Upper San Gabriel River EWMP Group

June 2015
Rev. August 2015
Rev. January 2016

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

ENHANCED WATERSHED MANAGEMENT PROGRAM PLAN

Prepared for:

Upper San Gabriel River Enhanced Watershed Management Program Group
(County of Los Angeles, Los Angeles County Flood Control District, Cities of Baldwin Park, Covina, Glendora, Industry, La Puente, and West Covina)

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County of Los Angeles
Los Angeles County Flood Control District
City of Baldwin Park
City of Covina
City of Glendora
City of Industry
City of La Puente
City of West Covina

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Executive Summary

The Upper San Gabriel River Enhanced Watershed Management Program Group (EWMP Group) is comprised of the County of Los Angeles (County), Los Angeles County Flood Control District (LACFCD), and the cities of Baldwin Park, Covina, Glendora, Industry, La Puente, and West Covina (Group Members). The USGR EWMP Group was formed in response to provisions of National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175 (Permit). By electing the optional compliance pathway in the MS4 Permit, the EWMP Group has leveraged this EWMP to facilitate a robust, comprehensive approach to stormwater planning for the San Gabriel River Watershed. Stormwater planning is essential to retain or reuse stormwater, enhance flood control, promote water conservation efforts, improve water quality, and may increase water supplies. It can also lead to greater recreation and public education opportunities along with improving local aesthetics. This EWMP also incorporates State agency priorities such as drought response and increased capture of stormwater for beneficial use per the Recycled Water Policy. There are also many key actions of the California Water Action Plan that are addressed by the EWMP including increased flood protection, establishing conservation as a California way of life, and providing safe water for all communities.

The San Gabriel River Watershed is a unique area with a wide diversity of land uses, ranging from heavily urbanized in the lower, coastal portion to nearly pristine, open spaces in the upper, higher elevation portion of the watershed in the San Gabriel Mountains. Controlling pollutants in stormwater is a major challenge for the Group Members, but regulations in the watershed provide clear compliance timelines to address water quality issues. In particular, the San Gabriel River Watershed is subject to a Total Maximum Daily Load (TMDL) for metals that requires compliance by 2026 and is listed as impaired for many pollutants including bacteria. According to the Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), metal levels above the established water quality standards can negatively impact aquatic life in the rivers, creeks, and estuary. Likewise, bacteria levels above the established standards can pose health risks to people that recreate in the watershed. The EWMP addresses these types of water quality impacts and presents a clear timeline for implementation.

IDENTIFICATION OF WATER QUALITY PRIORITIES

The water quality prioritization process identifies and prioritizes water quality impairments in the watershed based on review of available monitoring data. Based on permit requirements, the following categories of water body-pollutant combinations (WBPCs) are identified:

- **Category 1** are those subject to an established TMDL, as follows: metals (lead, copper, zinc, selenium, and mercury), nutrients (total nitrogen and total phosphorus) and legacy pollutants (polychlorinated biphenyl [PCB], chlordane, dieldrin, and dichlorodiphenyltrichloroethane [DDT]).
- **Category 2** are those on the State Water Resources Control Board 2010 Clean Water Act Section 303(d) list or those constituents that have sufficient exceedances to be listed, including metals (lead, zinc, selenium, nickel, cadmium, mercury and copper), the legacy pollutant polycyclic aromatic hydrocarbon (PAH), bacteria, cyanide, ammonia, diazinon, dioxin, total dissolved solids (TDS), cyanide, toxicity, benthic-macroinverteberates, dissolved oxygen (DO), and pH
- **Category 3** for those with observed exceedances, but too infrequent to be listed, and conditions that are not pollutants, including methylene blue active substances (MBAS), TDS, sulfate, chloride, cyanide, alpha-endosulfan, DO, and pH.

WATERSHED CONTROL MEASURES

The EWMP is designed to address all the identified Water Quality Priorities through a network of stormwater control measures. The following categories of control measures make up the EWMP:

- **Low impact development:** control measures implemented on parcels to retain stormwater runoff during rain events. For the EWMP, the Group Members' Low Impact Development (LID) ordinances are incorporated. In addition, residential LID programs, such as a rain barrel incentive program or other methods to reduce runoff from residential properties are incorporated. Group Members will also implement LID retrofits on public parcels.
- **Green streets:** the right-of-way along streets offers a significant opportunity to implement control measures on public land. The EWMP includes extensive green streets to retain runoff from roads and alleys. Green streets will potentially offer many other benefits to communities in terms of aesthetics, safety and increased property values.
- **Regional projects:** these control measures are potentially the most effective because they are able to capture runoff from large upstream areas. The EWMP emphasizes implementation of regional projects, particularly those that are able to retain the 85^{th} percentile, 24-hour storm event. The USGR EWMP highlights 9 multi-benefit regional projects (8 are discussed in the main document, and one is discussed in Appendix E), which will retain the stormwater volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects. The selection of these sites was based on detailed spatial analysis of soil type, topography, land ownership, land use type/density of development within drainage area, hydrologic delineation, and environmental constraints. The EWMP includes the volume of stormwater to be captured by regional projects on private land to assure required pollutant reductions are achieved. The Watershed Management Modeling System (WMMS) was used to prioritize control measures based on water quality benefits and cost effectiveness.
- **Minimum control measures (MCMs):** the MS4 Permit required Group Members to implement MCMs and they will continue to be implemented over the course of EWMP implementation. Enhanced MCMs, such as enhanced street sweeping and installation of catch basin inserts, are incorporated for the Covina, Glendora, Industry, and the County,

REASONABLE ASSURANCE ANALYSIS

A key element of the EWMP is the Reasonable Assurance Analysis (RAA), which is a quantitative demonstration through computer modeling that control measures will be effective in meeting water quality standards. The RAA describes baseline critical conditions and required pollutant reductions, representation of control measures, and the approach for selecting control measures. Additionally, the RAA was also applied to prioritize potential control measures to be implemented by the EWMP.

The WMMS was used to conduct the RAA for the USGR EWMP. WMMS is a publicly available modeling system that incorporates three tools: (1) the watershed model for prediction of long-term hydrology and pollutant loading, (2) a best management practice (BMP) model, and (3) a BMP optimization tool to support regional, cost-effective planning efforts. The WMMS was used to evaluate millions of potential scenarios of control measures for the EWMP, and select the most cost-effective scenarios while also incorporating input from the EWMP Group regarding the needs and opportunities within the communities.

The RAA Guidelines allow the EWMP to be developed with consideration of a "limiting pollutant", or the pollutant that drives BMP capacity (i.e., control measures that address the limiting pollutant will also address other pollutants). The RAA identifies the "limiting pollutants" for this watershed as zinc and *E.*

coli, and provides an assurance that addressing these pollutants will address the other Water Quality Priorities in the watershed.

EWMP IMPLEMENTATION PLAN

The outcome of the RAA presents a "recipe for compliance" for individual jurisdictions of the EWMP Group. The recipe consists of volumes of stormwater to be captured by LID, green streets, and regional projects and has a total equivalent capacity of nearly four Rose Bowl stadiums or 1,183 acre-feet. The recipe also describes the pace of implementation to achieve interim and final milestones.

ASSESSMENT AND ADAPTIVE MANAGEMENT FRAMEWORK

The EWMP Group has developed a Coordinated Integrated Monitoring Program (CIMP) separately from the EWMP to collect water quality data and measure the effectiveness of the EWMP. This section describes the process for evaluating the water quality data and "lessons learned" during implementation.

EWMP IMPLEMENTATION COSTS AND FINANAICAL STRATEGY

Based the RAA result, the total cost for the EWMP Group for implementation through 2036 including operation and maintenance is approximately $1.92 billion. The costs provided here are considered to be planning level, and can be refined with actual BMP implementation costs. The EWMP identifies potential funding sources and alternatives that Group Members will further pursue, including grants, fees, charges, and legislative policy.

STAKEHOLDER PARTICIPATION

The EWMP Group is strongly committed to providing the opportunity for meaningful stakeholder input throughout the development of the EWMP. The EWMP Group conducted public stakeholder meetings on May 5, 2014 and March 9, 2015 to receive feedback from stakeholders on the overall strategy to improving water quality, proposed control measures and regional projects, and potential partnership opportunities. Community input will continue to be solicited during the course of the EWMP implementation.

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LIST OF ACRONYMS AND ABBREVIATIONS

303(d) list	California State Water Resources Control Board 2010 Clean Water Act Section 303(d) list
Basin Plan	Water Quality Control Plan for the Los Angeles Region
BMP	Best Management Practice
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
CIMP	Coordinated Integrated Monitoring Program
County	County of Los Angeles (as a Municipality and MS4 Permittee)
CTR	California Toxics Rule
CWH	Council for Watershed Health
DDT	Dichloro-diphenyl-trichloroethane
DO	Dissolved Oxygen
EV	Exceedance Volume
EWMP	Enhanced Watershed Management Program
GIS	Geographic Information System
Group	Upper San Gabriel River EWMP Group
Group Members	County of Los Angeles, Los Angeles County Flood Control District, and the Cities of Baldwin Park, Covina, Glendora, Industry, La Puente, and West Covina
HFS	High Flow Suspension
HSPF	Hydrologic Simulation Program - FORTRAN
IC/ID	Illicit Connection/Illicit Discharge
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LACSD	Los Angeles County Sanitation District
Legacy Toxics	Pollutants from historic contaminants not currently used, such as PCBs and OC pesticides
LID	Low Impact Development
Limiting Pollutant	Pollutant that drives BMP capacity (i.e., control measures that address the limiting pollutant will also address other pollutants)
LSPC	Loading Simulation Program C++
LTA	Long-Term Assessment
MBAS	Methylene Blue Active Substances
MCM	Minimum Control Measure
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
NIMS	Nonlinearity-Interval Mapping Scheme
NOI	Notice of Intent
Nonpoint Source	Pollution that is not released through a specific geographic location but rather originates from multiple sources over a relatively large area. Nonpoint sources can related either to land or water use including failing septic tanks, animal-keeping practices, forestry practices, and urban and rural runoff.
NPDES	National Pollutant Discharge Elimination System
OC	Organochlorine
O&M	Operation & maintenance
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEIR	Programmatic Environmental Impact Report
Permit	Permit No. R4-2012-0175
Point Source	Pollutant loads discharged at a specific location from pipes, outfalls, and

	conveyance channels. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.
RAA	Reasonable Assurance Analysis
Regional Board	Los Angeles Regional Water Quality Control Board
RWL	Receiving Water Limit
RWQCB	Regional Water Quality Control Board
SGR	San Gabriel River
SUSTAIN	System for Urban Stormwater Treatment and Analysis Integration
SWPPP	Stormwater Pollution Prevention Plan
TAC	Technical Advisory Committee
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USGR	Upper San Gabriel River
USGS	United States Geological Survey
WBPC	Water Body-Pollutant Combination
WLA	Waste Load Allocation
WMMS	Watershed Management Modeling System
WMP	Watershed Management Program
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objectives
WRP	Water Reclamation Plant

1 Introduction

The Upper San Gabriel River (USGR) Enhanced Watershed Management Program (EWMP) has been developed by the Upper San Gabriel River Enhanced Watershed Management Program Group (Group), which originally comprised the County of Los Angeles, Los Angeles County Flood Control District (LACFCD), and the Cities of Baldwin Park, Covina, Glendora, Industry, and La Puente. In a letter dated June 18, 2015, the City of West Covina informed the Los Angeles Regional Water Quality Control Board (RWQCB or Regional Board) of its intent to join the Group. In response, the Group incorporated West Covina in the Introduction Section of the June 2015 version of the Draft EWMP and all the remaining elements in Appendix E of the August 2015 version of the Draft EWMP. The EWMP fulfills the requirements 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 Regional Board and became effective on December 28, 2012.

The EWMP contains customized strategies, watershed control measures, and best management practices (BMPs), including multi-benefit regional projects that retain and infiltrate stormwater runoff from the 85th-percentile, 24-hour storm event for the drainage area tributary to the project.

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 A-1** includes copies of the legal authority certifications.

Separately from the EWMP, the Group has developed a Coordinated Integrated Monitoring Program (CIMP) to progressively monitor water quality, determine effectiveness of the EWMP activities, and guide the Group's decisions for future adaptive management of the EWMP.

This document is presented as follows:

- **Section 1, Introduction** – Discusses the regulatory framework associated with the development of the EWMP, including permit requirements. The section also reviews the San Gabriel River Watershed, with emphasis on the EWMP area, the EWMP Group's jurisdictional boundaries, and geologic and environmental characteristics of the area.
- **Section 2, Identification of Water Quality Priorities –** Identifies water quality priorities for the water body pollutant combinations (WBPCs) in the Upper San Gabriel River EWMP area, and discusses the EWMP goals to achieving water quality standards.
- **Section 3, Watershed Control Measures** – Describes the different watershed control measures (also referred to as BMPs) that could be implemented individually or on a watershed scale to create an efficient program to focus resources on water quality priorities. This section provides an overview of the various types of BMPs considered, including multi-benefit, regional projects that capture and infiltrate the 85th percentile, 24-hour storm volume.
- **Section 4, Reasonable Assurance Analysis** – Describes key elements of the RAA, which is essentially a quantitative demonstration that control measures will be effective to meet Permit requirements. This section describes the modeling system used for the RAA, baseline critical conditions and required pollutant reductions, representation of control measures in the RAA, and the approach for selecting control measures in the EWMP.
- **Section 5, EWMP Implementation Plan and Compliance Schedule** – Presents the outcome of the RAA – the EWMP Implementation Plan, which is the "recipe for compliance" for each

jurisdiction to address the water quality priorities and comply with the MS4 Permit. This section describes the control measures or BMPs to be implemented for each jurisdiction and each watershed/assessment area, and also the pace of implementation to achieve applicable milestones.

- **Section 6, Assessment and Adaptive Management Framework** – Describes the adaptive management process that will be used to gather information over time and modify the EWMP to reflect the most current understanding of the watershed.
- **Section 7, EWMP Implementation Costs and Financial Strategy** – 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 to fund the program.
- **Section 8, References** – Lists the references cited in this EWMP.

1.1 BACKGROUND REGULATORY FRAMEWORK

1.1.1 Permit Requirements

The 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 Los Angeles County are not causing or contributing to exceedances of water quality objectives (WQOs) set to protect the beneficial uses in the receiving waters in the Los Angeles region.

On June 26, 2013, the EWMP Group submitted a notice of intent (NOI) to develop an EWMP to fulfill the requirements of the NPDES MS4 Permit Order. Subsequently, the draft EWMP Work Plan and draft CIMP were submitted to the Regional Board on June 27, 2014.

To establish consistency with Part VI.C.5-C.8 of the Permit, this EWMP:

(i) Prioritizes water quality issues resulting from stormwater and non-stormwater discharges from the MS4 to receiving waters within the EWMP area;

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

(iii) Modifies strategies, control measures, and BMPs, as necessary, based on analysis of monitoring data to ensure that applicable water quality-based effluent limitations (WQBELs) and receiving water limitations (RWLs) and other milestones set forth in this EWMP are achieved in the required timeframes; and

(iv) Provides appropriate opportunity for meaningful stakeholder input.

The EWMP identifies multi-benefit regional projects that retain (i) all non-stormwater runoff and (ii) all stormwater runoff from the 85th percentile, 24-hour storm event for the drainage areas tributary to the projects.

1.2 UPPER SAN GABRIEL RIVER EWMP AREA

1.2.1 San Gabriel River Watershed

The San Gabriel River Watershed encompasses approximately 680 square miles of eastern Los Angeles County, northwest Orange County, and southwest San Bernardino County. The San Gabriel River itself has a main channel length of approximately 58 miles. Its headwaters originate in the San Gabriel

Mountains with the East, West, and North Forks. The river flows through residential, commercial and industrial areas before reaching the Pacific Ocean in Long Beach. The main tributaries of the river are Walnut Creek Wash, San Jose Creek, and Coyote Creek. The EWMP area is mainly located in the upper portion of the San Gabriel River Watershed. Water bodies within the EWMP area include:

- Thompsons Wash
- Little Dalton Wash
- Big Dalton Wash
- San Dimas Wash
- Walnut Creek Wash
- Puente Creek
- San Jose Creek Reaches 1 and 2
- San Gabriel River Reaches 2, 3, 4, and 5
- North Fork of Coyote Creek

Water bodies downstream of the EWMP area include:

- San Gabriel River Reach 1
- Coyote Creek
- San Gabriel River Estuary

Additionally, there are unnamed tributaries draining unincorporated County areas that discharge into Coyote Creek and Puddingstone Reservoir.

1.2.2 EWMP Group Jurisdictional Boundaries

The EWMP Group consists of six cities, unincorporated areas of the County, and the LACFCD. Water bodies and geographic boundaries of the USGR EWMP Group are shown on **Figure 1-1** along with the named water bodies.

The LACFCD owns and operates the majority of flood control facilities within the San Gabriel River Watershed, while a small portion are owned and operated by the United States Army Corps of Engineers. The EWMP Group includes the LACFCD service areas as depicted in **Appendix A-3.**

Table 1-1 shows the land area distribution by each jurisdiction for the EWMP Group not including the Angeles National Forest. Size and land uses for the Group Members' jurisdictional boundaries are provided in **Table 1-2**.

Figure 1-1
Water Bodies and Geographic Boundaries of the USGR EWMP Group

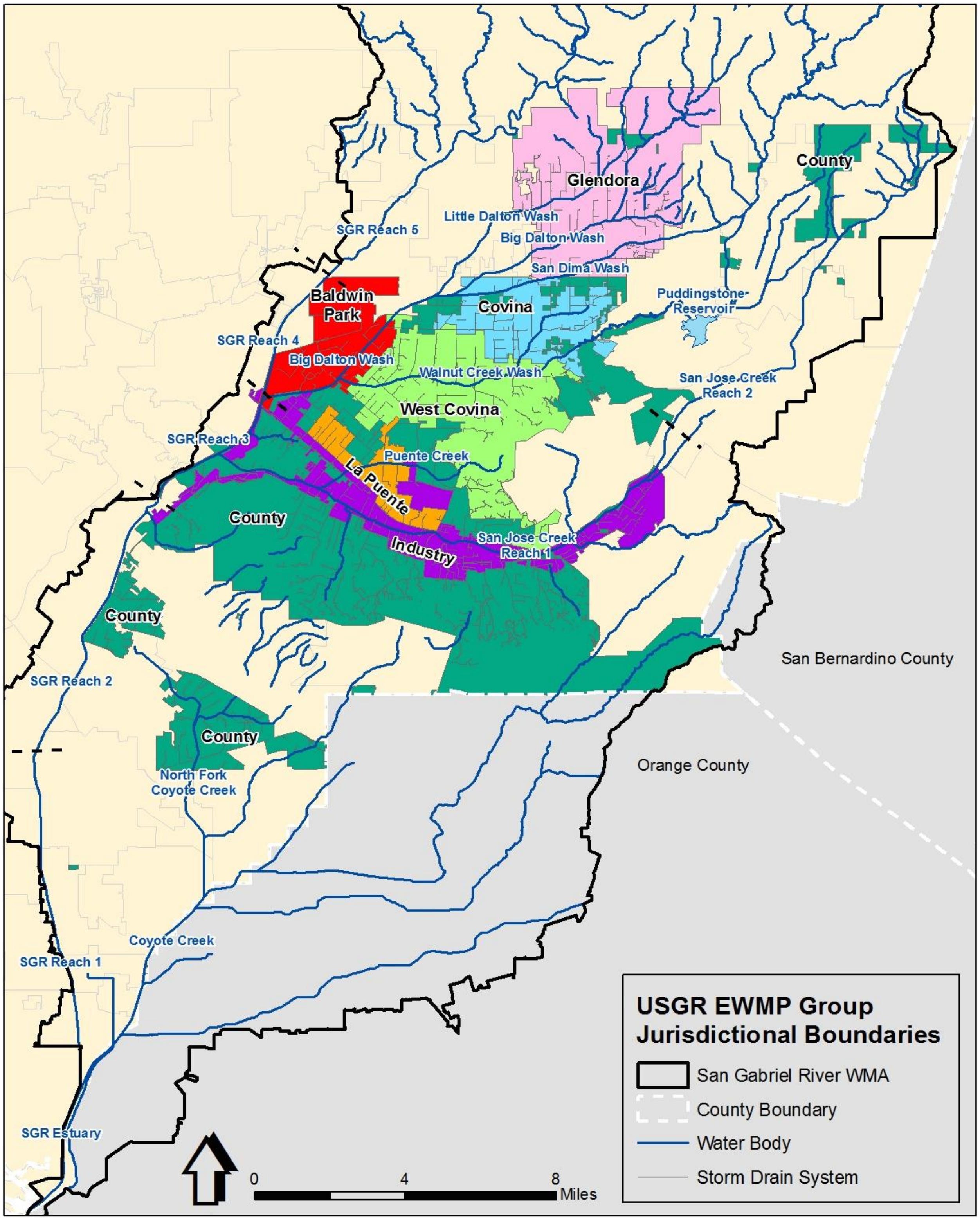


Table 1-1
EWMP Group Land Area by Jurisdiction

Jurisdiction	Land Area (acres)	Percent (%)
County of Los Angeles	40,812	51.6
City of Baldwin Park	4,335	5.5
City of Covina	4,481	5.6
City of Glendora	9,307	11.8
City of Industry	7,647	9.7
City of La Puente	2,207	2.8
City of West Covina	10,336	13.0
LACFCD	N/A	N/A
Total Area of EWMP Group	**79,125**	**100**

Table 1-2
List of Group Members with Land Use Summaries within Jurisdictional Boundaries

Group Member	Area (acres)	Percent of Land Area[1]			
		Res	Com/Ind	Ag/Nur	Open
County of Los Angeles	40,812	50	14	1	35
Baldwin Park	4,335	66	31	2	1
Covina	4,481	65	32	<1	3
Glendora	9,307	48	13	1	38
Industry	7,647	<1	75	3	22
La Puente	2,207	71	24	<1	5
West Covina	10,336	68	21	<1	11
LACFCD	N/A	N/A	N/A	N/A	N/A
All Members	79,125	50	23	1	26

1 Land use classifications include: residential (res), commercial and industrial (com/ind), agriculture and nursery (ag/nur), and open space (open). Totals correspond to the percent of the total area considered in the EWMP.

1.2.3 San Gabriel River Valley Geological Characteristics

The geology of the San Gabriel River Watershed can be subdivided into three basic types of geologic materials:

- Bedrock materials in the steep upper portion of the watershed in the Angeles National Forest in the San Gabriel Mountains
- Sedimentary materials comprising valley fill emanating from alluvial fans from the San Gabriel Mountains
- Marine sedimentary deposits which comprise the San Jose Hills and Puente Hills

The bedrock materials of the San Gabriel Mountains consist of igneous and metamorphic rocks, which were uplifted by faulting to form steep ridges and valleys in the upper portion of the watershed. These rocks are generally impermeable and transmit only small quantities of water through fractures.

The sedimentary materials which comprise the flatter areas of the valley are comprised of alluvial fan and fluvial deposits. These deposits tend to be very permeable, especially near the northern portions of the valley adjacent to the San Gabriel Mountains. The valley fill materials consist of interbedded silt, sand and gravels. The numerous gravel pits in the valley are located in these deposits. The deposits represent the most promising areas for regional infiltration facilities. During dry weather, surface water from the San Gabriel Mountains infiltrates rapidly into these deposits, providing a hydraulic separation of the lower portions of the watershed. A goal of the monitoring in the Coordinated Integrated Monitoring Program (CIMP) will be to establish when the EWMP area is hydraulically connected to the downstream water bodies.

The sedimentary deposits which form the upland areas of the San Jose Hills and Puente Hills consist of marine sandstone, siltstone, and shale. Because these deposits are fine-grained and consolidated, they have relatively low permeability. Aside from the disadvantages of higher elevation and relatively steep slopes, they represent poor areas for infiltration because of their expected low permeability.

