorizes the EPA to develop a program aimed at implementing nonpoint source management programs
- Apply for competitive grants available
- Apply for other grants (state and federal) for stormwater improvement, beach water quality improvement, and green infrastructure projects. (e.g. Prop. 84, CBI, etc.)

7.4.2. Fees and Charges

Financial strategies available to the permittees that have fees and charges include:

- Use existing revenue streams for stormwater/water supply/flood control projects to support stormwater quality projects.
- AB 2403 – Use new state law to pass rate increase for stormwater projects that have a water supply benefit and minimize the Proposition 218 process.
- Use revenue generated from a Stormwater Impact Fee (or "In-Lieu" Fee) to comply with LID ordinances to fund mitigation bank for regional projects.
- Increase solid waste management fees to cover the cost of enhanced street sweeping and other measures to reduce trash for compliance with TMDLs.
- Consider adopting water conservation fees that would provide funding for reducing irrigated runoff in order to both conserve groundwater and reduce dry weather pollution.
- Continue to pursue a county-wide stormwater parcel tax initiative (modified after the 2012 Clean Water Clean Beaches Initiative), which could be tied to AB 2403 as well.
- Consider assessments on car rentals since some of the pollution in our waterways is from cars driven on local streets.

7.4.3. Legislative and Policy

Financial strategies available to the permittees that require legislative or policy changes are summarized below:

- Develop stormwater retention credit trading market to use private equity.
- Ask the Metropolitan Water District (MWD) of Southern California to reevaluate their approach for managing the Local Resource Program (LRP) to fund stormwater capture and use projects that offset the use of imported water supplies.
- Pursue pollutant source control legislation patterned after SB 346 that either limits pollutants of concerns in products (e.g. copper in brake pads, or zinc in tires) or assesses a fee on those products that can be used by local governments to mitigate those pollutants.
- Form Special Assessment Districts and fees tailored to the Watershed Management Groups.
- Explore the use of Enhanced Infrastructure Finance Districts tailored to the Watershed Management Group, as outlined in recently adopted (2014) California legislation SB628.
- 2014 Water Resources Reform and Development Act of 2014 (WRRDA). Various funding opportunities should be explored.

7.4.4. Future Steps

The financial strategies described herein are options for funding sources, some or all of which will need to be implemented to develop a comprehensive financial solution. As each permittee determines the appropriate funding source(s), they will also need to consider the following items:

- Development of public support for financial strategies through outreach efforts;
- Creation of inter-jurisdiction watershed management group and EWMP financial working group; and
- Development of a more formal Stormwater Program Financial Plan, which would typically include the following components:
    - Implementation of new fee or charge;
    - Establishment of new enterprise fund;
    - Cash and debt financing;
    - Operating and capital reserves; and
    - Cash flow modeling.

The SMB EWMP Group as a whole, as well as individual members, are currently prioritizing and selecting the specific financing strategies that best fit their needs. It is anticipated that a more fully developed financial plan will be developed and implemented by the group and/or its individual members in the coming months and years that incorporates elements of the financial strategy described in this section and implements future steps identified above.

Section 8
Legal Authority

As required on page 39 of the Standard Provisions of the Permit, each permittee must maintain the legal authority to implement the provisions of the Permit consistent to the Annual Report submittals. **Appendix E** includes copies of the legal authority certification.

Section 9
References

CASQA, 2006. "An Introduction to Stormwater Program Effectiveness Assessment." White Paper: http://www.scvurpppw2k.com/pdfs/0405/CASQA%20White%20Paper_An%20Introduction%20to%20Stormwater%20Program%20Effectiveness%20Assessment4.pdf.

City of Los Angeles "Projects for 5-Year Expenditure plan – Santa Monica Bay, Ballona Creek, Marina Del Rey, Dominguez Channel." Excel Database. Received November 2013.

City of Los Angeles, Concept Memo #3: Reasonable Assurance Analysis Approach, December, 2013.

City of Los Angeles. "City of Santa Monica BMPs – Private and City Owned." Excel Database. Received November 2013.

City of Los Angeles. "City of Santa Monica BMPs – City Owned." Excel Database. Received November 2013.

City of Los Angeles. "LA Sanitation Green Infrastructure Projects list." Excel Database. December 2012. Received November 2013.

City of Los Angeles. "Low Flow Development Project Information" Excel Database. January 1, 2008. Received November 2013.

City of Los Angeles. "Santa Monica Bay Watershed Regional BMP Projects." PDF Document. Received November 2013.

City of Los Angeles. "Standard Urban Stormwater Mitigation Plan (SUSMP) LID Data " Excel Database. June 2006 through September 2013. Received November 2013.