1.2.4 Groundwater Basins

The alluvial and fluvial valley-fill deposits in the flatter areas of the watershed form two groundwater basins that underlie the EWMP area. Most of the area of Covina, Baldwin Park, Glendora, and West Covina overlie the Main San Gabriel Groundwater Basin. This groundwater basin is an important source of water supply, with a typical production of 250,000 acre-feet of water per year. The basin is adjudicated and actively managed by the Main San Gabriel Watermaster. Groundwater flow is generally from east to west across the basin, then southward into the Central Basin through the Montebello Forebay. There are numerous existing stormwater capture facilities that are operated by LACFCD, the largest being along the San Gabriel River and Santa Fe Dam. The groundwater contains a number of contaminant plumes stemming from past agricultural and industrial practices, including nitrate, volatile organic compounds, and perchlorate.

The Puente Basin is a smaller groundwater basin roughly co-located with the City of Industry south of the San Jose Hills. Groundwater flow is generally westward, flowing into the Main San Gabriel Basin near Highway 605. The Puente Basin is also adjudicated and managed by a three-person watermaster committee. The average production from this basin is approximately 1,000 acre-feet per year. Due to the poor quality of the groundwater, it is used for non-potable purposes including blending with reclaimed water, construction water, and irrigation.

1.2.5 Rainfall Conditions

The semi-arid climate of the Los Angeles region creates distinct hydrologic differences between the dry and wet seasons. The amount of rainfall is a key variable for water quality conditions and pollutant loadings from MS4 areas. To support EWMP development, a rainfall analysis was performed by aggregating data from available rain gages across the San Gabriel River Watershed. For comparison, other watersheds were also analyzed. Two key metrics were evaluated: (1) total annual rainfall, and (2) average rainfall per wet day (with wet days defined as days with rainfall totals greater than 0.1 inches). The second metric serves as a coarse indicator of rainfall intensity. The analysis covered 25 water years from 1987 through 2011—the total rainfall for each precipitation gage was aggregated into annual totals based on water year (i.e. previous October through current September).

For EWMP development, the last 10 years of available data from years 2002 to 2011was used to develop the RAA (Section 4). As shown in **Table 1-3** and **Table 1-4**, these 10 years were compared to the overall 25 years of record. Both the average and 90th percentile values were compared across the 10- and 25-year records. For the San Gabriel River, water year 2008 is a representative average year based on both rainfall metrics (yellow cells in **Table 1-3** and **Table 1-4**), while water year 2003 was proximal to the 90th percentile values for San Gabriel River in terms of rainfall per wet day, which is a conservative metric for BMP planning (green highlighted cells in **Table 1-4**). As such, for the San Gabriel River, water year 2008 is a representative year for average conditions and water year 2003 is a representative year for critical wet conditions, which will be important boundary conditions for the RAA (Section 4).

Table 1-3
Annual Rainfall Totals (Water Years 2002–2011 vs. 25-year Average)

Water Year	Average Rainfall Totals (inches/year)				
	Ballona Creek	Dominguez Channel	Malibu Creek	San Gabriel River	Los Angeles River
2002	25.4	19.1	28.1	30.6	30.5
2003	17.1	13.9	20.8	23.0	20.4
2004	10.2	8.1	9.2	13.7	11.2
2005	39.3	28.4	42.6	49.6	46.7
2006	14.1	9.8	16.9	17.9	17.5
2007	4.3	3.1	6.8	6.4	5.8
2008	13.2	11.9	18.6	19.4	17.5
2009	9.6	8.5	12.3	14.6	12.5
2010	16.8	14.9	20.3	24.1	20.5
2011	21.2	18.5	25.3	28.5	25.7
Avg. (1987-2011)	15.9	12.5	18.4	20.7	19.2
90th Percentile (1987-2011)	30.8	22.9	34.7	37.8	36.9

Yellow highlighted cells are the two years in each basin with the smallest difference from the 25-year average. Green cells have the smallest difference from 90th percentile of the 25-year record.

Table 1-4
Average Rainfall Per Wet Day (Water Years 2002–2011 vs. 25-year Average)

Water Year	Average Rainfall Per Wet Day (inches/wet day)				
	Ballona Creek	Dominguez Channel	Malibu Creek	San Gabriel River	Los Angeles River
2002	0.36	0.32	0.41	0.42	0.36
2003	0.79	0.66	0.88	0.92	0.84
2004	0.61	0.48	0.61	0.66	0.58
2005	0.98	0.69	1.03	1.07	1.03
2006	0.53	0.41	0.61	0.64	0.61
2007	0.31	0.27	0.39	0.41	0.37
2008	0.56	0.52	0.68	0.76	0.71
2009	0.49	0.48	0.56	0.65	0.57
2010	0.64	0.60	0.71	0.82	0.72
2011	0.62	0.58	0.73	0.76	0.70
Avg. (1987-2011)	0.59	0.52	0.67	0.72	0.66
90th Percentile (1987-2011)	0.78	0.66	0.91	0.97	0.89

Yellow highlighted cells are the two years in each basin with the smallest difference from the 25-year average. Green cells have the smallest difference from 90th percentile of the 25-year record.

1.3 STAKEHOLDER INVOLVEMENT

The EWMP Group is strongly committed to providing the opportunity for meaningful stakeholder input throughout the development of the EWMP. The EWMP Group participated in watershed coordination meetings that were developed to facilitate collaboration among watershed groups within the SGR Watershed as well as the Technical Advisory Committee (TAC), which was established by MS4 Permit to facilitate participation in the EWMP development by the Regional Board and stakeholder groups. The EWMP Group conducted public stakeholder meetings on May 5, 2014 and March 9, 2015 to receive feedback from stakeholders on the overall strategy to improving water quality, proposed control measures and regional projects, and potential partnership opportunities. USGR EWMP Group Members will continue to engage the communities during the course of EWMP implementation. Documentation of stakeholder outreach is provided in **Appendix A-2**.

2 Identification of Water Quality Priorities

Water quality priorities establish the goals for the EWMP, and support prioritization and scheduling of EWMP control measures. The water body pollutant combination (WBPC) defines the specific location and constituent that needs to be addressed in the watershed. The USEPA defines a water body as “a geographically defined portion of navigable waters, waters of the contiguous zone, and ocean waters under the jurisdiction of the United States, including segments of rivers, streams, lakes, wetlands, coastal waters and ocean waters”. Concrete-lined channels present in the EWMP area are therefore defined as water bodies. The Permit outlines a specific set of priorities based on total maximum daily loads (TMDLs), State Water Resources Control Board 2010 Clean Water Act Section 303(d) list, and monitoring data. Data were obtained from available sources and analyzed to evaluate exceedances of water quality objectives (WQOs). The determination of the WBPCs for the group is presented below.

2.1 WATER BODY-POLLUTANT RECEIVING WATER LIMITATION EXCEEDANCES

Monitoring data for sites within the Upper San Gabriel River Watershed Management Area was obtained from the following sources:

- The LACFCD provides long-term monitoring data from the San Gabriel River Mass Emission Stations S14 and S13.
- LACFCD tributary monitoring sites, each operated for two years:
  - Big Dalton Wash TS13
  - Puente Creek TS14
  - San Jose Creek TS15
  - Maplewood Channel TS16
  - North Fork of Coyote Creek TS17
  - Artesia-Norwalk Drain TS18
- The Council for Watershed Health (CWH) provides monitoring data from their monitoring activities throughout the San Gabriel River Watershed.
- The California Environmental Data Exchange Network (CEDEN).
- LACSD provides long-term dry weather receiving water monitoring data.

Stormwater quality data are sparse for the receiving waters in the EWMP area. Data obtained from the CWH and CEDEN largely consisted of short-term monitoring activities and many sites from these programs were only used for a single sampling event or had a limited number of constituents tested at the sites. However, the two LACFCD mass emission stations provide a history of stormwater quality for the upper San Gabriel River and Coyote Creek. Additionally, the tributary monitoring sites provide a two-year snapshot of stormwater quality within the watershed. All data were screened to identify potential WQO exceedances.

During dry weather, the San Gabriel River is typically dry upstream of the confluence with San Jose Creek and downstream of Whittier Dam. LACSD receiving water monitoring provides characterization of portions of the San Gabriel River, San Jose Creek, and Coyote Creek during dry weather. Monitoring of other receiving waters is generally sporadic, with the exception of the LACFCD program. A number of sites on receiving waters downstream from the EWMP area are regularly monitored under dry weather conditions by LACFCD. To identify the water quality priorities in the EWMP area, data reflective of receiving waters downstream from the EWMP area were considered. It is not known at this time if the MS4 discharges from the EWMP area are contributing to water quality issues observed downstream.

During dry weather, the water bodies in the EWMP area are generally hydraulically disconnected from the lower sections of the watershed due to the rapid infiltration over soft-bottom channels. The monitoring performed under the CIMP will also provide information to support a determination of whether the discharges are affecting the water quality of water bodies within and downstream of the EWMP area.

Water quality data from the past 10 years are compared to the WQBELs, where available, or the WQOs. Based on the data review, constituents that had no observed exceedances in the past five years or would not meet the 303(d) listing criteria for impairment could potentially be delisted are identified in the prioritization process.

2.2 EWMP GROUP'S WATER QUALITY PRIORITIES

EWMP area water quality priorities are based on TMDLs, 303(d) list, and monitoring data. From the available information and data analysis results, WBPCs were classified in one of the three Permit- defined categories. Category 1 if WBPCs are subject to established TMDLs, Category 2 if they are on the 303(d) list, or have sufficient exceedances to be listed, and Category 3 if there are observed exceedances but too infrequently to be listed.

Subcategories were identified and created to refine the prioritization process. Those pollutants with measurements exceeding WQOs are further evaluated and categorized based on the frequency, timing, and magnitude of exceedances. The subcategories are listed in **Table 2-1**. The WBPCs are placed in the respective subcategories as outlined in **Table 2-2**. Water quality based effluent limits applicable to Category 1 WBPCs and receiving water objectives corresponding to Category 2 and 3 WBPCs are listed in **Table 2-3.**

Table 2-1
Details for Water Body-Pollutant Combination Subcategories

Category	Water Body-Pollutant Combinations (WBPCs)	Description
1	**Category 1A:** WBPCs with past due or current Permit term TMDL deadlines with exceedances in the past 5 years.	WBPCs with TMDLs with past due or current Permit term interim and/or final limits. These pollutants are the highest priority for the current Permit term.
	Category 1B: WBPCs with TMDL deadlines beyond the Permit term with exceedances in the past 5 years.	The Permit does not require the prioritization of TMDL interim and/or final deadlines outside of the Permit term or USEPA TMDLs, which do not have implementation schedules. To ensure EWMPs consider long term planning requirements and utilize the available compliance mechanisms these WBPCs should be considered during BMP planning and scheduling, and during CIMP development.
	Category 1C: WBPCs addressed in USEPA TMDL without a Regional Board Adopted Implementation Plan.	
	Category 1D: WBPCs with past due or current Permit term TMDL deadlines but have not exceeded in past 5 years.	WBPCs where specific actions may end up not being identified because recent exceedances have not been observed and specific actions may not be necessary. The CIMP should address these WBPCs to support future re-prioritization.
	Category 1E: WBPCs with future Permit term TMDL deadlines but have not exceeded in past 5 years.	
2	**Category 2A:** 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements with exceedances in the past 5 years.	WBPCs with confirmed impairment or exceedances of RWLs. WBPCs in a similar class[1] as those with TMDLs are identified. WBPCs currently on the 303(d) List are differentiated from those that are not to support utilization of WMP compliance mechanisms.
	Category 2B: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements that are not a "pollutant"[2] (i.e., toxicity).	WBPCs where specific actions may not be identifiable because the cause of the impairment or exceedances is not resolved. Either routine monitoring or special studies identified in the CIMP should support identification of a "pollutant" linked to the impairment and re-prioritization in the future.
	Category 2C: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements but have not exceeded in past 5 years.	WBPCs where specific actions for implementation may not be identified because recent exceedances have not been observed. Pollutants that are in a similar class[1] as those with TMDLs are identified. Routine monitoring identified in the CIMP should ensure these WBPCs are addressed to support re-prioritization in the future.
3	**Category 3A:** All other WBPCs with exceedances in the past 5 years.	Pollutants that are in a similar class[1] as those with TMDLs are identified.
	Category 3B: All other WBPCs that are not a "pollutant"[2] (i.e., toxicity).	WBPCs where specific actions may not be identifiable because the cause of the impairment is not resolved. Routine monitoring identified in the CIMP should support identification of a "pollutant" linked to the impairment and re-prioritization in the future.
	Category 3C: All other WBPCs but have not exceeded in past 5 years.	Pollutants that are in a similar class[1] as those with TMDLs are identified.
	Category 3D: WBPCs identified by the EWMP Group.	The EWMP Group may identify other WBPCs for consideration in WMP planning.

1 Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL. (Permit pg. 49 – RWQCB, 2012).

2 While one or more pollutants may be contributing to the impairment, it currently is not possible to identify the specific pollutant/stressor.

Table 2-2
Summary of Upper San Gabriel River Watershed Management Area Water Body-Pollutant Combination Categories

Class[1]	Constituent[2]	Within EMWP Area: San Gabriel River Reach[3] 2	Within EMWP Area: San Gabriel River Reach[3] 3	Within EMWP Area: San Jose Creek Reach 1	Within EMWP Area: San Jose Creek Reach 2	Within EMWP Area: Puente Creek	Within EMWP Area: Walnut Creek Wash	Within EMWP Area: North Fork of Coyote Creek	Within EMWP Area: Pudding-stone Reservoir	Downstream of EWMP Area: Coyote Creek	Downstream of EWMP Area: San Gabriel River Reach 1	Downstream of EWMP Area: San Gabriel Estuary
Category 1A: WBPCs with past due or current term TMDL deadlines with exceedances in the past 5 years.												
Metals	Copper (Dry)									I	I	I
	Copper (Wet)[4]							I		I		
	Zinc (Wet) [4]							I		I		
	Selenium (Dry)			I	I							
Category 1B: WBPCs with TMDL deadlines beyond the current Permit term and with exceedances in the past 5 years.												
Metals	Copper (Dry)									F	F	F
	Copper (Wet) [4]							F		F		
	Zinc (Wet) [4]							F		F		
	Selenium (Dry)			F	F							
Category 1C: WBPCs addressed in USEPA TMDL without an Implementation Plan												
Nutrients	Total Nitrogen								X			
	Total Phosphorus								X			
Metals	Total Mercury								X			
Legacy	Polychlorinated Biphenyl (PCB) (Sediment)								X			
	PCB (Water)								X			
	Chlordane (Sediment)								X			
	Chlordane (Water)								X			
	Dieldrin (Sediment)								X			
	Dieldrin (Water)								X			
	DDT (Sediment)								X			
	DDT (Water)								X			

Continued

Table 2-2
Summary of Upper San Gabriel River Watershed Management Area Water Body-Pollutant Combination Categories

Class[1]	Constituent[2]	Within EMWP Area								Downstream of EWMP Area		
		San Gabriel River Reach[3]		San Jose Creek Reach		Puente Creek	Walnut Creek Wash	North Fork of Coyote Creek	Pudding-stone Reservoir	Coyote Creek	San Gabriel River Reach 1	San Gabriel Estuary
		2	3	1	2							
Category 1D: WBPCs with past due or current term deadlines without exceedances in the past 5 years.												
Metals	Copper (Dry)[4]							I				
	Lead (Wet)[5]	I	I	I	I	I	I	I		I		
Category 1E: WBPCs with TMDL deadlines beyond the current Permit term without exceedances in the past 5 years.												
Metals	Copper (Dry)[4]							F				
	Lead (Wet)[5]	F	F	F	F	F	F	F		F		
Category 2A: 303(d) Listed WBPCs with exceedances in the past 5 years.												
Bacteria	Indicator Organisms	303(d)	303(d)	303(d)	303(d)	303(d)	303(d)	303(d)		303(d)	303(d)	
Metals	Zinc		Wet							Dry		
	Lead				Dry					Dry		
	Selenium					303(d)		303(d)				
	Copper		X									
Legacy	Polycyclic Aromatic Hydrocarbon (PAH)	X	X	X	X							
Other	Cyanide	303(d)	X							X		
Category 2B: 303(d) Listed WBPCs that are not a "pollutant" (i.e., toxicity).												
Other	Benthic-Macroinvertebrates						303(d)					
Other	Dissolved Oxygen (DO)											303(d)
Other	pH			303(d)			303(d)			303(d)	303(d)	
Other	Toxicity			303(d)						303(d)		

Continued

Table 2-2
Summary of Upper San Gabriel River Watershed Management Area Water Body-Pollutant Combination Categories

Class[1]	Constituent[2]	Within EMWP Area								Downstream of EMWP Area		
		San Gabriel River Reach[3]		San Jose Creek Reach		Puente Creek	Walnut Creek Wash	North Fork of Coyote Creek	Pudding-stone Reservoir	Coyote Creek	San Gabriel River Reach 1	San Gabriel Estuary
		2	3	1	2							
Category 2C: 303(d) Listed WBPCs without exceedances in past 5 years[6].												
Nutrients	Ammonia			303(d)						303(d)		
Other	Diazinon									303(d)		
Other	2,3,7,8-TCDD (Dioxin)											303(d)
Metal	Cadmium					Wet						
	Copper			X		X	X					
	Lead					Dry	Dry					
	Zinc			X		X	X					
	Nickel									Dry		303(d)
	Mercury (Total)							X				
Salts	Total Dissolved Solids (TDS)			303(d) Dry								
Category 3A: WBPCs with exceedances in the past 5 years.												
Other	MBAS (methylene blue active substances)		Wet							Wet		
Salts	Sulfate		Dry	Dry	Dry							
	Chloride		Dry	Dry	Dry					Dry		
	TDS		Dry									
Legacy	Alpha-Endosulfan									Dry		
Other	Cyanide							X				
Category 3B: WBPCs that are not a "pollutant"[4] (i.e., toxicity).												
Other	Dissolved Oxygen (DO)		X	X	X					Wet	Dry	
	pH					X		Dry				

Continued

Table 2-2
Summary of Upper San Gabriel River Watershed Management Area Water Body-Pollutant Combination Categories

		Within EMWP Area								Downstream of EMWP Area		
		San Gabriel River Reach[3]		San Jose Creek Reach								
Class[1]	Constituent[2]	2	3	1	2	Puente Creek	Walnut Creek Wash	North Fork of Coyote Creek	Pudding-stone Reservoir	Coyote Creek	San Gabriel River Reach 1	San Gabriel Estuary
Category 3C: WBPCs with historical exceedances but none in the past 5 years.												
Other	Cyanide			X								
Metals	Selenium						X				X	X
	Lead											X
	Copper					Dry						
	Zinc											X
	Mercury (Total)						X					
Other	Lindane		X									

1 Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the EWMP for the TMDL.

2 WBPC listed as Wet or Dry where issue is restricted to a condition. Otherwise, WBPC is both an issue for both Wet and Dry and denoted with an X.

3 Data from Mass Emission Station S14 are included under San Gabriel River Reach 3 because the station is located just downstream of the reach break. TMDL and 303(d) listings historically applied to Reach 2.

4 Grouped allocation. Compliance in Coyote Creek, as measured at the Coyote Creek LTA station, is compliance for all tributaries.

5 Grouped allocation. Compliance in San Gabriel River Reach 2, as measured at the San Gabriel LTA station, is compliance for all tributaries.

6 As per the San Gabriel River Impaired Tributaries Metals and Selenium TMDL (SGR Metals TMDL), San Gabriel Reaches 4 and 5, Thompsons Wash, Big Dalton Wash, Little Dalton Wash, and San Dimas Wash, which are not impaired waterbodies on the 303{d) list, are subject to the wet weather Waste Load Allocation (WLA) for Lead.

I/F Denotes where the Permit includes interim (I) and/or final (F) effluent and/or RWLs.

303(d) WBPC on the 2010 303(d) List where the listing was confirmed during data analysis.

Table 2-3
Initial Classification of Water Body Pollutant Combinations

Constituent	Water Body	Category	Condition	WQO/RWL/WQBEL[(1)]
Copper	SGR R3	2A	Wet/Dry	Hardness Based
	SJC R1	2C	Wet/Dry	Hardness Based
	Puente Creek	2A	Wet/Dry	Hardness Based
	Walnut Creek	2A	Wet/Dry	Hardness Based
	NF Coyote Creek	1A/B	Wet	24.71 µg/L
		3A	Dry	20 µg/L
	Coyote Creek	1A/B	Wet/Dry	24.71 µg/L/20 µg/L
	SGR R1	1A/B	Dry	18 µg/L
	SGE	1A/B	Dry	3.7 µg/L
Lead	SGR R2	1D/E	Wet	81.34 µg/L
	SJC R1	1D/E	Wet	81.34 µg/L
	SJC R2	1D/E	Wet	81.34 µg/L
		2A	Dry	Hardness Based
	Puente Creek	1D/1E	Wet	81.34 µg/L
		2C	Dry	Hardness Based
	Walnut Creek	1D/E	Wet	81.34 µg/L
		2C	Dry	Hardness Based
	NF Coyote Creek	1D/E	Wet	96.99 µg/L
	Coyote Creek	1D/E	Wet	96.99 µg/L
	SGE	3C	Wet/Dry	3.16 µg/L
Zinc	SGR R3	2A	Wet/Dry	Hardness Based
	SJC R1	2C	Wet/Dry	Hardness Based
	Puente Creek	2C	Wet/Dry	Hardness Based
	Walnut Creek	2C	Wet/Dry	Hardness Based
	NF Coyote Creek	1A/B	Wet	144.57 µg/L
	Coyote Creek	1A/B	Wet	144.57 µg/L
		2A	Dry	Hardness Based
	SGE	3C	Wet/Dry	85.6 µg/L

Continued

Table 2-3
Initial Classification of Water Body Pollutant Combinations

Constituent	Water Body	Category	Condition	WQO/RWL/WQBEL(1)
Nickel	Coyote Creek	2C	Dry	Hardness Based
	SGE	2C	Wet/Dry	Hardness Based
Cadmium	Puente Creek	2C	Wet	Hardness Based
Selenium	SJC R1	1A/B	Dry	5 µg/L
	SJC R2	1A/B	Dry	5 µg/L
	Puente Creek	2A	303(d)	5 µg/L
	Walnut Creek	3C	Wet/Dry	5 µg/L
	NF Coyote Creek	2A	303(d)	5 µg/L
	SGR R1	3C	Wet/Dry	5 µg/L
	SGE	3C	Wet/Dry	5 µg/L
Mercury	Puddingstone	1C	Wet/Dry	0.05 µg/L
	Walnut Creek	3C	Wet/Dry	0.05 µg/L
	NF Coyote Creek	2C	Wet/Dry	0.05 µg/L
Total Nitrogen	Puddingstone	1C	Wet	0.71 mg/L as N
Total Phosphorus	Puddingstone	1C	Wet	0.071 mg/L as P
PCB (suspended sediment)	Puddingstone	1C	Wet	0.59 µg/kg
PCB (water)	Puddingstone	1C	Wet	0.17 ng/L
Chlordane (sediment)	Puddingstone	1C	Wet	0.75 µg/kg
Chlordane (water)	Puddingstone	1C	Wet	0.57 ng/L
Dieldren (sediment)	Puddingstone	1C	Wet	0.22 µg/kg
Dieldren (water)	Puddingstone	1C	Wet	0.14 ng/L
DDT (sediment)	Puddingstone	1C	Wet	3.94 µg/kg
DDT (water)	Puddingstone	1C	Wet	0.59 ng/L