City of Los Angeles. Concept Memos. MS Word Document Received. November, 2013

City of Los Angeles. Concept Memos. November 2013.

City of Malibu, 2012. Comment Letter – Bacteria TMDL Revisions for Santa Monica Bay Beaches. May 7, 2012.

Ferguson, D.M., Moore, D.F., Getrich, M.A., and M.H. Zhowandai, 2005. "Enumeration and speciation of enterococci found in marine and intertidal sediments and coastal water in southern California." Journal of Applied Microbiology 99(3).

Geosyntec Consultants, RAA Technical Memorandum, March 2015.

Geosyntec Consultants and Wright Water Engineers, 2012. International Stormwater Best Management Practices (BMP) Database Pollutant Category Summary Statistical Addendum: TSS, Bacteria, Nutrients, and Metals. July 2013.

Geosyntec Consultants, 2012. A User's Guide for the Structural BMP Prioritization and Analysis Tool (OCTA-SBPAT v1.0). Prepared for Orange County Transportation Authority. November 2012.

Geosyntec Consultants, 2012. San Luis Rey River Watershed Comprehensive Load Reduction Plan. October.

Grant, S.B., Sanders, B.F., Boehm, A.B., Redman, J.A., Kim, J.H., Mrse, R.D., Chu, A.K., Gouldin, M., McGee, C.D., Gardiner, N.A., Jones, B.H., Svejkovsky, J., Leipzig, G.V., and A. Brown, 2001.

"Generation of Enterococci Bacteria in a Coastal Saltwater Marsh and its Impact on Surf Zone Water Quality." Environmental Science and Technology 35(12).

Griffith, J.F., 2012. "San Diego County Enterococcus Regrowth Study." SCCWRP Technical Report.

Helsel, Dennis R. Nondetects and Data Analysis: Statistics for Censored Environmental Data. Hoboken, NJ: Wiley-Interscience, 2005. Print.

Imamura, G.J., Thompson, R.S., Boehm, A.B., and J.A. Jay, 2011. "Wrack promotes the persistence of fecal indicator bacteria in marine sands and seawater." FEMS Microbiology Ecology 77(1).

Izbicki, J, 2012a. "RE: MS#1092: Update submitted for "Sources of Fecal Indicator Bacteria to Groundwater, Malibu Lagoon, and the Near-Shore Ocean, Malibu, California." "RE: USGS Study". Email to Barbara Cameron. May 4, 2012 11:18 am.

Izbicki, J., Swarzenski, P., Burton, C., and L.C. Van DeWerfhorst, 2012b. "Sources of fecal indicator bacteria to groundwater, Malibu Lagoon, and the near-shore ocean, Malibu, California." Submitted 2012.

Jiang, S., McGee, C., Candelaria, L., and G. Brown, 2004. "Swimmer Shedding Study in Newport Dunes, California. Final Report." http://www.waterboards.ca.gov/rwqcb8/water_issues/programs/tmdl/docs/swimmerreport.pdf

Lee, C.M., Lin, T.Y., Lin, C.C., Kohbodi, G.A., Bhatt, A., Lee, R., and J.A. Jay, 2006. "Persistence of fecal indicator bacteria in Santa Monica Bay beach sediments." Water Research 40(14).

Litton, R.M., Ahn, J.H., Sercu, B., Holden, P.A., Sedlak, D.L., and S.B. Grant, 2010. "Evaluation of Chemical, Molecular, and Traditional Markers of Fecal Contamination in an Effluent Dominated Urban Stream." Environmental Science and Technology 44(19).

LACDPW, 2000. Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report. July 31.

LADPW. 2011-2012 Annual Stormwater Monitoring Report. http://ladpw.org/wmd/npdesrsa/annualreport/index.cfm

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4. November 8. http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/la_ms4/2012/Order%20R4-2012-0175%20-%20A%20Final%20Order%20revised.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Regional Board Basin Plan Amendment for the Santa Monica Bay Beaches Bacteria TMDL. June 7, 2012. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/90_New/Jan2013/Final%20BPA%20Attach%20A%20SMBB%20Dry&Wet%2007Jun12.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2010. Proposed Amendments to the Water Quality Control Plan – Los Angeles Region for the Santa Monica Bay Nearshore and Offshore Debris TMDL. Attachment A to Resolution No. R10-010. Adopted November 4, 2010. http://63.199.216.6/larwqcb_new/bpa/docs/R10-010/R10-010_RB_BPA.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2005. Total Maximum Daily Load for Metals in Ballona Creek. July 7, 2005. http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-007/05_0831/StaffReport.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2002. Draft Santa Monica Bay Beaches Bacteria TMDL, Revised Staff Report (Dry Weather Only). January 14, 2002.