Continued

Table 2-3
Initial Classification of Water Body Pollutant Combinations

Constituent	Water Body	Category	Condition	WQO/RWL/WQBEL[1]
E. coli	SGR R2	2A	303(d)	126 MPN/100 mL
	SGR R3	2A	303(d)	126 MPN/100 mL
	SJC R1	2A	303(d)	126 MPN/100 mL
	SJC R2	2A	303(d)	126 MPN/100 mL
	Puente Creek	2A	303(d)	126 MPN/100 mL
	Walnut Creek	2A	303(d)	126 MPN/100 mL
	NF Coyote Creek	2A	303(d)	126 MPN/100 mL
	Coyote Creek	2A	303(d)	126 MPN/100 mL
	SGR R1	2A	303(d)	235 MPN/100 mL
PAHs	SGR R2	2A	Wet/Dry	Species Specific
	SGR R3	2A	Wet/Dry	Species Specific
	SJC R1	2A	Wet/Dry	Species Specific
	SJC R2	2A	Wet/Dry	Species Specific
Cyanide	SGR R2	2A	Wet/303(d)	22/5.2 µg/L
	SGR R3	2A	Wet/Dry	22/5.2 µg/L
	SJC R1	3C	Wet/Dry	22/5.2 µg/L
	NF Coyote Creek	3A	Wet/Dry	22/5.2 µg/L
	Coyote Creek	2A	Wet/Dry	5.2 µg/L
MBAS	SGR R3	3A	Wet	500 µg/L
	Coyote Creek	3A	Wet	500 µg/L
TDS	SGR R3	3A	Dry	750 mg/L
	SJC R1	2C	Dry	750 mg/L
Chloride	SGR R3	3A	Dry	150 mg/L
	SJC R1	3A	Dry	180 mg/L
	SJC R2	3A	Dry	150 mg/L
	Coyote Creek	3A	Dry	150 mg/L
Sulfate	SGR R3	3A	Dry	300 mg/L
	SJC R1	3A	Dry	300 mg/L
	SJC R2	3A	Dry	300 mg/L

Continued

Table 2-3
Initial Classification of Water Body Pollutant Combinations

Constituent	Water Body	Category	Condition	WQO/RWL/WQBEL[1]
Lindane	SGR R3	3C	Wet/Dry	0.019 µg/L
Alpha-Endosulfan	Coyote Creek	3A	Dry	0.056 µg/L
Ammonia	SJC R1	2C	303(d)	Not reflective of MS4 discharges. LACSD implemented Nitrification and Denitrification to address the ammonia levels in the treated effluent.
	Coyote Creek	2C	303(d)	
Diazinon	Coyote Creek	2C	303(d)	0.17 µg/L
2,3,7,8-TCDD (Dioxin)	SGE	2C	303(d)	0.013 pg/L
Benthic Macro-Invertebrates	Walnut Creek	2B	303(d)	Reflective of a condition of pollution, not necessarily a result of MS4 discharge
Toxicity	SJC R1	2B	303(d)	Reflective of a condition of pollution, not necessarily a result of MS4 discharge
	Coyote Creek	2B	303(d)	
Dissolved Oxygen	SGR R3	3B	Wet/Dry	Reflective of a condition of pollution, not necessarily a result of MS4 discharge
	SJC R1	3B	Wet/Dry	
	SJC R2	3B	Wet/Dry	
	Coyote Creek	3B	Wet	
	SGR R1	3B	Dry	
	SGE	2B	303(d)	
pH	SJC R1	2B	303(d)	Reflective of a condition of pollution, not necessarily a result of MS4 discharge
	Puente Creek	3B	Wet/Dry	
	Walnut Creek	2B	303(d)	
	NF Coyote Creek	3B	Dry	
	Coyote Creek	2B	303(d)	
	SGR R1	2B	303(d)	

1 Category 1 constituents have WQBELs translating WLA from TMDLs to discharge limitations applicable at outfalls. Category 2 and 3 constituents are subject to WQO or RWL applicable in the receiving water. Outfall monitoring may be used to assess whether the MS4 system is causing or contributing to observed exceedances over WQO or RWL where they may exist.

2.3 WBPC CLASSIFICATION FOR COMPLIANCE SCHEDULING

Each WBPC is linked to a compliance schedule. There are four scheduling conditions under which the WBPCs may fall, including:

- Established schedule in an adopted TMDL including the WBPC (Category 1A, 1B, 1D, 1E)
- USEPA Adopted TMDL including the WBPC (Category 1C)
- 303(d) listed WBPC, or could be listed through the review of data (All Category 2)
- Observed exceedances of WBPC, but does not meet 303(d) listing criteria (All Category 3)

Where an established TMDL implementation schedule exists for a WBPC, the associated milestones and implementation schedule will apply to the EWMP. USEPA TMDLs, 303(d) listings without a TMDL adopted, and other exceedances of RWLs do not contain specified milestones or an implementation schedule. To address USEPA TMDLs and other WBPC without assigned milestones and implementation schedules, the Permit allows schedules to be proposed in the EWMP. To address the issue of RWL exceedances associated with WBPCs on the 303(d) List or other exceedances of RWLs, interim numeric milestones and compliance schedules must be set for each WBPC based on its placement in one of the following groups:

- **TMDL:** A Regional Board TMDL or Regional Board adopted Implementation Plan for an USEPA TMDL existed as of December 28, 2012 for the pollutant in the watershed.

- **Group A:** Pollutants that are in the same class[1] as those addressed in a TMDL in the watershed and for which the water body is identified as impaired on the 303(d) List as of December 28, 2012. Milestones and dates for their achievement consistent with those in the corresponding TMDL.

- **Group B:** Pollutants that are not in the same class as those addressed in a TMDL for the watershed, but for which the water body is identified as impaired on the 303(d) List as of December 28, 2012. EWMP assigned enforceable requirements and milestones and dates for their achievement.

- **Group C:** Pollutants for which there are exceedances of RWLs, but for which the water body is not identified as impaired on the 303(d) List as of December 28, 2012. EWMP assigned enforceable requirements and milestones and dates for their achievement.

- **USEPA TMDL:** Pollutants addressed by USEPA TMDL without an implementation plan/schedule. The time schedule assigned is as short as possible, taking into account the time since USEPA establishment of the TMDL, and technological, operation, and economic factors that affect the design, development, and implementation of the control measures that are necessary to comply with the WLAs

The process for setting numeric milestones and compliance schedules for Groups B and C, and USEPA TMDLs is dependent upon whether the water body is identified as impaired on the 303(d) list as of December 28, 2012 and if the pollutants are considered to be in the same class as those pollutants addressed in a TMDL for the watershed. Two findings must be made to determine whether or not a pollutant is in the same class as a TMDL pollutant:

[1] As defined in Part VI.C.2.a.i of the Permit (page 49), "Pollutants are considered in a similar class if they have similar fate and transport mechanisms, can be addressed via the same types of control measures, and within the same timeline already contemplated as part of the Watershed Management Program for the TMDL."

- The pollutant must have similar fate and transport mechanisms (e.g., sediment particle associated), and thus, can be addressed via the same types of control measures. These pollutants are in the same "BMP class" as other TMDL pollutants.
- The pollutant is in the same "scheduling class", that is, it can be addressed within the same timeline already established in an existing TMDL. To be considered in the same scheduling class, the water quality priority must be present in a water body already being addressed by the TMDL or upstream of a water body already being addressed by the TMDL and can be addressed on the same time frame as the TMDL pollutant.

To define whether a pollutant can be addressed within the same time frame as a TMDL pollutant, it is necessary to consider whether the reductions that will be achieved by the control measures implemented for the TMDL pollutant are expected to be sufficient to achieve the needed reductions for the other pollutants. The "limiting pollutant" analysis of the RAA is used to evaluate whether control measures implemented for the Regional Board adopted TMDLs will be sufficient to meet the RWLs for WBPCs that are in the same BMP class. If the RWLs will be met for the WBPCs, they are in the same scheduling class as the pollutants addressed by each respective Regional Board adopted TMDL. A limiting pollutant, which is acknowledged by the RAA Guidelines from the Regional Board, can be defined as a pollutant whose structural control measures[2] are anticipated to address exceedances from all other pollutants. In many cases, the limiting pollutant for wet weather (e.g., zinc) may differ from the limiting pollutant for dry weather (e.g., bacteria). If the limiting pollutant is a pollutant addressed by a TMDL, then other pollutants in the same class would be expected to be achieved by the final compliance date of the TMDL for the limiting pollutant. If the limiting pollutant is not a TMDL pollutant, then the limiting pollutant, and all other pollutants that are more limiting than the TMDL pollutant, do not have the ability to be considered on the same timeframe as those addressed in a TMDL. To be in the same class as a TMDL pollutant, the WBPC must be in both the same "BMP class" and the same "scheduling class" as the TMDL pollutant.

The enforceable milestones and compliance schedules requirements must control MS4 discharges such that they do not cause or contribute to exceedances of RWLs and the milestones and dates for their achievement must be within a timeframe that is as short as possible, taking into account the technological, operation, and economic factors that affect the design, development, and implementation of the control measures that are necessary. The time between dates shall not exceed one year. Milestones shall relate to a specific water quality endpoint (e.g., percentage of the MS4 drainage area is meeting the RWLs) and dates shall relate either to taking a specific action or meeting a milestone. In summary, Group A pollutants must have milestones and schedules consistent with the TMDL for the pollutant in the same class. Group B and C pollutants must have schedules that are as short as possible and include at least annual milestones.

Furthermore, for Group B pollutants, where retention of (i) all non-stormwater runoff and (ii) all storm water runoff from the 85th percentile, 24-hour storm event is technically infeasible, and where the Regional Board determines that MS4 discharges cause or contribute to the water quality impairment, the

[2] By evaluating the role of *structural* control measures when identifying limiting pollutants, the scheduling of control measures can be simplified early in the planning process. For example, even though the required reductions to achieve copper RWLs may be higher than those for zinc, a significant portion of the reduction of copper loading is anticipated through the brake pad replacement programs (an institutional control measure). Zinc could be categorized as more limiting than copper because reductions in zinc loading will likely require more structural control measures. Note that adjustments to water quality objectives through special studies like water-effect ratios (WERs) could also be used to address water quality priorities during EWMP implementation, but those considerations have not been incorporated into the analysis of which pollutant is limiting.

EWMP Group may initiate development of a stakeholder-proposed TMDL upon approval of the EWMP. Any extension of this compliance mechanism beyond the current Permit term shall be consistent with the implementation schedule in a TMDL for the WBPCs adopted by the Regional Board. However, *E. coli* are the only Group B constituent, and the Regional Board is currently developing a TMDL for the San Gabriel River watershed.

Benthic macro-invertebrates, dissolved oxygen, and pH 303(d) listings are reflective of watershed pollution and not necessarily a result of MS4 discharges. Additionally, ammonia is being addressed through the implementation of nitrification and denitrification treatment processes at the LACSD facilities. These parameters are not scheduled, but will be assessed through the CIMP implementation and watershed wide stormwater monitoring coalition (SMC) and schedules developed as necessary through the adaptive management component of the CIMP and EWMP.

2.3.1 WBPCs included in TMDLs with Implementation Schedules

Compliance schedules are directly assigned to WBPCs where they are addressed by a Regional Board-established TMDL, or United States Environmental Protection Agency (USEPA) TMDL with Regional Board adopted Implementation Schedules. TMDLs and compliance schedules are presented in **Table 2-5**. The Category 1A, 1B, 1D, and 1E constituents include copper, lead, zinc, and selenium. The compliance schedule for these WBPCs has been established in the San Gabriel River Metals (SGR Metals) TMDL Implementation Plan as shown in **Table 2-6**.

2.3.2 WBPCs included in USEPA TMDLs

WBPCs in the USEPA TMDL group include nutrients, mercury, and legacy toxics. The permit requirements for information included in the EWMP are as follows:

- Data for current conditions of the WBPC,
- Description of BMPs,
- Time schedule to achieve compliance,
- Demonstration the schedule is as sort as practicable, and
- If the schedule exceeds one year, interim milestones are a necessary part of the schedule.

To determine schedules for these WBPCs, similar TMDLs in the region are used as precedent. The Harbor Toxics TMDL includes consideration of mercury and legacy pollutants in water, sediment, and fish tissue. These hydrophobic compounds bound tightly to the soil and organic particles. Nearly the entire mass load of the legacy pollutants is bound to the suspended solids. Additionally, the TMDL will be used as the model for compliance scheduling for total nitrogen and total phosphorus, because the nutrient concentrations are generally correlated with sediment just as with the OC and PCB constituents, as the runoff mobilizing sediment simultaneously mobilizes nutrients present in the soil matrix and bound to the soil particles. Furthermore, loading is greatest during storm conditions and the infiltration BMPs implemented to control metals are expected to control nutrients. The nutrient allocations are expressed as annual load, which is largely the loading during storm events. Therefore, the compliance schedule for the USEPA TMDL group will follow the Harbor Toxics TMDL.

2.3.3 WBPCs Classified in Group A

Group A WBPCs are in the same class as the SGR Metals TMDL WBPCs and will be addressed by the control measures implemented to achieve compliance with waste load allocations (WLAs). Therefore, it is proposed that 303(d)-listed WBPCs of the same class as the SGR Metals TMDL WBPCs will be linked to the compliance schedule established in the SGR Metals TMDL Implementation Plan. The metals schedule is applied to WBPCs where metals are listed or data supports their listing for water bodies not originally included in the SGR Metals TMDL. The RAA is used to demonstrate compliance for Group A WBPCs.

Infiltration type BMPs will provide treatment for all constituents. PAHs, cyanide, diazinon, and TDS are included in the SGR Metals TMDL schedule as these constituents will be controlled by the infiltration BMPs for wet weather and activities to control non-storm water discharges.

The dioxin listing for the SGR Estuary is in the same class of constituent as legacy pollutants addressed by the Harbor Toxics TMDL. Therefore, dioxin is assigned the Harbor Toxics TMDL schedule.

The watershed loading of sediment is used as a surrogate for watershed toxics loading in the RAA, which is the same mechanism used to simulate particle associated with metals loading. Therefore, the 303(d)-listed WBPCs that are in the same class as the SGR Metals TMDL WBPCs will be linked to the compliance schedule established in the SGR Metals TMDL Implementation Plan.

2.4 WBPCS CLASSIFIED IN GROUP B

Indicator organisms (bacteria) are the sole Group B WBPC. Bacteria are not of the same class as the SGR Metals TMDL WBPCs, but to some degree, may be addressed by the control measures implemented to achieve compliance with the limiting Group 1 pollutant, zinc. A great majority of dry and wet weather samples collected from Los Angeles region waterways, including the SGR and its tributaries, exceed the receiving water limits for bacteria. Compliance with bacteria standards may involve additional controls beyond those determined necessary for zinc. Additional analyses may be necessary to fully define the bacteria compliance condition. The Basin Plan provides consideration of high flow suspension (HFS) of objectives in certain channelized receiving waters where greater than 0.5 inches of rain in a 24-hour period. Because the recreational beneficial use was shown to be unattainable for concrete lined channels, the bacteria objectives are suspended when flows increase beyond the trigger level associated with a 24-hour storm of 0.5 inches or more. In addition, areas where bacteria TMDLs have been adopted include a set number of allowable exceedance days to reflect the fact that reference watersheds typically exceed bacteria objectives several days in a given year.

The Indicator Bacteria in the San Gabriel River, Estuary, and Tributaries TMDL (SGR Bacteria TMDL) was adopted in Basin Plan Amendment Resolution No. RIS-005 Attachment A (adopted by the Regional Board on June 10, 2015) is anticipated to be in effect by the next permit cycle. The SGR Bacteria TMDL establishes a 20-year implementation schedule, which corresponds to a final compliance deadline of 2036. Further, the TMDL prescribes a specific number of Allowable Exceedance Days for bacteria within the San Gabriel River and its tributaries that are summarized in **Table 2-4**.

Table 2-4
Allowable Exceedance Days for Indicator Bacteria within the San Gabriel River and its Tributaries

Allowable Number of Exceedance Days	Daily Sampling	Weekly Sampling
Dry Weather	5	1
Non-HFS Waterbodies Wet Weather	17	3
HFS Waterbodies Wet Weather (not including HFS days)	9	2

The installation of controls for the Metals TMDL compliance and addressing significant non-storm water flows would be the first phase of the bacteria compliance. After the controls necessary to meet the Metals TMDL WLAs are functional, additional controls as a second phase, if necessary, to meet the bacteria objectives in MS4 discharges would commence.

2.5 WBPCS CLASSIFIED IN GROUP C

Most of the WBPCs in Group C are of the same class as the SGR Metals TMDL WBPCs will be addressed by the control measures implemented to achieve compliance with the SGR Metals TMDL WBPCs. Therefore, it is proposed that Category 3A and 3C WBPCs be linked to the compliance schedule established in the SGR Metals TMDL Implementation Plan. The RAA is used to demonstrate compliance for WBPCs.

Table 2-5
Schedule of TMDL Milestones for the EWMP

TMDL	Compliance Goal	Weather Condition	Compliance Dates and Compliance Milestone (Bolded numbers indicated milestone deadlines within the current Permit term) [1]													
			2012	**2013**	**2014**	**2015**	**2016**	**2017**	2020	2023	2024	2026	2028	2030	2032	2036
San Gabriel River Metals and Impaired Tributaries Metals and Selenium TMDL	% of MS4 area Meets WQBELs[2]	Dry						30%	70%	100%						
		Wet						10%	35%	65%		100%				
Dominguez Channel and Greater Los Angeles and Long Beach Harbor Water Toxic Pollutants TMDL	Meet WQBELs	All	12/28												3/23	
			Interim												Final	
Los Angeles Area Lakes TMDLs for Puddingstone Reservoir and Santa Fe Dam Park Lake	Meet waste load allocations (WLAs)	All	USEPA TMDLs, which do not contain interim milestones or implementation schedule. The Permit (Part VI.E.3.c, pg. 145 – RWQCB, 2012) allows MS4 Permittees to propose a schedule in the EWMP.													

[1] The Permit term is assumed to be five years from the Permit effective date or December 27, 2017.

[2] Water Quality Based Effluent Limitations

Table 2-6
Compliance Schedule for WBPCs in the EWMP

Constituent	**Compliance Schedule Source**	**Weather Condition**	**Compliance Dates and Compliance Milestone** (Bolded numbers indicated milestone deadlines within the current Permit term) [1]												
			2012	**2013**	**2014**	**2015**	**2016**	**2017**	2020	2023	2024	2026	2028	2032	2036
Copper	SGR Metals TMDL (TMDL)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Lead	SGR Metals TMDL (TMDL)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Zinc	SGR Metals TMDL (TDML)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Cadmium	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Nickel	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Mercury, Total (N. Fork Coyote Creek and Walnut Creek Wash)	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Selenium	SGR Metals TMDL (TMDL)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Total Nitrogen[2]	SGR Metals TMDL (Group A)	Annual	12/28 Interim						35%	65%		12/28 Final			
Total Phosphorus[2]	SGR Metals TMDL (Group A)	Annual	12/28 Interim						35%	65%		12/28 Final			
Total Mercury[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
PolychlorinatedBiphenyl (PCB) (Suspended Sediment) [2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			

Constituent	Compliance Schedule Source	Weather Condition	Compliance Dates and Compliance Milestone (Bolded numbers indicated milestone deadlines within the current Permit term)[1]												
			2012	**2013**	**2014**	**2015**	**2016**	**2017**	2020	2023	2024	2026	2028	2032	2036
PCB[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Chlordane (Suspended Sediment)[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Chlordane[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Dieldrin (Suspended Sediment)[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Dieldrin[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Dichloro-diphenyl-tricloroethane (DDT) (Suspended Sediment)[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
DDT[2]	SGR Metals TMDL (Group A)	All	12/28 Interim						35%	65%		12/28 Final			
Bacteria (Indicator Organisms)	LA River TMDL (Group B)	Dry													100%
		Wet													100%
PAH	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Cyanide	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
Ammonia	Not an MS4 Source	All	LACSD Implementation of nitrification and denitrification addresses control of ammonia.												
Diazinon	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
TDS	SGR Metals TMDL (Group A)	Dry						30%	70%	100%					
Sulfate	SGR Metals TMDL (Group C)	Dry						30%	70%	100%					

Constituent	**Compliance Schedule Source**	**Weather Condition**	**Compliance Dates and Compliance Milestone**												
			(Bolded numbers indicated milestone deadlines within the current Permit term) [1]												
			2012	**2013**	**2014**	**2015**	**2016**	**2017**	2020	2023	2024	2026	2028	2032	2036
Chloride	SGR Metals TMDL (Group C)	Dry						30%	70%	100%					
Alpha-Endosulfan	SGR Metals TMDL (Group C)	Dry						30%	70%	100%					
MBAS	SGR Metals TMDL (Group C)	Wet						10%	35%	65%		100%			
Lindane	SGR Metals TMDL (Group C)	Dry						30%	70%	100%					
		Wet						10%	35%	65%		100%			
2,3,7,8-TCDD (Dioxin)	Harbor Toxics TMDL (Group A)	All	12/28 Interim											3/23 Final	
Benthic Macro-invertebrates	None	All	Reflective of a condition of pollution, not necessarily a result of MS4 discharge												
Dissolved Oxygen	None	All	Reflective of a condition of pollution, not necessarily a result of MS4 discharge												
pH	None	All	Reflective of a condition of pollution, not necessarily a result of MS4 discharge												
Toxicity	None	All	Reflective of a condition of pollution, not necessarily a result of MS4 discharge												

[1] The Permit term is assumed to be five years from the Permit effective date or December 27, 2017.
[2] Compliance dates and milestones apply to the MS4 discharges to Puddingstone Reservoir.
Note: Additional interim milestones include annual assessment of monitoring data and watershed compliance as part of the USGR Annual Report.

2.6 INITIAL SOURCE ASSESSMENT

Constituents were evaluated to determine if MS4 discharges could be a potential source. Many constituents are typically associated with MS4 discharges and additional investigation is not necessarily required to determine if they are a potential source to the receiving water. Metals, nutrients, and bacteria are commonly found in runoff from urban areas. Metals may be naturally occurring bound to soil and sediment movement by storms would increase the loading to the receiving waters. Automobile wear are a source of metals, with tires wear most influenced by zinc, lead, and copper, while brakes were is associated with copper. Metal architectural features and building materials may contribute zinc, copper, lead or other metals to the MS4 system by leaching during storm events. Other NPDES discharges may contain metals. Where historic soil contamination exists, legacy pollutants such as Polychlorinated biphenyls (PCBs) and organochlorine (OC) pesticides may be found in urban stormwater. However, for some constituents such as selenium, cyanide, and ammonia, MS4 discharges are either not known as significant sources of the constituent or other potential sources are more likely. In the absence of outfall data, it would be inappropriate to directly link any one jurisdiction to specific pollutants.