http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2002-004/02_0114_tmdl%20Dry%20Weather%20Only_web.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2002. Proposed Amendments to the Water Quality Control Plan – Los Angeles Region to incorporate the Santa Monica Bay Beaches Bacteria TMDL. Attachment A to Resolution No. 02-004. http://63.199.216.6/larwqcb_new/bpa/docs/2002-004/2002-004_RB_BPA.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 2002. Proposed Amendments to the Water Quality Control Plan – Los Angeles Region to incorporate Implementation Provisions for the Region's Bacteria Objectives and to incorporate the Santa Monica Bay Beaches Bacteria TMDL. Attachment A to Resolution No. 2002-022. http://63.199.216.6/larwqcb_new/bpa/docs/2002-022/2002-022_RB_BPA.pdf

Los Angeles Regional Water Quality Control Board (Regional Board), 1995. Updated 2011. Water Quality Control Plan, Los Angeles Region. http://www.waterboards.ca.gov/rwqcb4/water_issues/programs/basin_plan/index.shtml

Los Angeles Regional Water Quality Control Board (Regional Board), 2012. Order No. R4-2012-0175 NPDES Permit No. CAS004001 Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County, except those Discharges Originating from the City of Long Beach MS4. November 8. http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/la_ms4/2012/Order%20R4-2012-0175%20-%20A%20Final%20Order%20revised.pdf

MWH Team, 2014a. J2/J3 EWMP Work Plan, June.

MWH Team, 2014b. J2/J3 CIMP, June.

Online Project Tracking and Integration (OPTI) Database. http://irwm.rmcwater.com/la/dashboard.php

Phillips, M.C., Solo-Gabriele, H.M., Piggot, A.M., Klaus, J.S., and Y. Zhang, 2011. "Relationships between Sand and Water Quality at Recreational Beaches", Water Resources 45(20).

Sabino, R., Verissimo, C., Cunha, M.A., Wergikowski, B., Ferreira, F.C., Rodrigues, R., Parada, H., Falcao, L., Rosado, L., Pinheiro, C., Paixao, E., and J. Brandao, 2011. "Pathogenic fungi: An unacknowledged risk at coastal resorts? New insights on microbiological sand quality in Portugal." Marine Pollution Bulletin 62: 1506-1511.

SCCWRP, 2005. Microbiological Water Quality at Reference Beaches in Southern California during Wet Weather (SCCWRP Technical Report 448). August.

SCCWRP, 2007a. Assessment of Water Quality Concentrations and Loads from Natural Landscapes (SCCWRP Technical Report 500). February.

SCCWRP, 2007b. Sources, Patterns and Mechanisms of Storm Water Pollutant Loading From Watersheds and Land Uses of the Greater Los Angeles Area, California, USA (SCCWRP Technical Report 510). March.

Stein, E.D., Tiefenthaler, L.L., and Schiff, K.C., 2007. "Sources, Patterns and Mechanisms of Storm Water Pollutant Loading From Watersheds and Land Uses of the Greater Los Angeles Area, California, USA." Southern California Research Project (SCCWRP), Technical Report 510, March.

Tiefenthaler, L., Stein, E.D., and K.C. Schiff, 2011. "Levels and patterns of fecal indicator bacteria in stormwater runoff from homogenous land use sites and urban watersheds." Journal of Water and Health 9:279-290.

U.S. Department of Agriculture (USDA), 2009. National Engineering Handbook (210-VI-NEH), Chapter 7. Natural Resource Conservation Service.

United States Environmental Protection Agency (USEPA), 1993. Subsurface Flow Wetlands for Wastewater Treatment, A Technology Assessment. July 2013.

United States Environmental Protection Agency (USEPA), 2012. Santa Monica Bay Total Maximum Daily Loads for DDTs and PCBs.

Ventura County Flood Control District, 2003. Stormwater monitoring report, 1997- 2003.

Weisberg, S.B., and D.M. Ferguson, 2009. "North Santa Monica Bay Source Investigation Study, Ramirez Creek and Escondido Creek, Malibu, 2009 Summary and Recommended Studies." SCCWRP.

Weston Solutions, 2010. "Tecolote Creek Microbial Source Tracking Summary – Phases I, II, and III."

Wright Water Engineers (WWE) and Geosyntec Consultants, 2007. FAQ: Why does the International Stormwater BMP Database Project omit percent removal as a measure of BMP performance? http://www.bmpdatabase.org/Docs/FAQPercentRemoval.pdf.