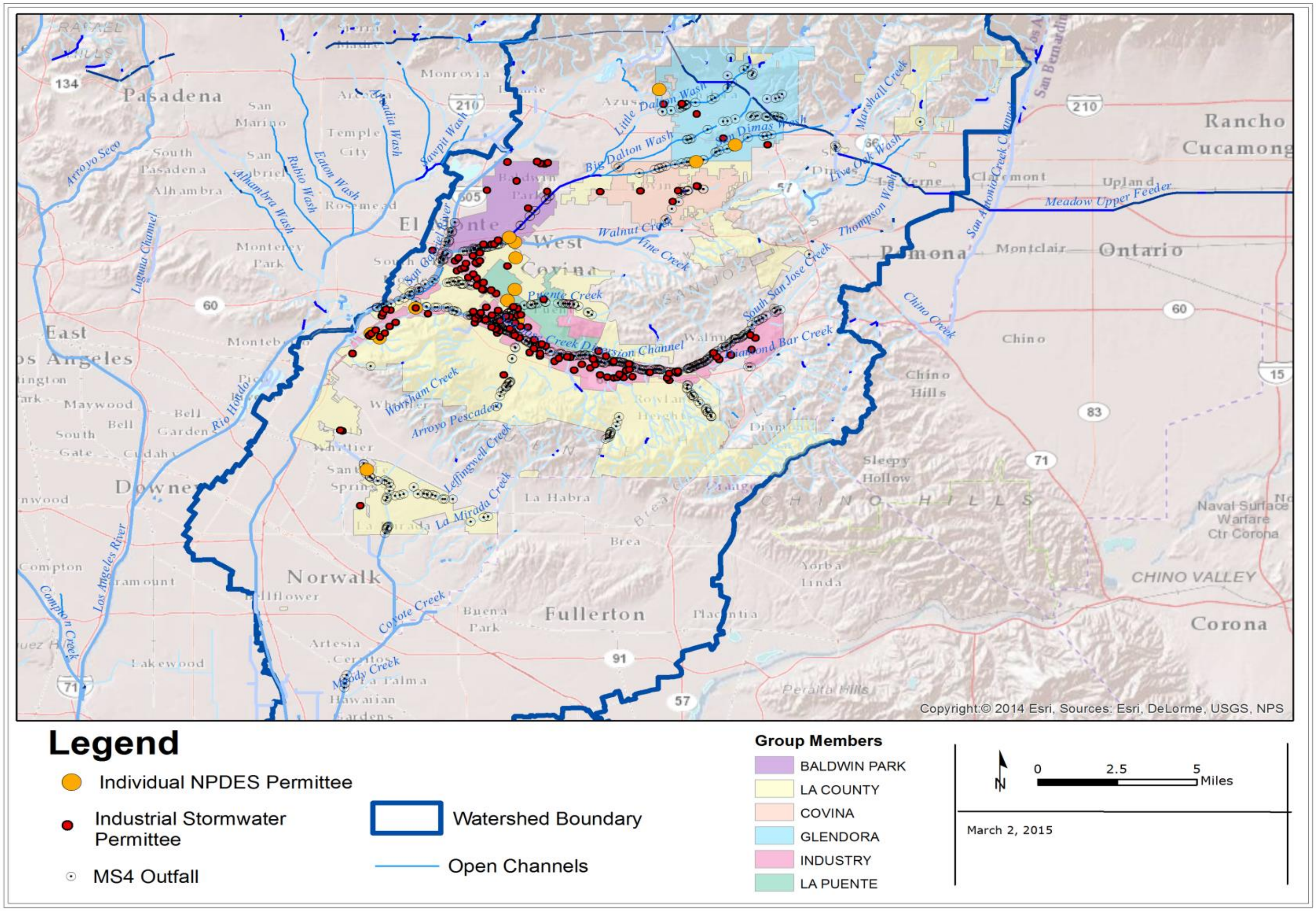
Ammonia exceedances are being addressed through NPDES permit limits and associated treatment upgrades for the wastewater reclamation plants. The primary source of ammonia is likely wastewater treatment plant discharges, and controlling their effluent through their individual NPDES permit is the appropriate method to address receiving water exceedances.

Additionally, the MS4 Annual Report information was reviewed to evaluate Illicit Connection and Illicit Discharge Elimination Programs, Industrial/Commercial Facility Programs, Development Construction Programs, and Public Agency Activities Programs. Existing data, however, is very limited and could not be used to determine potential sources at this time. As additional data is collected, evaluations will be made and included in the EWMP, as appropriate, as part of the adaptive management process. The extensive receiving water monitoring results were used as part of the development of the Water Quality Priorities. Data and conclusions from the WMMS further support the water quality priorities since outfall monitoring was not historically performed in the EWMP area. The zinc heat map presented in **Figure 4-5** was used as the basis of determining detention volumes from MS4 discharges. Additional sources of data for the source assessment are discussed below.

2.6.1 Dischargers

There are many facilities in the San Gabriel River Watershed that have NPDES permits to discharge industrial wastewater and stormwater. **Figure 2-1** shows the location of NPDES-permitted dischargers within the USGR EWMP area. The California Integrated Water Quality System was used to identify all currently active, or active within the past three years, NPDES permittees within the watershed. There are approximately 18 NPDES major dischargers, minor permits, and dischargers covered under general permits, and 150 dischargers covered under the industrial stormwater permit.

Figure 2-1
Location of NPDES-permitted Dischargers within the USGR EWMP Area



2.6.2 Metals and Selenium TMDL Report and Staff Report

The TMDL for metals and selenium for the San Gabriel River and Impaired Tributaries was established by the USEPA in 2007. The source assessment section of the TMDL documentation divides sources into point sources, which includes "discharges for which there are defined outfalls such as wastewater treatment plants, industrial discharges, and storm drain outlets," and nonpoint sources from various land uses and source activities not regulated through NPDES permits (USEPA, 2007).

Major findings of the source assessment for point sources, relevant to the USGR EWMP area, included the following (USEPA, 2007) (RWQCB, 2013).

Municipal Stormwater:

Municipal storm water contributes sources of metals to the San Gabriel River from automobile brake pads, vehicle wear, building materials, pesticides, erosion of paint and deposition of air emissions from fuel combustion and industrial facilities. A 2007 study from the Brake Pad Partnership determined that up to half of the anthropogenic copper discharged to the San Francisco Bay could be linked to brake pad debris. In 2010, SB 346 was signed, with provisions to limit the amount of copper used in brake pad material.

Industrial Stormwater:

Potential metals loading during dry weather are considered to be low, as non-storm water discharges are prohibited or controlled by NPDES permits. However, one study by *Stenstrom et al. (2005)* showed that loading of copper, lead, and zinc from industrial facilities may exceed applicable California Toxics Rule (CTR) standards. Runoff from metal plating, transit, and recycling facilities are considered to have a high potential for metals loading.

Construction Stormwater:

One study by Raskin et al. (2004) showed that there is a potential for metals loading due to leaching of metals from building materials and construction waste during wet weather events. Potential metals loading during dry weather are considered to be low, as non-storm water discharges are prohibited or controlled by NPDES permits.

Publicly Owned Treatment Works:

Three water reclamation plants (WRPs) discharge to water bodies within the USGR EWMP area. A description of each facility taken from the TMDL Report and updated by the LACSD is provided below:

- Pomona WRP
  - Discharges tertiary-treated effluent to the South Fork of San Jose Creek. The influent to the Pomona WRP is a combination of municipal and industrial wastewater.
  - During dry weather, a majority of the treated effluent is reclaimed for landscape and crop irrigation, as well as for industrial processes.
- San Jose Creek WRP
  - Permitted to discharge 100 Million gallons per day (MGD) of tertiary-treated effluent via five permitted discharge points. The influent to the San Jose Creek East and West WRPs is a combination of municipal and industrial wastewater.
  - Discharge No. 001 to San Gabriel River Reach 1 is a combination of San Jose Creek East and West WRP effluent and in 2014 was the primary discharge point for San Jose Creek West WRP. The outfall is eight miles

south of the plant near Firestone Blvd. The river is concrete-lined from the discharge point to the Estuary, about nine miles downstream. A turnout located approximately midway down the pipe is used to divert reclaimed water to spreading grounds.

- Discharge No. 001A to the unlined portion of the San Gabriel River Reach 2 is a combination of San Jose Creek East and West WRP effluent. The outfall is located near the turnout to the spreading grounds, which is near Whittier Blvd.
- Discharge No. 001B to the unlined portion of the San Gabriel River Reach 2 is a combination of San Jose Creek East and West WRP effluent. The outfall is located mid-way between Discharges 001A and 001 near Slauson Blvd. Discharge is expected to begin in 2015.
- Discharge No. 002 to San Jose Creek from San Jose Creek East WRP is used for groundwater recharge at the San Gabriel Coastal Spreading Grounds. San Jose Creek is unlined from the discharge point to the San Gabriel River. In 2014, this outfall was the primary discharge point for the San Jose Creek East WRP.
- Discharge No. 003 delivers treated effluent to the unlined portion of the San Gabriel River Reach 3 as well as the San Gabriel Coastal Spreading Grounds.
- The 2015 San Jose Creek WRP NPDES permit is expected to permit two additional discharge points to the unlined San Gabriel River Reaches 4 and 5 in the area of the Santa Fe Dam.

- Whittier Narrows WRP
  - Discharge No. 001 discharges to the river about 700 feet upstream from the Whittier Narrows Dam.
  - The tertiary-treated effluent generally flows down the river to the San Gabriel River Spreading Grounds. The influent to the Whittier Narrows WRP is a combination of municipal and industrial wastewater.

2.6.3 USEPA Lakes TMDLs

The USEPA Lakes TMDLs addressed, among others; nutrients, mercury, chlordane, DDT, dieldrin, PCBs load to and in-lake conditions for Puddingstone Reservoir (USEPA 2012). Discharges to the reservoir include the MS4 system including contributions from General Construction and General Industrial dischargers. Three Resource Conservation and Recovery Act cleanup sites are located near the Puddingstone Reservoir watershed. The potential contaminants of concern identified at these three sites are not relevant to the nutrients, mercury, chlordane, dieldrin, PCBs or DDT impairments. It is not known whether or not these facilities contributed mercury, chlordane, dieldrin, PCBs, or DDT to Puddingstone Reservoir in the past. Application of chlorine in the swim beach area may impact pH levels in the lake. The following summarizes the source assessment in the TMDL.

The majority of nutrient loading to Puddingstone Reservoir originates from the surrounding watershed including: irrigation (10.1 percent of the total irrigation volume is assumed to reach the lake). Loading due to direct deposition from the atmosphere. The northern subwatershed comprises 85.6 percent of the drainage area and contributes 86 percent and 90 percent of the total phosphorus and total nitrogen loads, respectively, to Puddingstone Reservoir. The majority of the remaining load originates from the southern subwatershed.

There are several potential sources of mercury loading in the Puddingstone Reservoir watershed. The majority of loading results from atmospheric deposition to the lake surface. Upland areas are the second largest source; these loads are delivered from tributaries and storm drains in either the water column or sediments. Irrigation of surrounding parklands may contribute loading as well.

PCBs in Puddingstone Reservoir are primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Watershed loads of PCBs may arise from spills from industrial and commercial uses, improper disposal, and atmospheric deposition. Industrial and commercial spills tend to be associated with specific land areas, such as older industrial districts, junk yards, and transformer substations. Stormwater loads from the watershed were estimated based on simulated sediment load and observed PCB concentrations on sediment near inflows to the lake. Atmospheric deposition occurs across the entire watershed. However, there is no definitive information on specific sources of elevated PCB load within the watershed at this time.

Chlordane in Puddingstone Reservoir is primarily due to historical loading and storing within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed were estimated based on simulated sediment load and observed chlordane concentrations on sediment near inflows to the lake. Watershed loads of chlordane may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations, while atmospheric deposition occurs across the entire watershed. There is no definitive information on specific sources within the watershed at this time.

Dieldrin present in Puddingstone Reservoir is primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading and direct atmospheric deposition to the lake are considered negligible sources of dieldrin. Stormwater loads from the watershed could not be directly estimated because all sediment and water samples were below detection limits. Watershed loads of dieldrin may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations, while atmospheric deposition occurs across the entire watershed. There is no definitive information on specific sources of elevated dieldrin load within the watershed at this time.

Total DDTs present in Puddingstone Reservoir are primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed were estimated based on simulated sediment load and observed DDT concentrations on sediment data near inflows to the lake. Watershed loads of DDT may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations, while atmospheric deposition occurs across the entire watershed. There is no definitive information on specific sources of elevated DDT load within the watershed at this time.

2.6.4 Indicator Bacteria TMDL Report and Staff Report

The TMDL for Indicator Bacteria in the San Gabriel River, Estuaries and Tributaries (RWQCB, 2015) was approved by the Regional Water Board on June 10, 2015. The Indicator Bacteria TMDL becomes effective when approved by USEPA. The source assessment in the TMDL is as follows:

> The significant contributors of bacteria loading to the San Gabriel River, San Gabriel River Estuary, and its tributaries are dry- and wet- weather discharges from municipal separate storm sewer systems (MS4s). Watershed-wide data show elevated levels of bacteria in the river. Data collected from natural landscapes in the upper watershed indicate that open space loading is not a significant source of bacteria. Data from storm drains and channels draining urban areas show elevated levels of bacteria, indicating that urban areas are a source. Data from throughout the Los Angeles Region further demonstrate that bacteria concentrations are significantly greater in developed areas. Based on this information, runoff from urban areas served by MS4s is a significant source of bacteria.

Additionally, the TMDL sets allowable exceedance days, and includes a schedule for compliance.

3 Watershed Control Measures

The Permit requires the identification of Watershed Control Measures, which are strategies, institutional measures, and BMPs[3] that will implemented through the EWMP individually or collectively at a watershed-scale to address Water Quality Priorities. This section provides an overview of the categories of BMPs used to develop the USGR EWMP (and simulated by the RAA), summarizes existing and planned structural BMPs, and describes the institutional control measures that will be implemented including customization of MCMs. In addition, details are provided for 8 "signature" (or example) regional projects that have been identified in the USGR EWMP. The signature or example projects will be implemented or substituted with another multi-benefit regional project capable of retaining the equivalent water quality design volume within the same sub-basin and/or jurisdiction.

The objectives for the watershed control measures as identified in the Permit are as follows:

- Prevent or eliminate the non-storm water discharges to the MS4 that are determined to be a source of pollutants to the MS4 or receiving waters.
- Implement pollutant controls necessary to achieve interim and final WQBELs and RWLs at the corresponding compliance schedules.
- Ensure the discharges from the MS4s do not cause or contribute to RWLs.

A network of control measures was selected for the EWMP Implementation Plan using a combination of existing information and modeling. The approach for selecting the control measures included the following steps:

1. Summarize existing structural and institutional BMPs (as described in this section)
2. Identify a menu of potential control measures to be considered (as described in this section)
3. Evaluate effectiveness of potential BMPs on receiving water quality and jurisdictional loading with modeling (as described in Section 4)
4. Identify the combination and sequencing of BMPs to be included in the EWMP Implementation Plan to achieve interim and final water quality objectives (described in Section 5)

As outlined in Section 1, by definition the USGR EWMP shall include multi-benefit regional projects that retain the storm water volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects. Additionally, the watershed control measures should incorporate effective innovative technologies, approaches and practices, and includes green infrastructure. This section highlights multi-benefit regional projects to be implemented by the EWMP, along with innovative green infrastructure BMPs.

3.1 INTRODUCTION TO CATEGORIES OF CONTROL MEASURES

Two overarching categories of BMPs will be discussed throughout the EWMP:

- **Structural BMPs:** these BMPs retain, divert or treat stormwater and/or non-stormwater, and can either be distributed throughout the watershed or sited regionally.

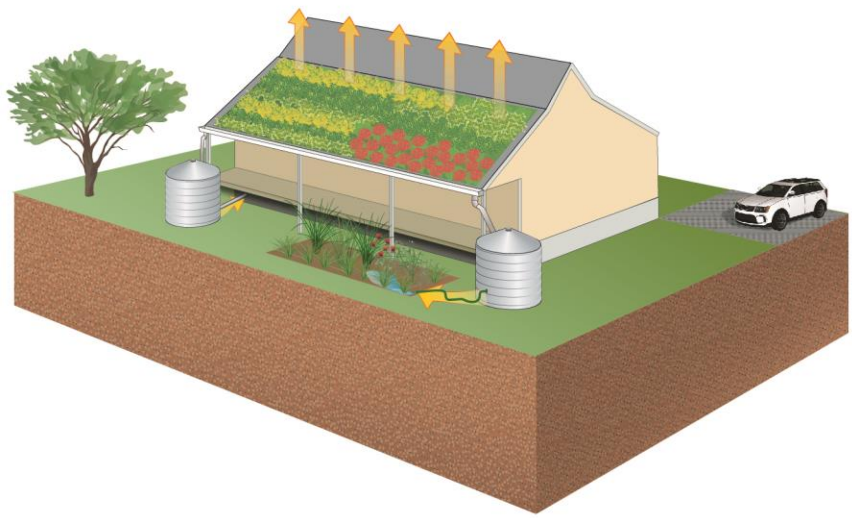
[3] In this EWMP, the terms "control measures" and "best management practices (BMPs)" are used interchangeably.

- **Institutional BMPs:** these BMPs encompass the Minimum Control Measures (MCMs) outlined in the permit, other non-structural BMP's, and any other source control measures, such as community education programs.

Furthermore, the three main categories of structural BMPs included in the EWMP include low-impact development, green streets, and regional projects, as defined below:

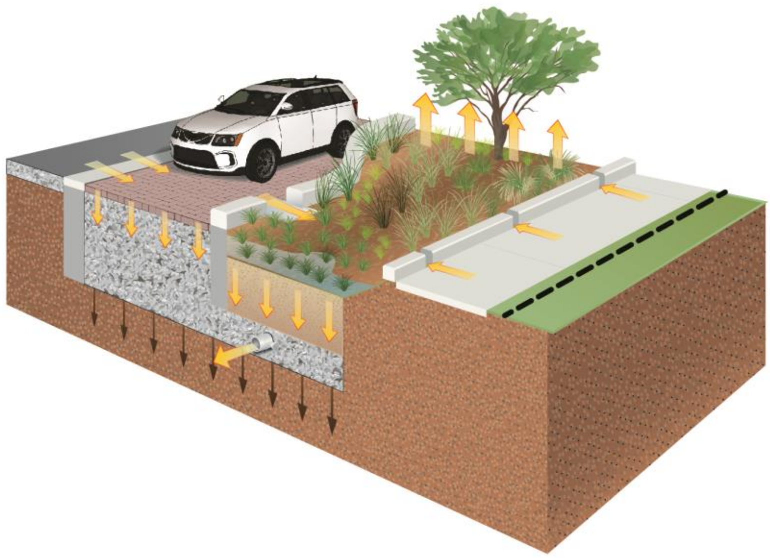
- **Low-Impact Development (LID):** Distributed structural practices intended to treat runoff relatively close to the source and typically implemented at a single-parcel- or few-parcel-level (normally less than 10 tributary acres) (**Figure 3-1**).

Figure 3-1
Conceptual Schematic of LID Implemented at the Parcel Scale



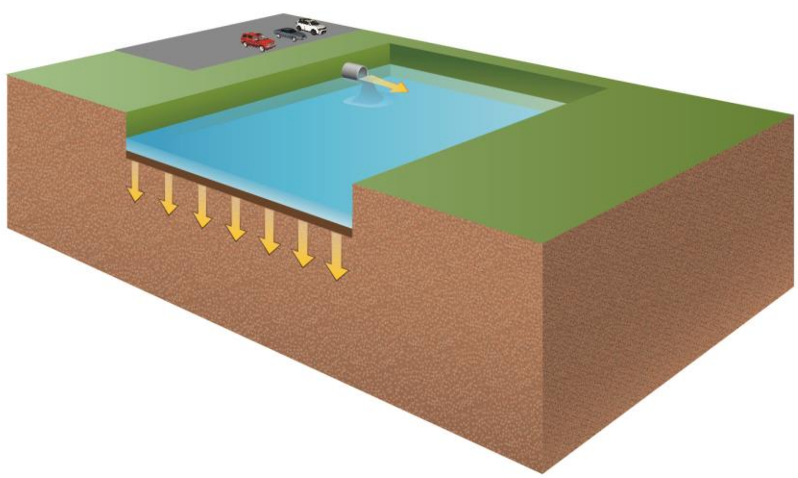
- **Green Streets and Green Infrastructure:** Distributed structural practices intended to treat runoff within public transportation rights-of-way (normally less than 10 tributary acres) (**Figure 3-2**).

Figure 3-2
Conceptual Schematic of Green Street/Green Infrastructure



- **Regional BMPs[4]:** Constructed structural practices intended to treat runoff from a contributing area of multiple parcels (normally on the order of 10s or 100s of acres or larger) (**Figure 3-3**).

Figure 3-3
Conceptual Schematic of Regional BMP



[4] Note not all regional BMPs are necessarily able to capture the 85thpercentile, 24-hour storm. The subset of regional BMPs that can capture the 85th percentile, 24-hour storm are referred to as "Regional EWMP Projects" herein.

Table 3-1 summarizes the types of BMPs that were included in the EWMP.

Table 3-1
Types of BMPs Considered in the EWMP

<table>
<tr><th colspan="2">Category</th><th>Type</th></tr>
<tr><td rowspan="7">Structural (Section 3.2)</td><td rowspan="4">Low Impact Development</td><td>LID ordinance (new/redevelopment)</td></tr>
<tr><td>Existing and Planned BMPs</td></tr>
<tr><td>Residential LID</td></tr>
<tr><td>LID on public parcels (retrofits)</td></tr>
<tr><td>Green Streets</td><td>Green streets</td></tr>
<tr><td rowspan="2">Regional</td><td>Regional BMPs on public parcels (Tier 1, Tier 2, and Tier 3)</td></tr>
<tr><td>Regional BMPs on private parcels</td></tr>
<tr><td colspan="2">Institutional (Section 3.3)</td><td>Minimum control measures and enhanced minimum control measures</td></tr>
</table>

3.2 STRUCTURAL CONTROL MEASURES

Constructed BMPs will perform the majority of required pollutant reduction for the USGR EWMP. To implement control measures efficiently at the watershed-scale and support compliance tracking, structural BMP programs will be an important element of EWMP implementation. This section describes the structural BMP programs necessary to implement the EWMP. Detailed fact sheets of the structural control measures are provided in **Appendix B-2**.

Both regional projects and regional EWMP projects are included in this EWMP and categorized as described below:

- Tier 1 Regional Projects: Top tier regional BMPs identified during the regional BMP selection process. Tier 1 regional BMPs have been modeled explicitly utilizing SUSTAIN (System for Urban Stormwater Treatment Analysis and Integration). Ten regional BMPs have been included in the EWMP as “signature” or example regional EWMP projects.
- Tier 2 Regional Projects: Potential other regional projects or regional EWMP projects that are located on the other parcels owned by the Group Members.
- Tier 3 Regional Projects: Potential regional BMPs located on school properties (if elected by the individual Group Member) and public parcels owned by other entities identified during EWMP implementation.
- Private Regional Projects: Potential regional projects located on privately owned land.

3.2.1 Regional Control Measures on Public Parcels

The Permit places heavy emphasis on regional projects as multi-benefit components of the EWMP. The compliance determination of the Permit specifies that retention of the stormwater volume associated with the 85th percentile, 24-hour storm (design storm) achieves compliance with final TMDL RWLs and WQBELs for upstream areas. Regional projects that achieve this specification are referred to as "Regional EWMP Projects".

Regional projects are centralized facilities located near the downstream ends of large drainage areas (typically treating 10s to 100s of acres). Unlike LID and green streets, runoff is typically diverted to regional projects after it has already entered storm drains, but before entering the receiving waters. Routing offsite runoff to public parcels (versus treating surface runoff near its source) often allows regional BMPs to be placed in the cost-effective locations with the best available BMP opportunity. Regional projects have access to large volumes of runoff from extensive upstream areas, and thus can provide a cost-effective mechanism for infiltration, pollutant reduction, and augmentation to water supply.

3.2.1.1 Regional Project Screening Methodology

An initial screening methodology was developed to identify preferred project sites for regional projects. Criteria were established in order to rank possible sites based on project site constraints and preferred project site attributes. Geographic information system (GIS) spatial analysis was utilized in order to process and compare data layers among the potential sites.

Site Identification

Potential project sites were identified using two main sources of information; 1) the Los Angeles County Parcel Boundary Map (Parcels identified by Assessor Identification Number (AIN), available from the Los Angeles County of the Assessor) and 2) the County of Los Angeles GIS shapefile of land use types (available at http://egis3.lacounty.gov/dataportal/2014/07/07/la-county-land-types/). The land use file contains land areas such as parks, recreation centers, sports complexes, schools, and open spaces. The parcel file was used to define individual parcels and identify possible site locations that are not in the land use file. Project sites containing one or more parcels that are linked by land use type and ownership. In this manner, parcels were grouped into their respective sites using the shape boundaries of the land use file and ownership information. **Figure 3-4** illustrates an example of grouping multiple parcels into individual sites.

Figure 3-4
Example of Two Public Parcels Grouped as One Site

<u>Initial Site Evaluation</u>

GIS spatial analysis was performed on each individual project site. Multiple layers of data were processed using GIS and used to evaluate potential sites. **Figure 3-5** graphically illustrates the method used to develop the preliminary list of sites for regional projects.

Because land acquisition for projects would significantly increase the cost, only parcels that are currently publicly owned were identified. More than 2,000 public parcels in the EWMP Group area were evaluated using the GIS spatial analysis. After grouping the parcels, sites smaller than half an acre were eliminated because they are considered impractical for constructing a large-scale, regional project. The BMP footprint and therefore the ability to capture large volumes of runoff would be limited with sites smaller than half an acre.

To evaluate the potential for stormwater recharge within the watershed, a site suitability analysis was conducted, using several GIS data layers. These layers are summarized in **Table 3-2** and presented in **Figures 3-6 through 3-14**.

Each layer used in the spatial analysis was defined as one of the following types: (1) constraints, (2) preferences, and (3) flags. The layer types are defined as follows:

- Constraints – Layers used to filter parcels from further consideration by assigning a YES/NO value.
- Preferences – Layers used to evaluate expected effectiveness of potential parcel and produce a relative rank of parcels by assigning a score of 1-5.
- Flags – Layers that could affect the feasibility but are not considered site constraints until further site investigation is conducted and are assigned as flags.

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Figure 3-5
Initial Screening Methodology

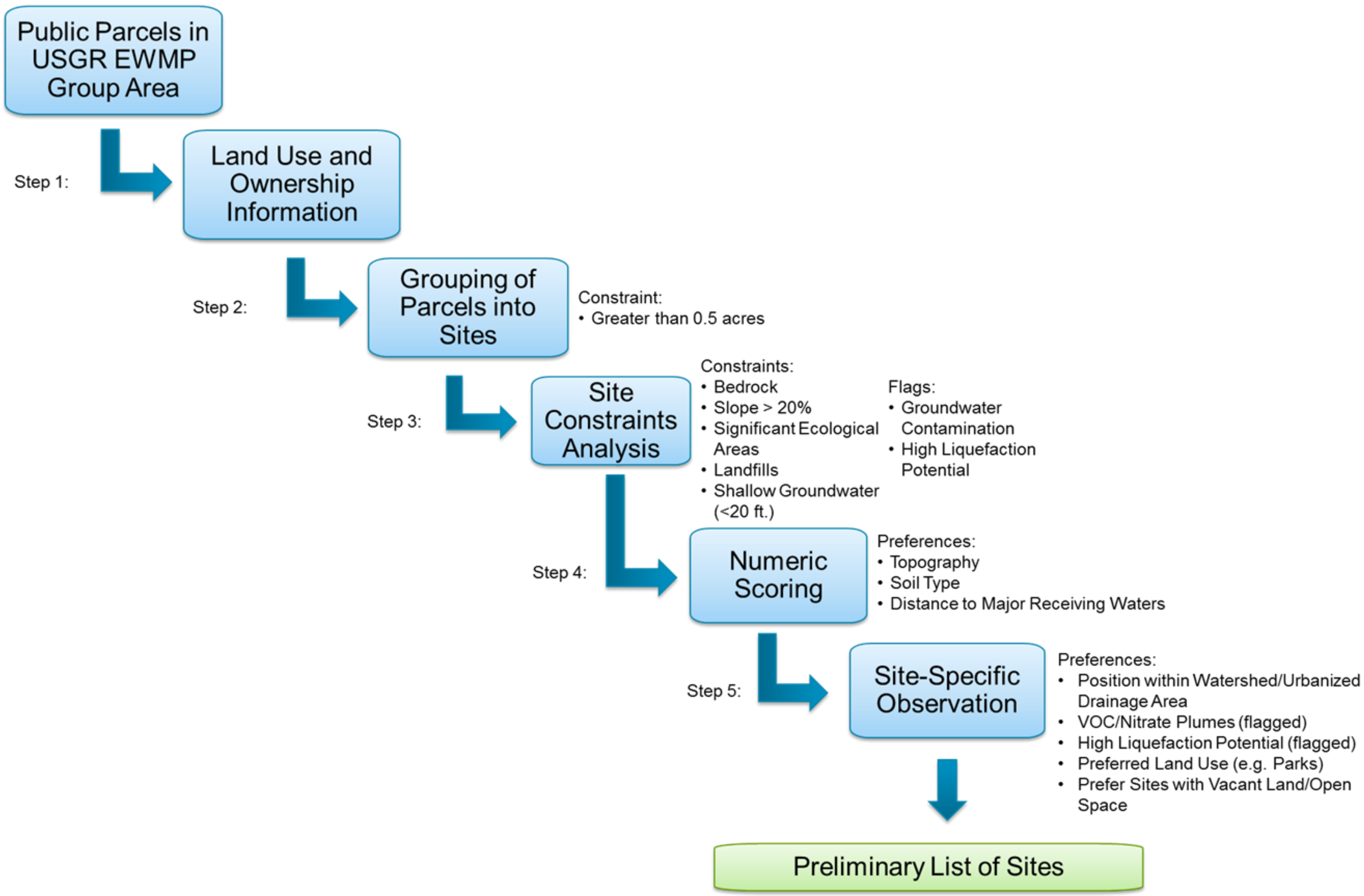


Table 3-2
GIS Data Layers and Descriptions

Layer	Source	Description	Type
Bedrock	California Geological Survey	Areas of bedrock where infiltration is severely limited	Constraint
Methane-Producing Landfill	County of Los Angeles Department of Public Works, April 2012	Disposal sites that historically accepted degradable refuse material	Constraint
Significant Ecological Area (SEA)	County of Los Angeles Planning	Land that contains irreplaceable biological resources	Constraint
Depth to Groundwater	Main San Gabriel Basin Watermaster, July 1997	Depth to groundwater	Constraint if depth to groundwater is less than 20 feet
Ground Surface Slope	USGS Digital Elevation Model (DEM)	30-foot horizontal, 5-foot vertical resolution	Constraint if slope greater than 20%, Preference if slope less than 20%,
Distance to Large, Open Channel	Calculated using County's SDS Channels Shapefile	Horizontal distance to nearest large, open channel	Preference
Soil Infiltration Rate	County of Los Angeles Department of Public Works, Tetra Tech	Infiltration rate	Preference
Groundwater Contamination	MWH Hydrogeologic Assessment of Continuous Recharge and Extraction of Recycled Water in the Main San Gabriel Basin, January 2011	Existence of VOCs or nitrate in groundwater greater than the Maximum Contaminant Level (MCL)	Flag
High Liquefaction Potential	California Geological Survey Seismic Hazard Zonation Program, 1999	Areas of historic occurrence of liquefaction as defined in Public Resource Code Section 2693(c)	Flag

Figure 3-6
Bedrock

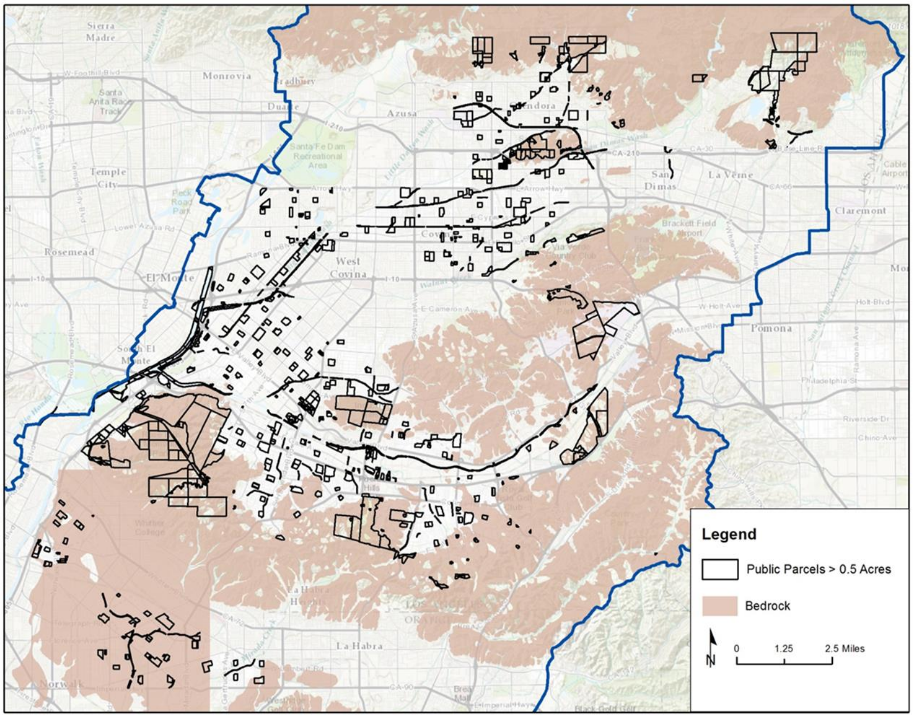


Figure 3-7
Methane-Producing Landfills

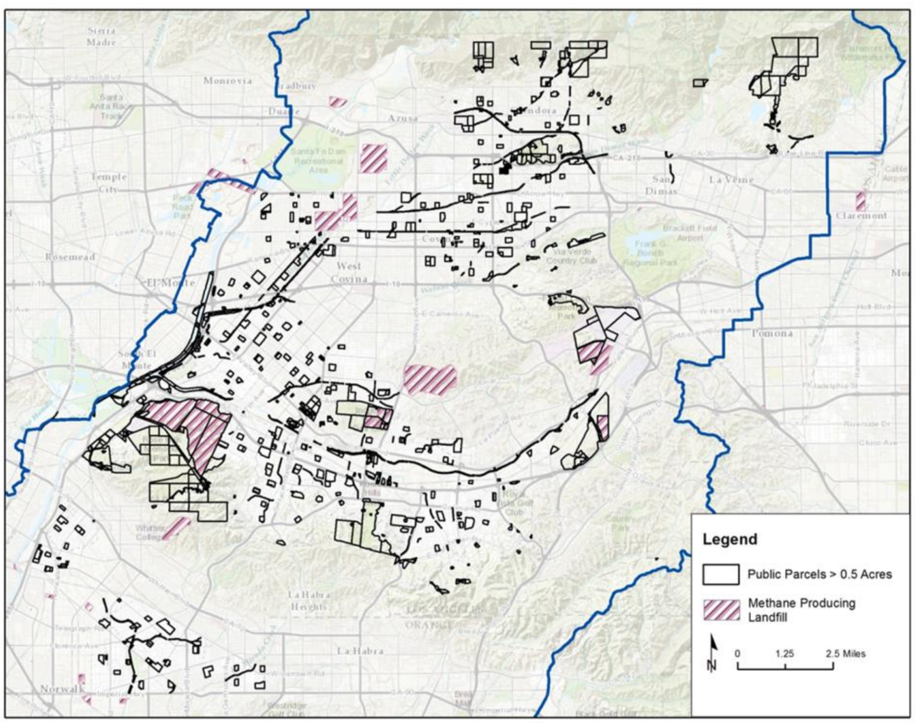


Figure 3-8
Significant Ecological Areas (SEAs)

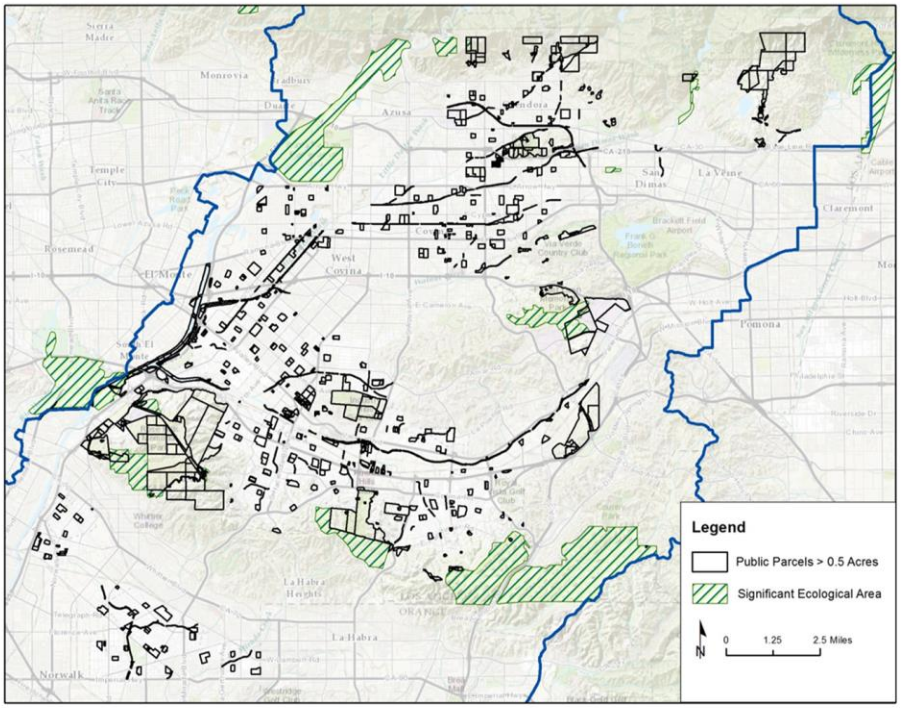


Figure 3-9
Depth to Groundwater (<20 ft. BGS)

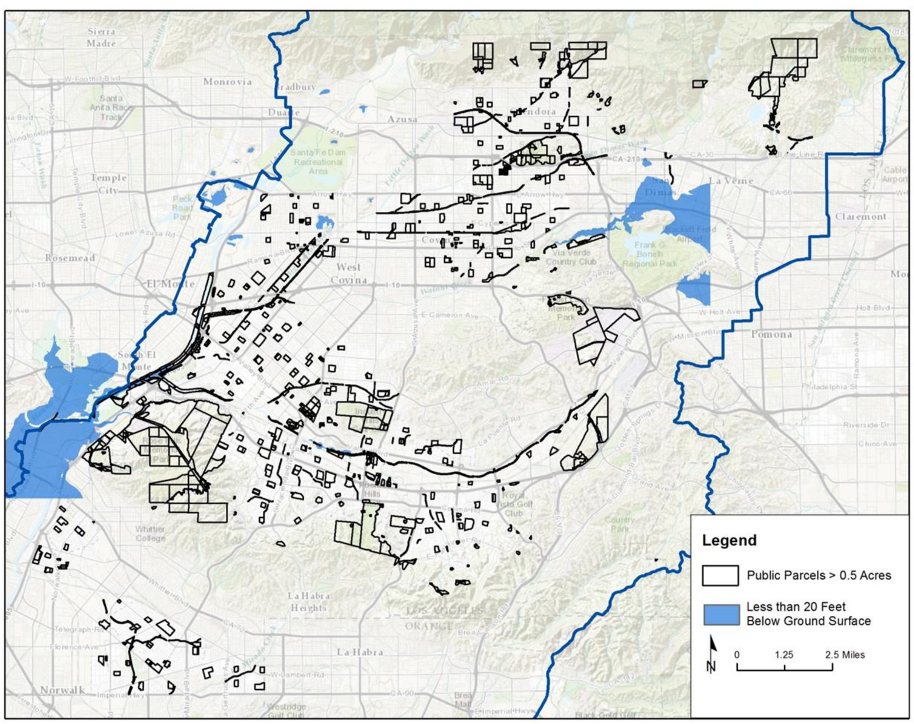


Figure 3-10
Ground Surface Slope

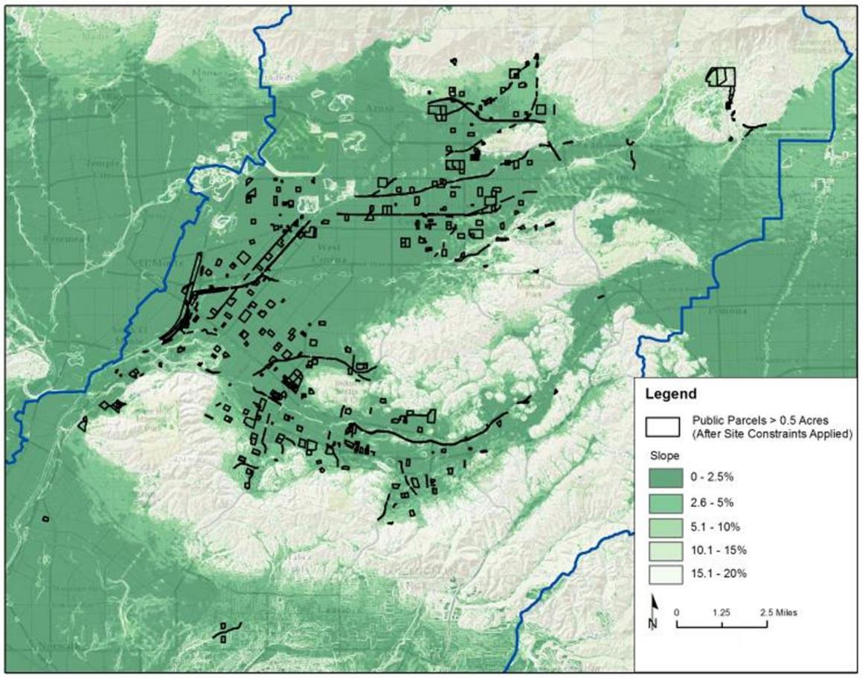


Figure 3-11
RAA Subwatersheds and Flow Direction

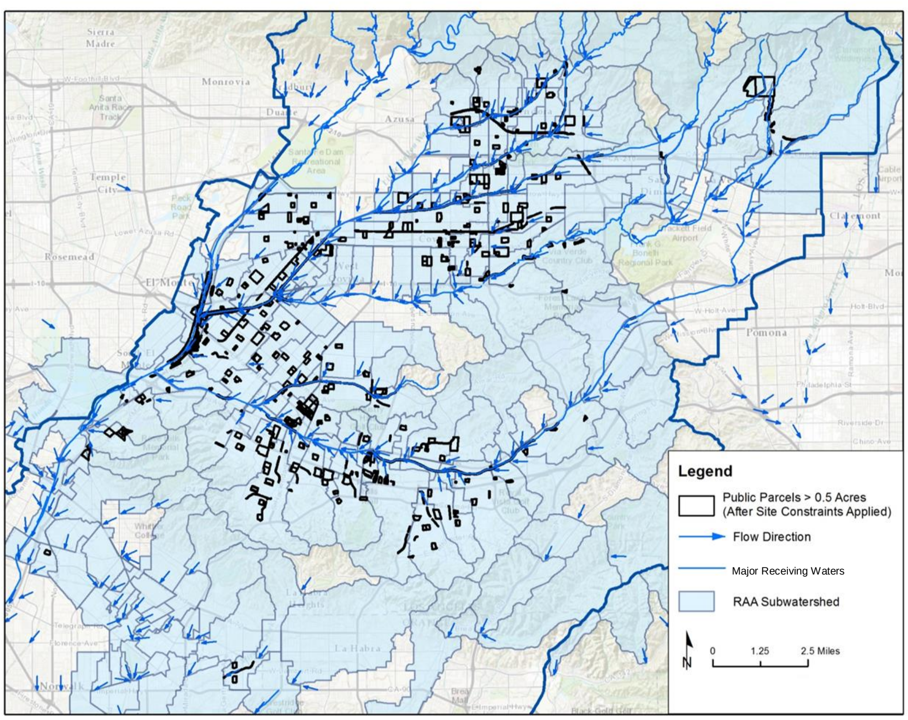


Figure 3-12
Soil Infiltration Rates

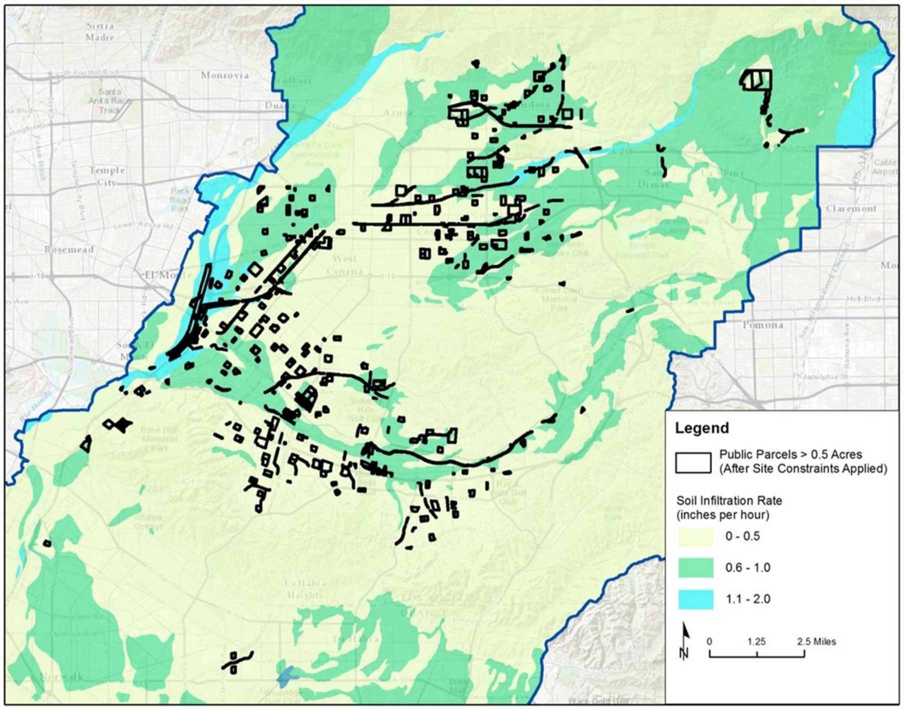


Figure 3-13
Groundwater Contamination

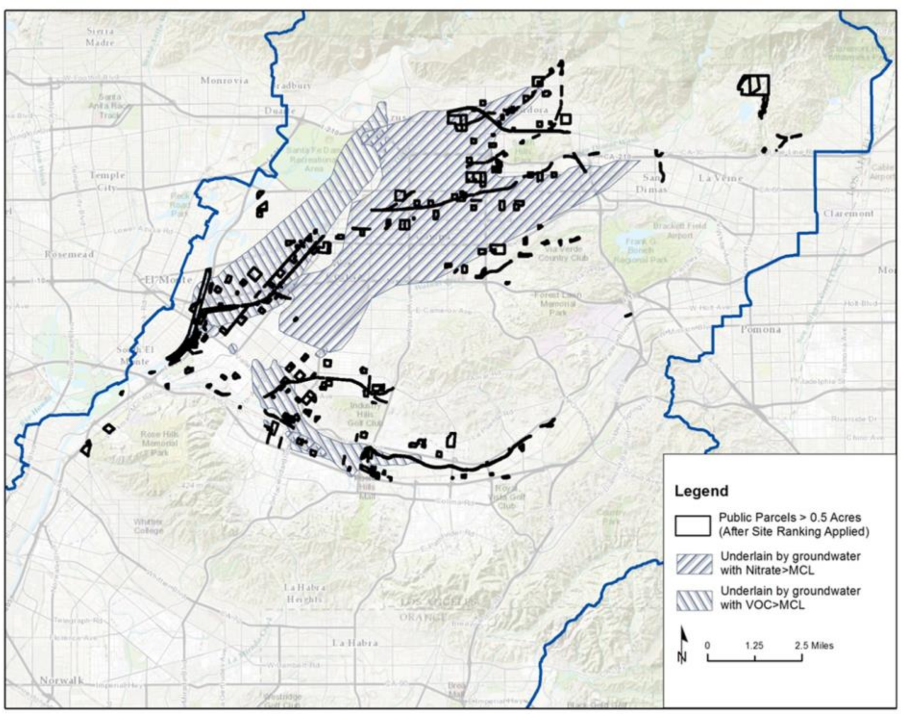
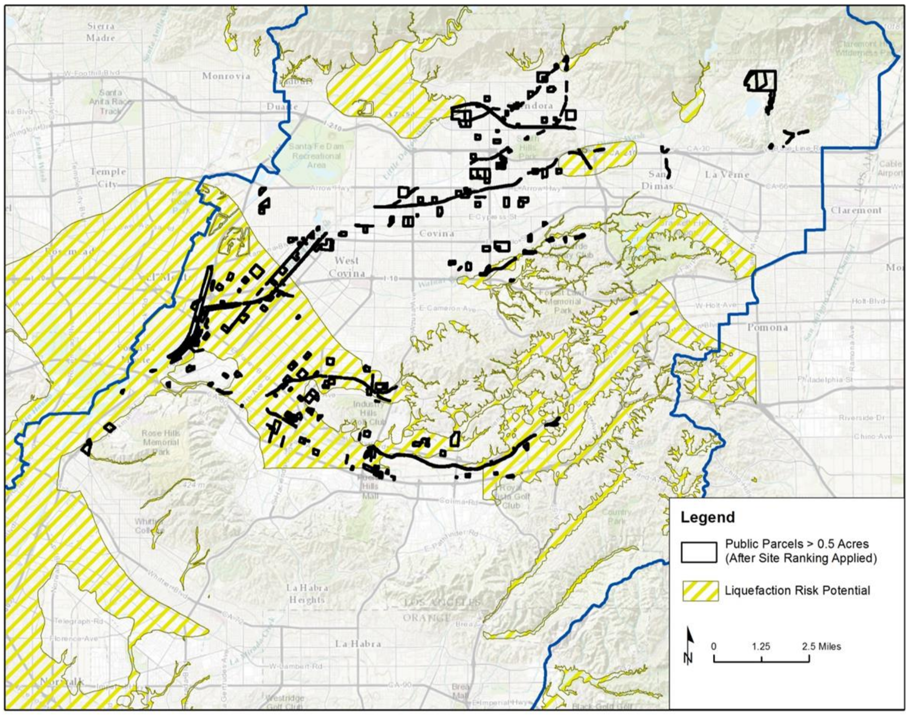


Figure 3-14
High Liquefaction Potential



In the Upper San Gabriel River watershed, most subwatersheds tend to drain towards a large, open channel, such as the San Gabriel River or San Jose Creek. Therefore, it is reasonable to assume that if a site is closer to a large, open channel, the area draining towards the site (i.e. contributing drainage area) is likely to be larger. Conversely, if a site is far from a large, open channel, the contributing drainage area to the site is likely to be smaller. For this reason, the distance of a site to a major large, open channel was used as an indicator of the potential contributing drainage area to the site. If the contributing drainage area to a site is larger, the site has more potential to capture and infiltrate large quantities of runoff. Therefore, sites closer to a large, open channel were considered preferable.

Numeric scoring was performed by discretizing a 200-foot regular Cartesian grid over the EWMP Group area. The size of the grid was driven by the resolution of the coarsest data layer, the Digital Elevation Model (DEM). The grid was generated using the NAD 1983 State Plane California V FIPS 0405 Feet projection.

The method used for numeric scoring included the following steps:

1. Raw values (e.g. percent for slope, inches per hour for soil infiltration, and feet for distanced to major receiving waters) were calculated by spatially joining grid cell centroids to each layer.
2. Raw values were indexed to the scoring matrix in **Table 3-3**.

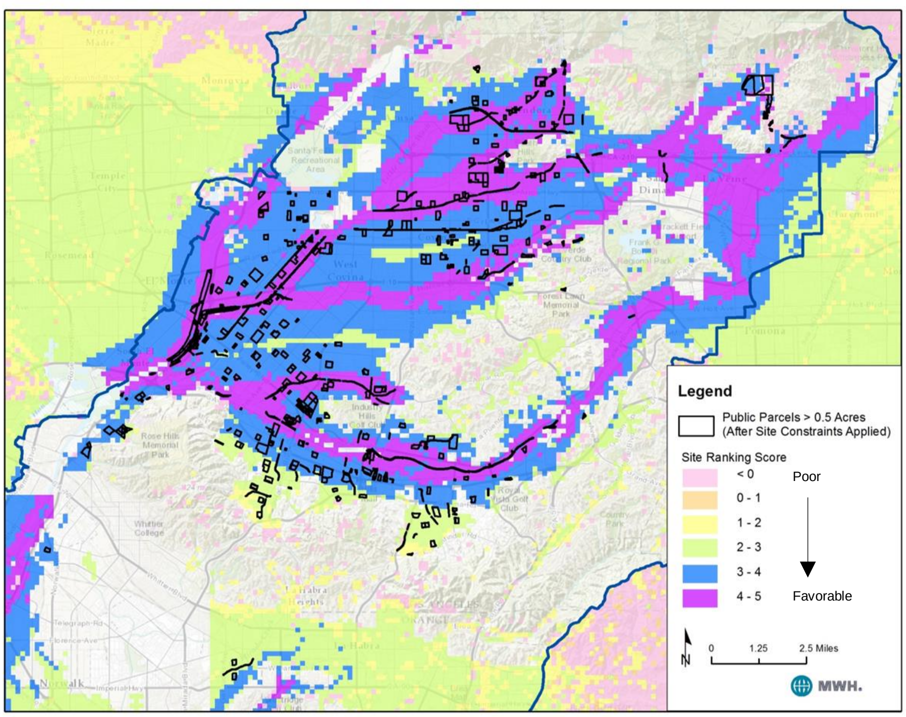
Table 3-3
Scoring Matrix for Regional EWMP Project Initial Screening

Layer	Numeric Score 1	2	3	4	5
Soil Infiltration Rate (in/hr)	0-0.1	0.1-0.25	0.25-0.5	0.5-1	>1
Distance to Conveyance (miles)	>2	1-2	0.5-1	0.25-0.5	0-0.25
Ground Surface Slope (%)	15-20	10-15	5-10	2.5-5	0-2.5

3. The total score for each cell was determined by averaging the three scores for each of the preference layer types, yielding a total score of 1-5. Note that constraints layer types are not scored, but were assigned YES for true or NO for false, i.e., indicating the presence of a particular constraint.
4. Each site was assigned a score based on the grid cell that the site's centroid was located in.

The numeric scoring was used to help identify sites that represented relatively favorable areas for stormwater recharge, consisting of sites with good soil infiltration rates (greater than 0.5 inches per hour), preferable slopes (less than 5 percent), and sites closer to major receiving waters (within half of a mile). The resulting scoring map is presented in **Figure 3-15**.

Figure 3-15
Numeric Scoring Process



Following the GIS spatial analysis, sites were further evaluated using aerial imagery. Sites consisting of infeasible land use types, including natural and wildlife areas, historic sites, hospitals, and in-channel parcels were not considered for further analysis. Sites were checked visually to ensure that the contributing drainage area to the site appears to be primarily from the MS4. Sites were checked to determine if existing development (such as buildings at a park) would significantly impact the space available to construct a regional project.

3.2.1.2 Example Regional EWMP Projects

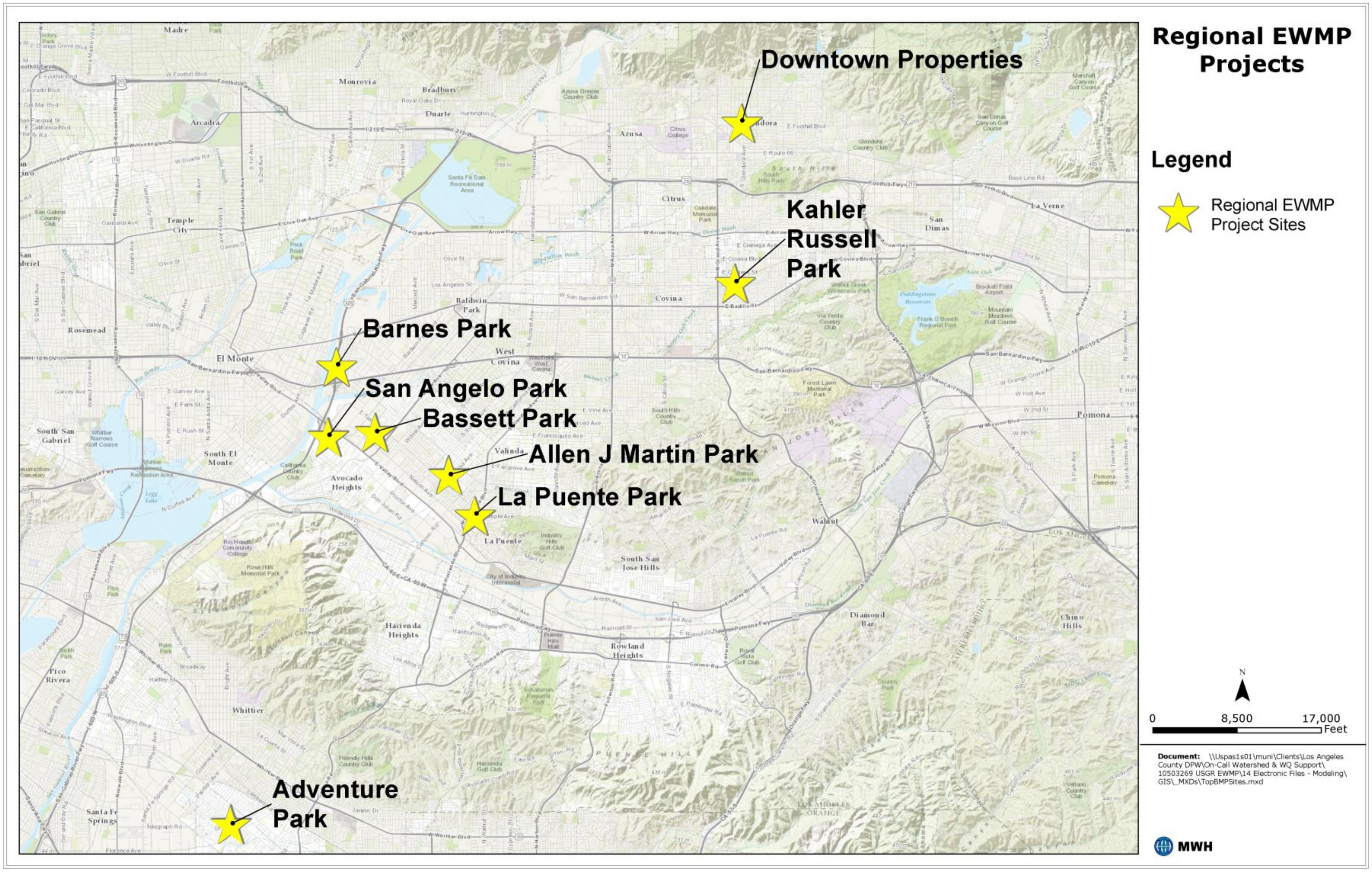
Based on the extensive initial screening process and through coordination with the Group Members, 8 "signature" or example regional EWMP project sites were selected for conceptual design and inclusion in the EWMP plan. These "signature" regional EWMP projects are example projects that may be substituted with another multi-benefit project of equivalent capture volume as noted. These example regional EWMP projects retain and infiltrate or beneficially reuse all stormwater runoff from the 85th-percentile, 24-hour storm event for the drainage area tributary to the project. Additional information on the selection and conceptual design of the example regional EWMP projects is provided in **Appendix B-1**. Additional potential regional projects are listed in **Appendix C-8**. The example regional EWMP project sites are listed in **Table 3-4** and presented in **Figure 3-16**.

Operations and maintenance considerations and evaluation of multi-benefit features, such as groundwater recharge, improvements to enhance existing facility user experience, and educational outreach opportunities, will be key issues to be addressed. Preliminary sketches and conceptual site layouts have been developed for each project (**Appendix B-1)**.

Table 3-4
Example Regional EWMP Project Sites

Regional EWMP Project Site	Implementation Agency	Address	Milestones (Contingent Upon Funding)
Bassett Park	County	510 Vineland Avenue, La Puente, CA 91746	Design and permitting by December 2021; completion by December 2023
Kahler Russell Park	Covina	735 North Glendora Avenue, Covina, CA 91724	Design and permitting by December 2018; completion by December 2023
San Angelo Park and Vacant Lot	Industry	245 San Angelo Avenue, Bassett, CA 91746	Design and permitting by December 2018; completion by 2020
Allen J Martin Park	County	14830 East Giordano Street, La Puente, CA 91744	Design and permitting by December 2021; completion by December 2023
Barnes Park	Baldwin Park	3251 Patritti Avenue, Baldwin Park, CA 91706	Design and permitting by December 2021; completion by December 2023
La Puente Park	La Puente	15538-15598 E Temple Ave, La Puente, CA 91744	Feasibility determination of an alternative project at Bassett High School by June 2016; Design and permitting by December 2021; Completion by December 2023
Adventure Park (aka Gunn Ave. Park)	County	10130 S. Gunn Avenue, Whittier, CA 90605	Completion by December 2020
Downtown Properties	Glendora	Foothill Blvd. and Glendora Ave., Glendora, CA 91741	Design and Permitting by December 2018; Completion by December 2023

Figure 3-16
Regional EWMP Project Sites



The example projects represent opportunities to capture and infiltrate stormwater and protect receiving waters. 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. The conceptual level designs include the following components, and each is discussed further below:

- Preliminary geotechnical evaluation at each site
- Preliminary evaluation of potential environmental constraints
- Construction feasibility review
- Cost estimates and project schedules

Preliminary Geotechnical Evaluation

Geotechnical evaluations have been conducted to verify site constraints such as bedrock, high groundwater, and clay and silt layers that may impact the feasibility of the regional EWMP project. These evaluations augment assumptions from the initial screening of all regional project sites. The results of these evaluations may be used to inform the level of effort required for a construction level geotechnical study. Boring logs from the geotechnical study are in included as **Appendix B-3**

Evaluation of Potential Environmental Constraints

A Programmatic Environmental Impact Report (PEIR) for County-wide watershed activities associated the Permit was developed by the County of Los Angeles Department of Public Works on behalf of the LACFCD. The Draft PEIR was circulated for public comment on January 21, 2015 and certified by the Los Angeles County Board of Supervisors on May 26, 2015. Copies of the draft PEIR can be found at www.LACoH2Osheds.com. An initial study of potential environmental considerations for the example regional EWMP projects is summarized in **Appendix B-4.**

The PEIR evaluates the major environmental effects of implementing proposed EWMP projects from a broad perspective; this evaluation is a program-level analysis. While the Permittees are developing the design, construction, and operation details of the projects that would be included in the EWMPs, these project details are not the focus of this PEIR. Instead, the PEIR frames the nature and magnitude of the expected environmental impacts associated with these proposed EWMP projects and identifies program mitigation measures to reduce the impacts of the projects as proposed. More detailed project-level analyses of individual EWMP projects may be conducted separately by each of the Permittees as required by California Environmental Quality Act (CEQA). The PEIR can provide a basis for the discussion of the environmental documents, assessments and permitting required for the implementation of priority projects. The PEIR can be used by the local implementing agencies to streamline environmental review of individual EWMP projects. The implementing agency may determine that a more detailed, project-level analysis is required, or may determine some projects to be exempt from CEQA. For non-exempt projects, project-level CEQA review will be conducted separately by the appropriate implementing agency. The separate environmental review of individual projects will evaluate site-specific impacts and incorporate feasible mitigation measures and alternatives (CEQA Guidelines, Section 15168[c]).

Construction Feasibility Review

Preliminary engineering considerations have been developed to determine the feasibility of construction the proposed projects. Based the information gathered, best professional judgment, and technical assumptions, a preliminary sizing and placement of the BMP(s) have been provided for each site (**Appendix B-1**).

Available as-built drawings of stormwater infrastructure have been reviewed for the purposes of confirming technical assumptions to be used in the conceptual designs, such as slope, depth, and size of storm drains.

3.2.1.3 Additional Potential Regional Projects (Tier 2 and Tier 3)

Regional Project Program Highlights:

- Retrofits public parcels with regional projects
- Can provide community cobenefits (recreation, groundwater recharge, habitat)
- Maximizing infiltration rate, runoff diversion rate, and drainage area will maximize BMP efficiency

Assumptions:

Public parcels identified via desktop screening and vetted by Group will be retrofit to treat runoff diverted from upstream (offsite) drainage area. Assume infiltration basins where feasible.

Additional potential (Tier 2) regional projects were identified using a detailed spatial analysis, beginning with an initial spatial analysis of constraints, and culminating with an identification of publically-owned parcels potentially suitable for regional projects. Certain Group Members also elected to consider regional projects on parcels owned by other public entities such as local school districts and transportation authorities (Tier 3 regional projects). Tier 2 and Tier 3 candidate sites represent important components of the compliance strategy even though the large number of parcels required more generalized analysis than the signature sites. Section 3.5 describes the Tiers selected for inclusion by each Group Member and the associated analysis. A list of potential regional projects is provided in **Appendix C-8.**

3.2.2 Regional Control Measures on Private Parcels

Private Regional Project Program Highlights:

- Retrofits private parcels with regional projects
- Requires land acquisition or public/private partnerships
- Parcel identification and prioritization required
- Maximizing infiltration rate, runoff diversion rate, and drainage area will maximize BMP efficiency

Assumptions:

Infiltration basins implemented at or near subwatershed outlets

Additional control measures required beyond the opportunities identified in the preceding subsections are identified as regional control measures on private parcels. Because specific opportunities for land acquisition and/or public-private partnerships cannot be confirmed during the timeframe of the EWMP development, the RAA modeling described in Section 4 report a conceptual volume of infiltration basins required in each subwatershed to meet the numeric goal. Modeling assumptions for additional regional control measures on private parcels will follow the assumptions presented for subsurface infiltration basins, as discussed in Section 3.5 and presented in **Appendix C-1**.

3.2.3 LID Programs

A key element of the structural BMP strategy for the USGR EWMP is to assume that LID will be distributed throughout the watershed. LID can provide multiple benefits to the surrounding community, including increasing property values, landscape value and sense of well-being, increased safety, and reducing crime rate (Ward et al. 2008; Shultz and Schmitz 2008; Wolf 2008; Northeastern Illinois Planning Commission 2004; Hastie 2003; Kuo 2003; Kuo et al. 2001a; Kuo et al. 2001b; Wolf 1998) as well as the reduction in reliance of imported water, a key issue in Southern California.

For the purposes of this EWMP, it is assumed that LID is defined as a series of distributed structural practices that capture, infiltrate, and/or treat runoff at the parcel scale. Common LID practices include bioretention, permeable pavement, and other infiltration BMPs that manage runoff at the source. Rainfall harvest practices such as cisterns can also be used to capture rainwater that would otherwise run off a parcel and offset potable water demands. **Appendix B-2** provides fact sheets explaining several potential LID practices. For the RAA, the LID BMPs are designed to capture the 85^{th} percentile storm from the significantly redeveloped site parcels on which they are located.

While individually these features are not large, when deployed across numerous parcels throughout the watershed, they can collectively make significant progress towards improving water quality and achieving WQOs. Since the vast majority (nearly 90 percent according to RAA inputs) of runoff from the developed portion of the watershed is generated from impervious areas on parcels, LID is a natural choice as a key strategy to address imperviousness. This strategy can be viewed as the "first line of defense" due to the fact that the water is treated on-site before it runs off from the parcel and travels downstream. Especially for areas where regional opportunities do not exist downstream, LID is an effective strategy that will only be limited by the extent of implementation.

The following paragraphs provide an overview of each specific LID strategy. **Appendix C-3** provides an analysis that defines the overall opportunity for and extent of implementation for each individual element. The approach/assumptions for representing LID BMPs in the RAA is described in Section 4.3.

LID Ordinance (New/Redevelopment)

The Permit specifies adoption of LID ordinances requiring mitigation of newly developed and redeveloped areas. As such, redevelopment LID projects will take existing impervious surfaces offline over time – greatly improving the effluent water quality and materially advancing EWMP objectives. The key advantage to the Group members is that these projects are 100 percent funded by the developer. As such, the RAA assumes that a certain percentage of parcels is redeveloped over the course of the compliance period and reflects the benefits of the LID ordinance. **Figure 3-18** shows areas that are subject to redevelopment, per the WMMS land use data

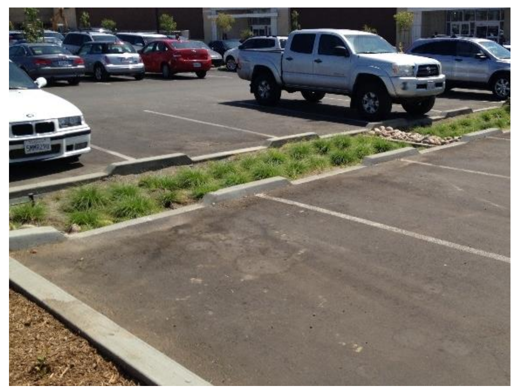


Figure 3-17. Biofiltration in a Redeveloped Shopping Center Parking Lot

As this program matures it is important to maintain a robust set of engineering standards to ensure that BMPs are being sized, sited, and designed properly. The USGR EWMP Group will retain the responsibility of reviewing and approving calculations, engineering plans, and specifications provided by developers. Ultimately, a strong LID ordinance program provides an inexpensive strategy to continually make progress towards EWMP goals. As redevelopment occurs throughout the watershed, it will be important for the USGR EWMP Group to track BMP implementation and compare to the projections made by the RAA.

LID Ordinance Program Highlights:

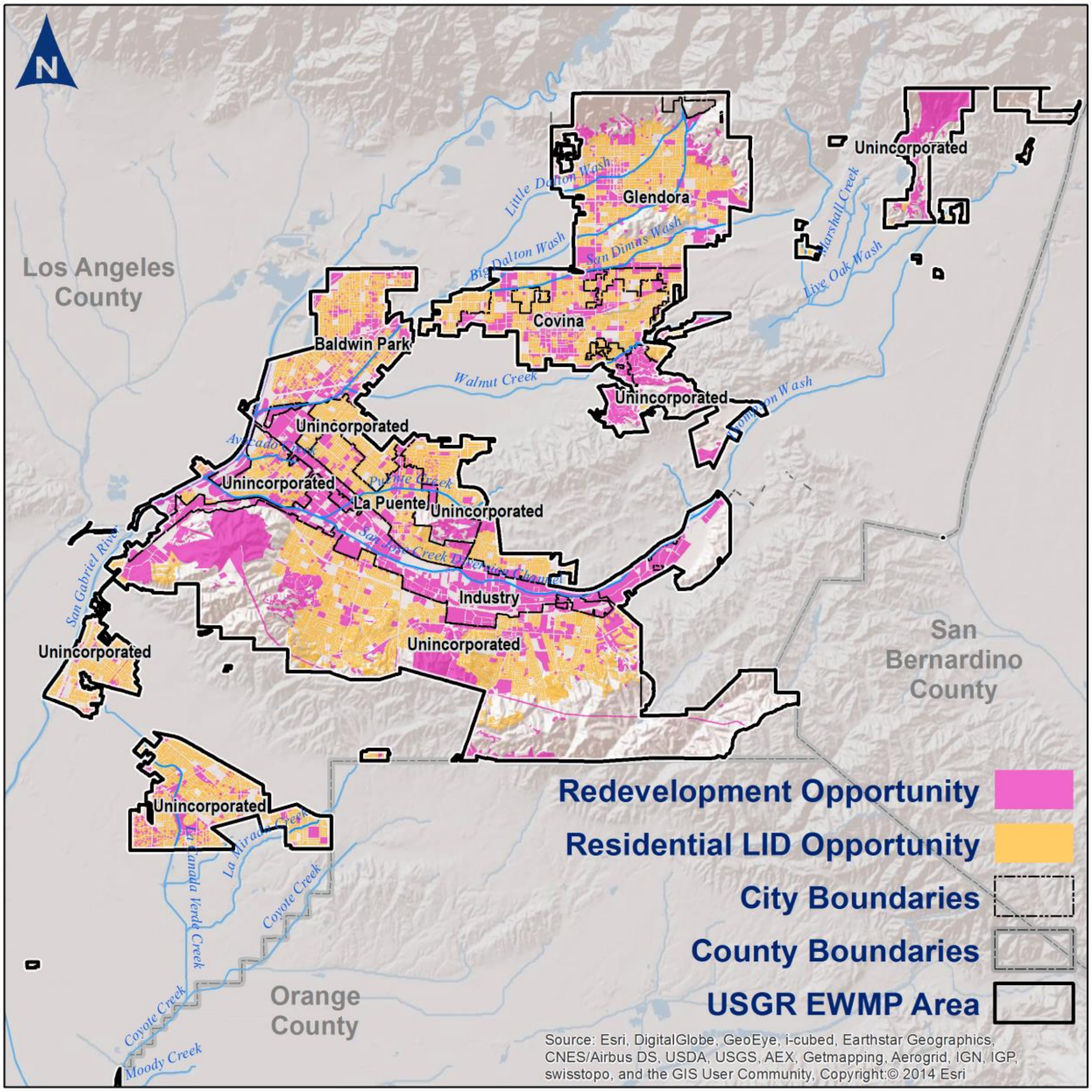
- Ongoing water quality improvement program
- Important to account for water quality benefits
- Costs to Group agencies minimal
- Requires strong standards and oversight
- Benefit based on number of redeveloped parcels

Assumptions:

BMP implementation to capture 85^{th} percentile storm on redeveloped parcels, based on land use-specific historical redevelopment growth rates reported by Los Angeles Bureau of Sanitation (rates vary from 1.65% of commercial land use to 3.74% of industrial land

Note that while LID on new/redevelopment is a structural BMP, the MS4 Permit categorizes it as an MCM since the control measures are implemented by developers.

Figure 3-18
Opportunities for Redevelopment and Residential LID



Residential LID

Accounting for approximately 25 percent of all developed impervious area in the watershed, residential parcels represent an important opportunity for LID implementation (**Figure 3-18** shows the extent of high-density residential land, per the WMMS land use data). Runoff from residential parcels is often directly connected to a curb and gutter or other conveyance system on the street. Based on input from the EWMP Group, the RAA assumes that a residential LID program will be initiated to encourage and incentivize residential homeowners to retrofit their properties with LID features.

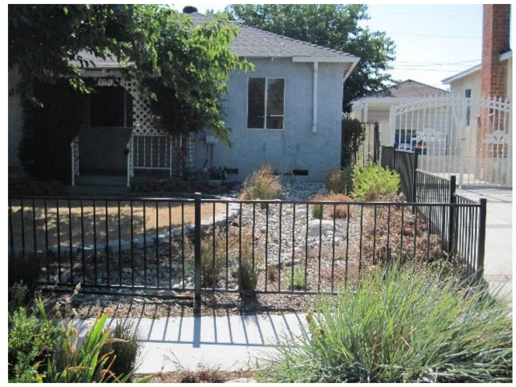


Figure 3-19. Residential LID Retrofit in the form of a Xeriscaped Infiltration Swale

Treating runoff through a voluntary program at the residential parcel scale can significantly offset the need for regional or green infrastructure BMPs. A well-designed residential LID program will thoroughly engage individual homeowners to establish a sense of stewardship and ownership as they transform small areas of their property into stormwater treatment elements. Incentive programs can potentially be aligned with existing water conservation programs such as turf replacement or xeriscaping incentives. Partnering with key non-governmental organizations can be an effective strategy to rapidly developing an effective program that includes community engagement and preparation of standard plans and procedures. As with the redevelopment ordinance program, BMPs implemented as part of this program will be tracked and compared to the projections made by the RAA.

Residential LID Program Highlights:

- Incentivizes installation of BMPs on residential land
- Offsets more expensive BMPs downstream
- NGO partners can help develop and operate program
- Homeowner engagement and stewardship is critical
- Benefit based on rate of adoption by homeowners

Assumptions:

Starting 2017, one percent of residential parcels per year in each jurisdiction (approximately 193 acres per year across the entire EWMP area) will be retrofit with BMPs to retain the 85th percentile storm

LID on Public Parcels (Retrofits)

Although public parcels represent less than 6 percent of all impervious land use in the watershed, they provide key opportunities to implement LID on parcels where the USGR EWMP Group has domain. These opportunities provide several key advantages, including the ability to coordinate efforts with already-planned infrastructure upgrades (e.g., parking lot rehabilitations), avoidance of land acquisition costs, and the opportunity for public engagement and education.

Figure 3-20. Bioretention and Permeable Pavement at the Los Angeles Zoological Park

Sites that attract significant public traffic, such as libraries, City Hall, and parks can also provide excellent forums to demonstrate LID practices. Not only will these demonstrations help the USGR EWMP Group to achieve the goals of the EWMP, if done properly they can advance the public's understanding, acceptance, and support for these types of projects which will be critical for developing financial funding strategies for larger efforts (such as green streets and regional projects). **Figure 3-21** shows the public parcels that were considered for LID.

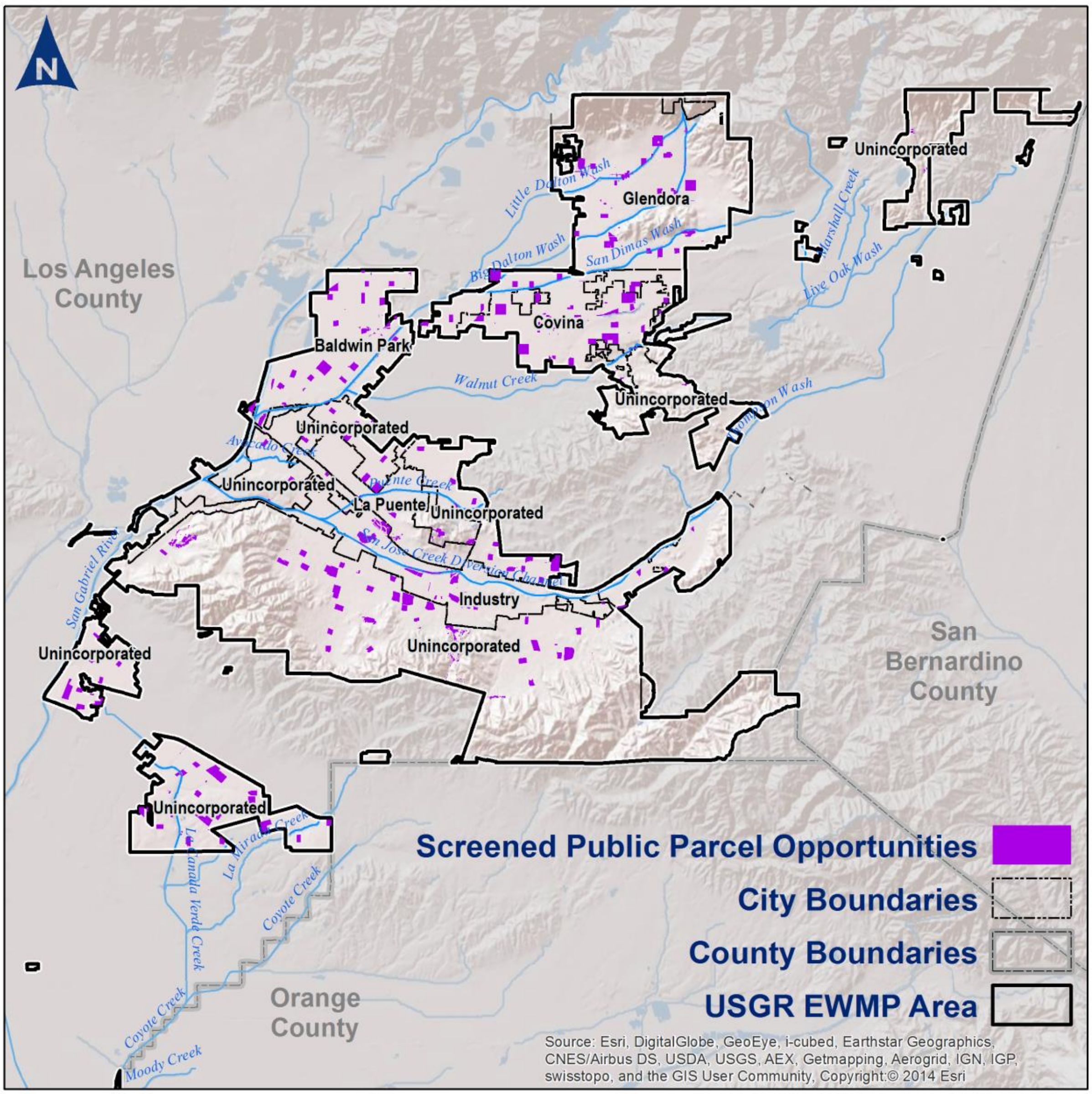
Public Parcel LID Program Highlights:

- Implements LID on public parcels through retrofits
- Key opportunities for public education
- Readily integrated into planned site rehabilitation
- Can be leveraged to generate public support/funding
- Small number of public parcels limits total impact

Assumptions:

Public parcels identified via desktop screening for slopes, groundwater, and soil contamination (2,270 acres in total) will be retrofit to treat onsite runoff from the 85th percentile storm.

Figure 3-21
Opportunities for LID on Public Parcels



3.2.4 Existing and Planned BMPs

Figure 3-22. Biofiltration in a Parking Lot

In addition to the above programs, the EWMP incorporates ongoing structural BMP activities that have recently been or are currently taken place. An inventory of existing and planned structural BMPs within each jurisdiction was developed to account for these activities. Existing and planned BMPs were identified through a data request distributed to the USGR EWMP Group to identify BMPs within the EWMP area. In addition, a literature review was performed to identify further structural BMP projects that were not encompassed by the data request. The literature review included the following documents/sources:

- Integrated Regional Watershed Management Plan (IRWMP) documents,
- Notice of Intent (NOI),
- 2011-2012 Annual Report, and
- Online OPTI database (for planned BMPs).

Existing and Planned BMP Highlights:

- Accounts for ongoing or recent BMP activity
- Projects will count as credit toward EWMP objectives as they are completed
- Documentation of project details is key

Assumptions:

Includes projects implemented after 2011, as identified in the EWMP Work Plan

As with the other programs, it will be important to track project details such as BMP size, type, and drainage area to compare to the assumptions/performance used in the RAA. Appendix C-6 details the existing and planned structural BMPs.

3.2.5 Green Streets Program

Figure 3-23. A Residential Green Street

The Permit specifies that EWMPs should "incorporate effective technologies, approaches and practices, including green infrastructure." Rights-of-way along streets may be the most extensive opportunity for the USGR EWMP Group to implement green infrastructure BMPs on public land. In developed areas, curb and gutter in the road provides the primary means of conveying stormwater (and associated pollutants) directly to storm drain inlets and receiving waters. Green streets provide an opportunity to intercept this runoff prior to entering the MS4 and treat it within the public right-of-way. Green streets have been demonstrated to provide "complete streets" benefits in addition to stormwater management, including pedestrian safety and traffic calming, street tree canopy and heat island effect mitigation, increased property values, and even reduced crime rates.

As with LID, green streets tend to be distributed practices that are deployed throughout a watershed to treat runoff near the source. Key advantages of green streets, however, are that they are located on land directly controlled by public entities and can intercept runoff from larger upstream drainage areas when compared to LID projects.

Green Streets Program Highlights:

- Implements green infrastructure in the rights-of-way
- High potential for significant load reduction
- Agencies retain ownership and O&M burden
- Design/construction standards can yield efficiency
- Strategic selection of streets can yield cost savings
- Opportunity for integration with Capital Improvement Program (CIP)
- Data limitations currently hamper decision making

Assumptions:

Green streets implemented on suitable rights-of-way (screened for slope and road functional class) to treat contributing parcel and roadway runoff.

Green streets are typically implemented as linear bioretention/biofiltration practices installed parallel to roadways. Systems receive runoff from the gutter via curb cuts or curb extensions (sometimes called bump outs) and infiltrate it through native or engineered soil media. Permeable pavement can also be implemented in tandem, or as a standalone practice, in parking lanes of roads. The methods for screening potential street opportunities is discussed in **Appendix C-3** and the approach/design assumptions for representing green streets in the RAA is described in Section 4.3 and C-4, and C-5. The screening procedure identified over 1,700 linear miles of potential frontage length for green streets, as shown in **Figure 3-24**. The required extent of green street implementation (per the RAA) is presented in Section 5 and detailed in **Appendix C-5**.

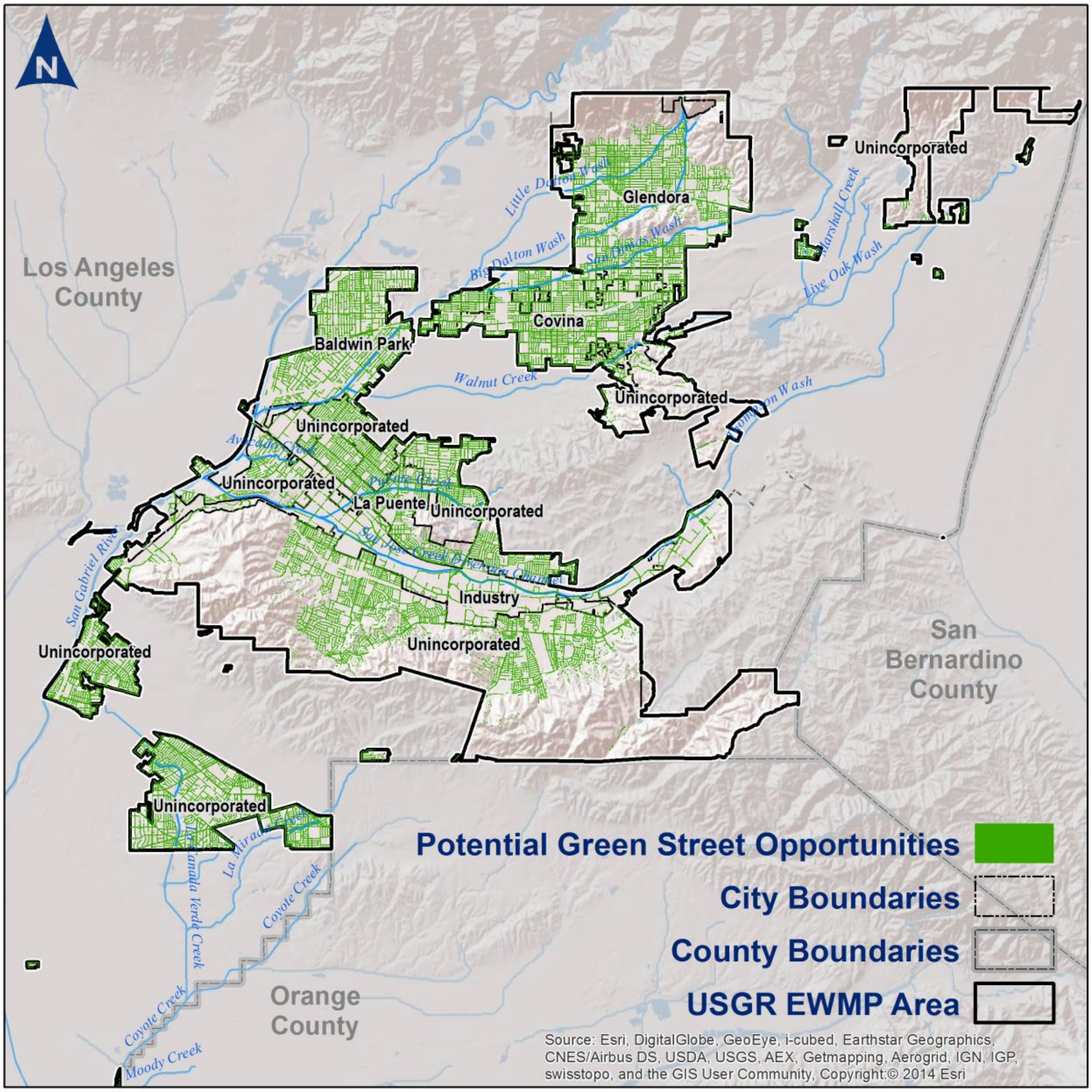
Due to the large number of locations where green streets could be implemented, and the relative magnitude of green streets as a BMP category (compared to other BMPs) in the EWMP Implementation Plan, it is anticipated that a green streets program will be a key element of the compliance strategy for the EWMP.

Effort on this program will be evaluated in conjunction with other programs, such as the residential LID program and the regional BMP program. For example, downstream of places where the residential LID program is heavily implemented, or upstream of locations where large regional projects are constructed, the need for green street retrofits within the same drainage area will be reduced. As with the other programs, it will be important to track the details of green street implementation, such as street length, retention design characteristics, and drainage area to compare to the assumptions/performance used in the RAA. Green street considerations are summarized by jurisdiction in **Table 3-5**.

Table 3-5
Summary of Green Street Steps to be Taken by Jurisdictions

Jurisdiction	Green Streets Program Activities
Unincorporated Los Angeles County	• Prioritize locations for green street features by December 2017. • Develop tracking systems to quantify the benefits and costs of green street features by December 2017. • Update infrastructure design guidelines with sustainable practices, including stormwater capture BMPs, for use in implementing green streets by December 2018.
Baldwin Park	• Develop a Green Street Master plan to complement the EWMP and Green Street Policy by December 2018.
Covina	• Development of a plan to incorporate into and complement the City CIP based on the EWMP and Green Street Policy by December 2018.
Glendora	• Develop a Green Street Master plan to complement the EWMP and Green Street Policy by December 2018.
Industry	• Create a Green Street Atlas to identify opportunities for green streets by December 2017. • Review, utilize, and modify, where applicable, Los Angeles County's infrastructure design guidelines to facilitate implementation of green streets by 2019
La Puente	• Revise the CIP to incorporate projects that replace or realign curbs and provide for the implementation of the Green Streets Policy; will request funding from 2016-2017 budget.

Figure 3-24
Opportunities for Green Streets



3.3 INSTITUTIONAL BMPS

A number of institutional control measures and MCMs are outlined in the EWMP, representing an array of practices to most effectively address pollutants at their source or affect their transport. In general, institutional control measures are able to achieve modest load reductions but may do so cost effectively. As described further in Section 4, institutional control measures were either modeled explicitly or implicitly. This section presents the MCMs and low-impact development (LID) programs as institutional BMPs of this EWMP.

3.3.1 Minimum Control Measures (MCMs)

The MS4 Permit requires the implementation of MCMs in Parts VI.D.4 through VI.D.10. These MCMs are similar to the programs required under Order No. 01-182, as detailed in **Table 3-6**. Group Members are not proposing to modify or customize any MCMs; therefore, the standard permit provisions will be implemented. However, some Group Members are proposing to add enhancements to the MCMs as discussed in the next subsection.

The Permit requires the continuation of existing MCMs until the EWMP is approved by the Regional Board. The existing MCMs, much like those proposed in the Permit, comprise six categories:

1) Public Information and Participation Program
2) Industrial/Commercial Facilities Program
3) Development Planning Program
4) Development Construction Program
5) Public Agency Activities Program
6) Illicit Connections and Illicit Discharges Elimination Program

3.3.2 Enhanced MCMs

Enhanced MCMs, such as enhanced street sweeping and installation of catch basins, are incorporated for Covina, Glendora, Industry, and the County for an additional 5% reduction in the RAA for implementing institutional controls. Baldwin Park and La Puente did not elect to conduct enhanced MCMs outside of those required by the permit for their jurisdiction. The enhanced MCMs are summarized in **Table 3-7**.

Table 3-6
Comparison of Storm Water Management Program MCMs

Program Element	Activity	Old Permit (Order No. 01-182)	New Permit (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 Waste Discharge Identification number of applicable facilities	x	x
	Source Control BMPs	x	x
	Provisions for Significant Ecological Areas (Environmentally Sensitive Areas)	x[3]	x
	Progressive enforcement of compliance with stormwater requirements	x	x
	Interagency coordination	x	x

Table 3-6
Comparison of Storm Water Management Program MCMs (continued)

Program Element	Activity	Old Permit (Order No. 01-182)	New Permit (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	x
	Standard Urban Stormwater Mitigation Program (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
	California Environmental Quality Act 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 Geographic Information System (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	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 Illicit Connections/Illicit Discharges (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 WMP 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

Table 3-7
Summary of Institutional MCMs by Jurisdiction

Jurisdiction	MCMs	Enhanced MCMs
Unincorporated Los Angeles County	Implementation of MCMs in the 2012 Permit	• Incorporation of regenerative sweepers in the street cleaning program by December 2016. • Expedited installation of full capture systems in catch basins in high trash generation areas: 40% by December 2016; 80% by December 2017; 100% by December 2018. • Development of a Nutrients Reduction Outreach Program in areas draining to Puddingstone Reservoir by December 2018.
Baldwin Park		• Not Elected.
Covina		• Expedited installation of full capture systems in catch basins in high trash generation areas: 40% by December 2016; 80% by December 2017; and 100% by December 2018. • Incorporation of regenerative sweepers in the street cleaning program since December 2012.
Glendora		• Incorporation of regenerative sweepers in the street cleaning program starting in December 2014.
Industry		• Expedited installation of full capture systems in catch basins in high trash generation areas: Priority A and B catch basins by December 2016 and the remainder by June 2018. • Provide educational materials and information to the Industry Manufacturing Council (IMC) through IMC's monthly newsletter and monthly luncheons on an ongoing basis starting in October 2015. The IMC is the chamber of commerce for the city. • Incorporate regenerative sweepers in the street cleaning program by December 2015.
La Puente		Not Elected

3.4 NON-STORMWATER DISCHARGE CONTROL MEASURES

The Permit effectively prohibits non-stormwater discharges and the SGR Metals TMDL includes milestones for attainment of dry weather RWLs. The EWMP Implementation Plan has assurance of eliminating non-stormwater discharges through implementation of the network of wet weather control measures. Additional information on control of non-stormwater discharges is provided in **Section 5.4.**

3.5 SUMMARY OF EWMP CONTROL MEASURES

The Group Members were surveyed to determine which of the institutional and structural control measures discussed in the preceding section are feasible and best align with existing planning efforts. These jurisdictional preferences are summarized in **Table 3-8** and provided the foundation for the control measure opportunities modeled in the RAA. The assumed opportunity for each control measure category is tabulated in **Table 3-9** and discussed in detail in **Section 4.3** and **Appendix C-3.**

Table 3-8
Summary of BMP Assumptions Survey

	Institu-tional[1]	LID Ordinance	Resident-ial LID	LID on Municipal Parcels	Permeable Pavement[2]	Tier 1 Region-al	Tier 2 Region-al	Tier 3 Regional/ LID on Schools
Baldwin Park	5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covina	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Glendora	10%	Yes	Yes	Yes	Yes	Yes	Yes	No
La Puente	5%	Yes	Yes	Yes	No	Yes	Yes	Yes
Unincorporated LA County	10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Load reduction attributed to MCMs or enhanced MCMs
[2] With green streets

Table 3-9
Summary of EWMP Control Measure Opportunities included in RAA

BMP Category	Type	Description of Program
Institutional	MCMs and/or Enhanced MCMs	For 5% reduction: implement new MCMs in 2012 Permit For additional 5% reduction (for Covina, Glendora, Industry and the County): identify control measures and schedule for implementation. Examples include enhanced street sweeping and implementation of catch basin inserts. Each agency provided input on which control measures they would be implementing.
Low Impact Development	LID Ordinance (New/Redevelopment)	BMP implementation assumed to be equal redevelopment growth rates reported by Los Angeles Bureau of Sanitation (see Appendix C-4). Each agency will track redevelopment and verify that that LID is implemented at projected rate, based on capacities and schedules in Section 5.
	Existing and Planned BMPs	Planned LID BMPs will be implemented as planned, according to projects constructed after 2011 that were listed in the Work Plan.
	Residential LID	Starting in 2017, each agency will have a residential LID program that enrolls 1% of residential parcels per year. Each enrolled parcel will retain the 85^{th} percentile storm (if less, then additional parcels will be enrolled). Each agency will track redevelopment and verify that that residential LID is implemented at projected rate, based on capacities and schedules in Section 5.
	LID on Public Parcels (Retrofits)	Each agency will implement LID projects on public land according to the specified capacities and schedule in Section 5. Projects are assumed to retain the 85^{th} percentile storm.
Green Streets	Green Streets	Each agency will implement green street projects according to the specified capacities and schedule in Section 5.
Regional	Tier 1 projects on Public Parcels (Top tier projects)	Each agency will implement Tier 1 regional projects (top ranked 21 projects) according to the specified capacities in Section 5. The design details for the 8 signature Tier 1 projects are specified in Section 3.2.1.
	Tier 2 projects on Public (Group-Owned) Parcels	Each agency will implement Tier 2 regional projects (other regional projects on public land) according to the specified capacities in Section 5. These regional BMPs were assumed to be a 3-ft-deep infiltration basin.
	Tier 3 projects on Public (School) Parcels	If this category of BMP was elected, the agency will implement Tier 3 regional projects (regional BMPs on school properties) according to the specified capacities in Section 5. These regional BMPs were assumed to be a 3-ft-deep infiltration basin.
	on Private Parcels	Each agency will implement regional projects on private land (other regional according to the specified capacities in Section 5. Assumed 3-ft-deep infiltration basin at subwatershed outlets. During adaptive management, agencies will likely strive to find additional opportunities for BMPs on public land to avoid this category of BMP / land acquisition.

4 Reasonable Assurance Analysis

A key element of the EWMP is the RAA, which is prescribed by the Permit as a process to demonstrate "that the activities and control measures…will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term" (Permit section C.5.b.iv.(5), page 63 – RWQCB, 2012). While the Permit prescribes the RAA as a quantitative *demonstration* that control measures will be effective, the RAA also promotes a modeling process to support the EWMP Group with *selection* of control measures. In particular, the RAA was used to evaluate the many different scenarios/combinations of institutional, distributed and regional control measures (described in Section 3) that could potentially be used to comply with the RWLs and WQBELs of the Permit, and was then used to select the control measures specified in the EWMP Implementation Plan (described in Section 5). It is acknowledged that while the RAA is a critical element of the EWMP, the content can be rather technical and some readers may wish to skip to Section 5, which describes the EWMP Implementation Plan (i.e., the outcome of the RAA).

This section describes key elements of the RAA including the following:

- Modeling system used for the RAA (4.1)
- Baseline critical conditions and required pollutant reductions (4.2)
  - Baseline model calibration (4.2.1)
  - Water quality targets (4.2.2)
  - Critical conditions for wet weather and dry weather (4.2.3)
  - Selection of limiting pollutants (4.2.4)
  - Required interim and final pollutant reduction (4.2.5)
- Representation of control measures in RAA (4.3)
- Approach for selecting control measures for the EWMP Implementation Plan (4.4)

As referenced throughout this section, many details of the RAA are provided in the RAA Appendix that is attached as Appendix C (including several sub-appendices). In 2014, the Regional Board issued RAA Guidelines (RWQCB, 2014), which outline expectations for developing RAAs, and those guidelines were followed closely during development of this RAA.

4.1 MODELING SYSTEM USED FOR THE RAA

The Watershed Management Modeling System (WMMS) is the modeling system used to conduct the RAA for the USGR EWMP. WMMS is specified in the Permit as an approved tool to conduct the RAA. The LACFCD, through a joint effort with USEPA, developed WMMS specifically to support informed decisions for managing stormwater. The WMMS is a comprehensive watershed model of the entire Los Angeles County area that includes the unique hydrology and hydraulics features and characterizes pollutant loading and downstream transport for all of the key TMDL constituents (Tetra Tech 2010a, 2010b). The ultimate goal of WMMS is to identify cost-effective water quality improvement projects through an integrated, watershed-based approach. A version of WMMS5 is available for public download

[5] The version of WMMS used for this RAA was enhanced from the version available for download. Enhancements include updates to calibration parameters according to the RAA Guidelines (Regional Board, 2014), more refined BMP routing assumptions, and application of an updated two-tier, jurisdiction-based BMP optimization approach.

from Los Angeles County Department of Public Works website (http://dpw.lacounty.gov/wmd/wmms/res.aspx).

The entire WMMS domain encompasses Los Angeles County's coastal watersheds of approximately 3,100 square miles, representing 2,566 subwatersheds. Of those, the USGR EWMP area encompasses 258 subwatersheds[6] (**Figure 4-1**).

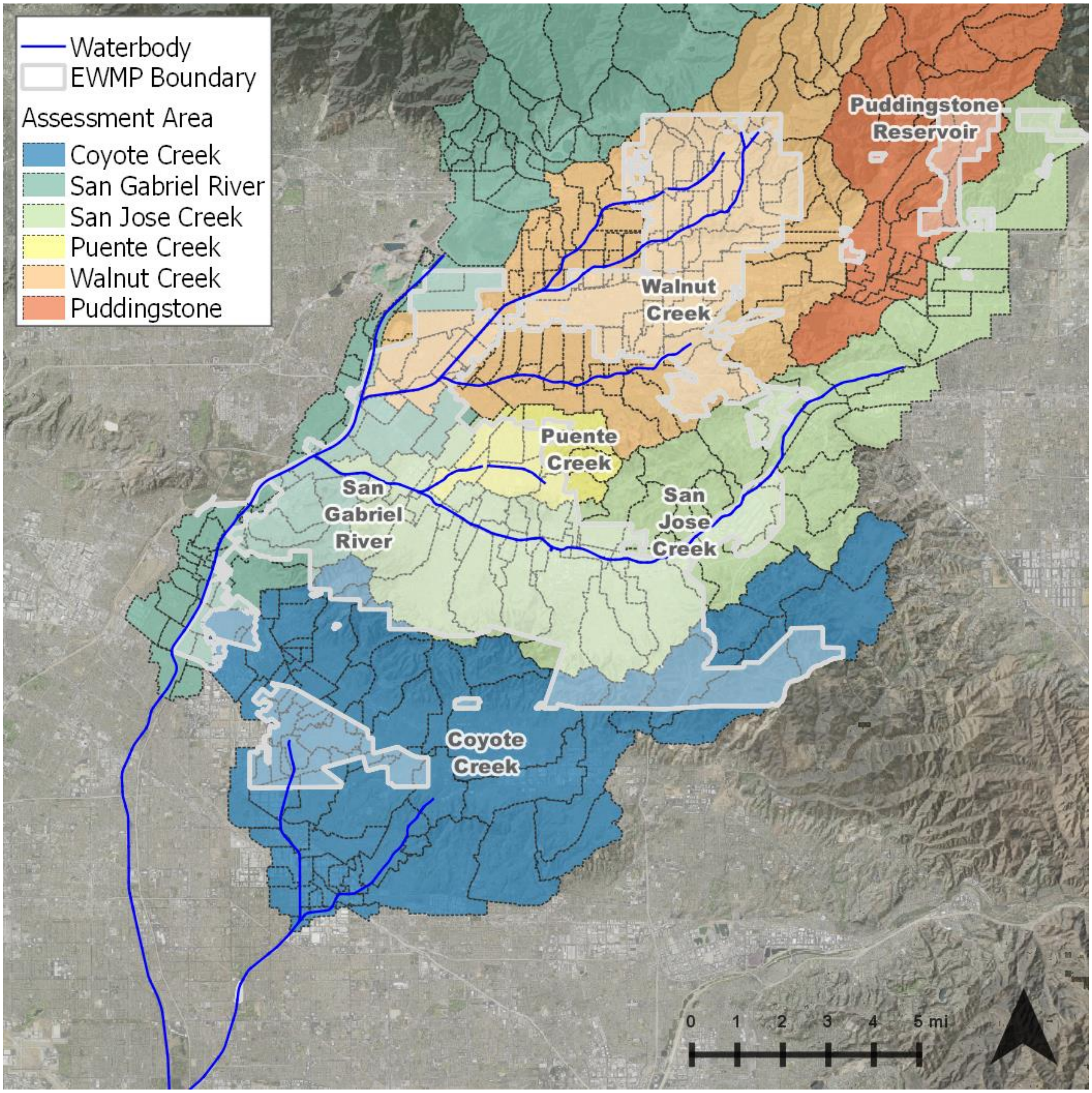
The WMMS is a suite of three modeling tools to support BMP planning:

1. A watershed model for prediction of baseline hydrology and pollutant loading (Loading Simulation Program – C+ [LSPC]);
2. A model for simulating the performance of control measures in terms of flow, concentration and load reduction (System for Urban Stormwater Treatment Analysis and Integration [SUSTAIN]); and
3. A tool for running millions of potential scenarios and optimizing/selecting control measures based on cost-effectiveness (also within SUSTAIN).

The LSPC and SUSTAIN models within WMMS are described in more detail in the following subsections.

[6] To support evaluation of regional BMPs, some of these subwatersheds were further grouped by "pour point" to receiving waters.

Figure 4-1
USGR EWMP Group Area and 258 Subwatersheds Represented by WMMS



4.1.1 Watershed Model - LSPC

The watershed model included within WMMS is the LSPC (Tetra Tech and USEPA 2002; USEPA 2003; Shen et al. 2004). LSPC is a watershed modeling system for simulating watershed hydrology, erosion, and water quality processes, as well as in-stream transport processes. LSPC also integrates a GIS, comprehensive data storage and management capabilities, and a data analysis/post-processing system into a convenient Windows-based environment. The algorithms of LSPC are identical to a subset of those in the Hydrologic Simulation Program–FORTRAN (HSPF) model with selected additions, such as algorithms to dynamically address land use change over time. USEPA's Office of Research and Development (Athens, Georgia) first made LSPC available as a component of USEPA's National TMDL Toolbox (http://www.epa.gov/athens/wwqtsc/index.html). LSPC has been further enhanced with expanded capabilities since its original public release.

4.1.2 BMP Performance and Selection Model – SUSTAIN

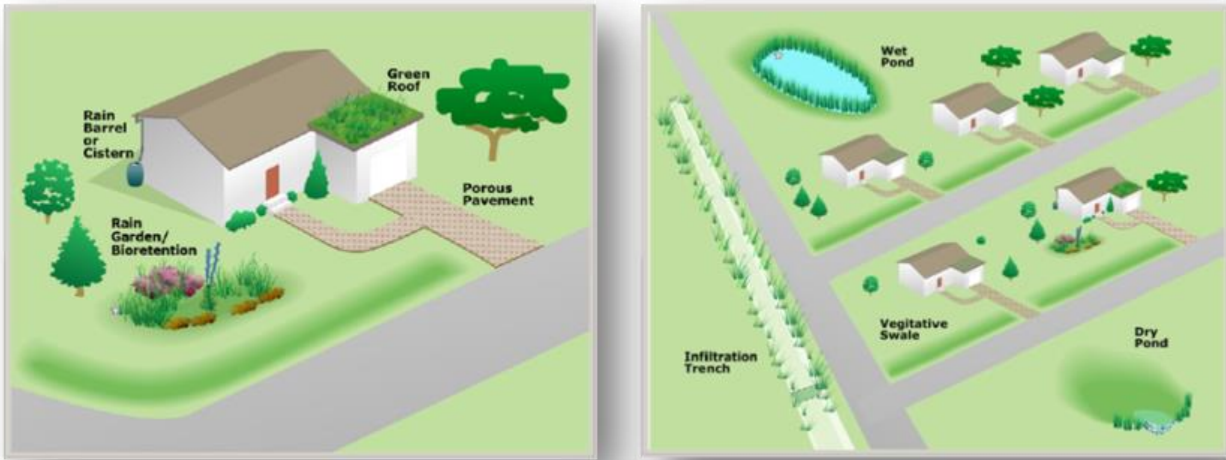
SUSTAIN was developed by the USEPA to support practitioners in developing cost-effective management plans for municipal stormwater programs and evaluating and selecting BMPs to achieve water quality goals (USEPA, 2009; http://www2.epa.gov/water-research/system-urban-stormwater-treatment-and-analysis-integration-sustain). SUSTAIN was specifically developed as a decision-support system for selection and placement of BMPs at strategic locations in urban watersheds (see **Figure 4-2**). It includes a process-based continuous simulation BMP module for representing flow and pollutant transport routing through various types of structural BMPs. This simulation provides the *primary application* of SUSTAIN – simulating the performance of selected stormwater control measures.

The *secondary application* of SUSTAIN is BMP selection, which is based on cost-benefit of different BMP alternatives. The SUSTAIN model in WMMS includes a cost database[7] comprised of typical BMP cost data from a number of published sources including BMPs constructed and maintained in Los Angeles County (Tetra Tech 2010a, 2010b). SUSTAIN considers certain BMP properties as "decision variables," meaning they are allowed to vary within a given range during model simulation to support BMP selection and placement optimization. As BMP sizes and locations change, so do cost and performance. SUSTAIN runs iteratively to generate a cost-effectiveness curve comprised of millions of BMP scenarios (e.g., the model was used for the EWMP to evaluate the different combinations of green infrastructure as compared to regional BMPs, and provides a recommendation on the most cost-effective scenario)[8].

[7] The BMP cost database from WMMS was updated for this EWMP, as described in Section 4.6.

[8] For the EWMP, optimization was conducted at the jurisdictional-level using SUSTAIN as opposed to the watershed-level using the Nonlinearity-Interval Mapping Scheme (NIMS) component of WMMS.

Figure 4-2
SUSTAIN Model Interface Illustrating BMP Opportunities in Watershed Settings



4.2 BASELINE CRITICAL CONDITIONS AND REQUIRED POLLUTANT REDUCTIONS

This section describes the application of the LSPC model to simulate current conditions, identify critical conditions and calculate required pollutant reductions. The calculated required reductions drive the extent of the control measures to be implemented by the EWMP under the EWMP Implementation Plan.

4.2.1 Baseline Model Development and Calibration

A fundamental element of the RAA is simulating baseline / existing conditions in the watershed prior to implementation of control measures. For the USGR RAA, baseline conditions were simulated using the LSPC watershed model in WMMS, including predictions of flow rate and pollutant concentrations over a 10-year period, as follows:

- The simulation period is October 1, 2001 to September 20, 2011[9].
- Simulated pollutants include total suspended solids, *E. coli*, total copper, total zinc, total lead, total nitrogen and total phosphorous. These are the 7 pollutants that are directly represented by WMMS.
- An hourly time step was used to simulate the flow rate and pollutant concentration at each of the 258 subwatershed outlets (see **Figure 4-1**) and the resultant downstream receiving water conditions.
- The model explicitly accounts for effects of major hydraulic structures in the watershed including Whittier Narrows, Santa Fe Dam, debris basins and multiple diversion structures.

In order to encourage accurate representation of existing/baseline conditions, the RAA Guidelines provide "model calibration criteria" for demonstrating the baseline predictions are accurate and to ensure the "calibrated model properly assesses all the variables and conditions in a watershed system" (Regional

[9] All stormwater control measures implemented prior to September 30, 2011 are assumed to be implicitly represented within the baseline conditions.

Board , 2014). Detailed hydrology and water quality calibrations were performed for the USGR RAA, as follows (see **Figure 4-3** for a map of water quality and hydrology calibration stations):

- Water quality calibration: the water quality calibration process for the USGR RAA leveraged two primary monitoring datasets:
    - Small-scale, land use-specific water quality monitoring data collected by the Southern California Coastal Water Research Program (LACDPW, 2010b) and
    - Large-scale receiving water monitoring data collected by Los Angeles County Department of Public Works (LACDPW) at mass emission stations in Coyote Creek (S13) and San Gabriel River (S14). All seven pollutants (i.e. total suspended solids, *E. coli*, total copper, total zinc, total lead, total nitrogen and total phosphorous) represented in WMMS were calibrated to the data from the mass emission stations.
- Hydrology calibration: a total of six stations were used for the hydrology calibration including gages along San Gabriel River, Coyote Creek, San Jose Creek and Dalton Wash. Gages along Fullerton Creek and Brea Creek were also used to assess the representation of the various flood control/water conservation structures (i.e., impoundments) in the watershed.

The comparison of the calibrated hydrology model to the RAA Guidelines is shown in **Table 4-1**, and the water quality calibration is shown in **Table 4-2**. The baseline (LSPC) model performs quite well for representing existing hydrologic and water quality conditions. Details of the baseline model development and calibration are presented in **Appendix C-1**. For the stations (**Table 4-1**) and pollutants (**Table 4-2**) where the calibration performance assessment was Fair, steps will be taken to compile additional data prior to future baseline model updates. The next update will occur during the adaptive management process, no later than June 20, 2021. Types of data that may be targeted for baseline model updates include the following:

- Data collected under the CIMP including flow rates and concentrations during dry and wet weather conditions measured at receiving water, mass emission and outfall stations,
- Operations data (outflows) for impoundments in the SGR watershed, and
- Data collected by LACSD at receiving stations in the SGR watershed.

Table 4-1
Summary of Hydrology Calibration Performance by Baseline Model

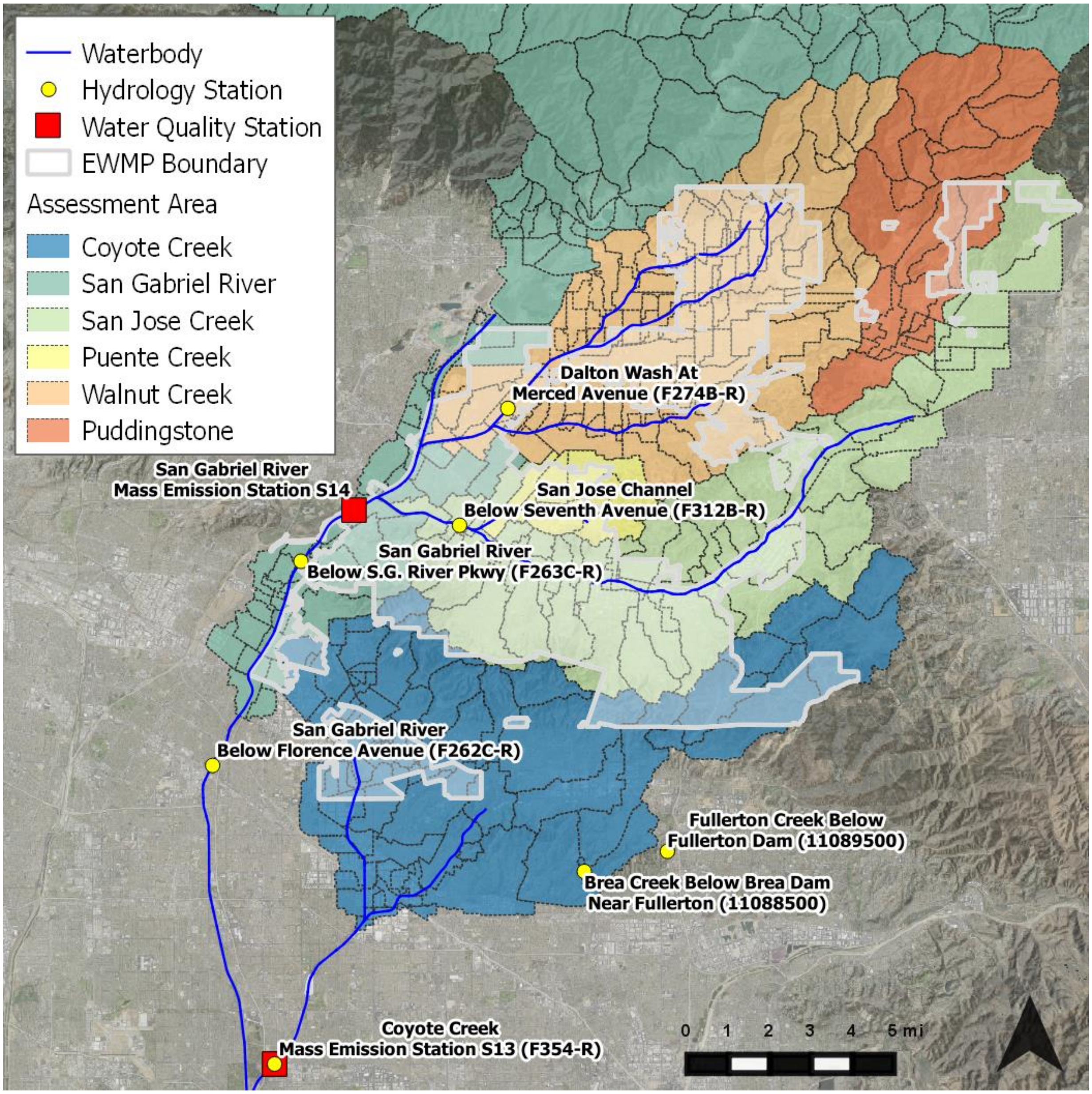
Location	Model Period	Hydrology Parameter	Modeled vs. Observed	RAA Guidelines Performance Assessment
Fullerton Creek below Fullerton Dam CA (United States Geological Survey (USGS) 11089500)	10/1/2002 – 9/30/2011	Annual Volume	-4.0%	Very Good
		Storm Volume	-14.8%	Good
Coyote Creek near Spring Street (LA DPW F354)	10/1/2003 – 9/30/2011	Annual Volume	-16.3%	Fair
		Storm Volume	5.2%	Very Good
Brea Creek below Brea Dam, Fullerton, CA (USGS 11088500)	10/1/2002 – 9/30/2011	Annual Volume	5.9%	Very Good
		Storm Volume	-4.0%	Very Good
San Gabriel River Below Florence Avenue (LA DPW F262C)	10/1/2002 – 9/30/2011	Annual Volume	17.5%	Fair
		Storm Volume	9.0%	Very Good
San Jose Channel Below Seventh Avenue (LA DPW F312B)	10/1/2002 – 9/30/2011	Annual Volume	-24.8%	Fair
		Storm Volume	8.1%	Good
Dalton Wash At Merced Avenue (LA DPW F274B)	10/1/2002 – 9/30/2011	Annual Volume	-19.4%	Fair
		Storm Volume	-10.0%	Good

Table 4-2
Summary of <u>Water Quality</u> Calibration Performance by Baseline Model

	San Gabriel River Mass Emission Station (S14)			Coyote Creek Mass Emission Station (S13)		
Water Quality Parameter	**Sample Count**	**Modeled vs. Observed Load (% Error)**	**RAA Guidelines Performance Assessment**	**Sample Count**	**Modeled vs. Observed Load (% Error)**	**RAA Guidelines Performance Assessment**
Total Sediment	23	7.6%	Very Good	59	2.9%	Very Good
Total Copper	22	-4.6%	Very Good	33	6.7%	Very Good
Total Zinc	22	8.7%	Very Good	33	-8.6%	Very Good
Total Lead	22	38.7%	Fair	33	32.6%	Fair
E.coli *	23	-30.1%	Fair	33	-26.7%	Fair
Total Nitrogen**	--	--	--	33	-11.9%	Very Good
Total Phosphorous	23	-4.3%	Very Good	33	-21.5%	Good

* *E. coli* was assumed to have a 1:1 translator with fecal coliform.
** Total Nitrogen was approximated using the sum of the observed Total Kjeldal Nitrogen (TKN) and nitrate/nitrite values.

Figure 4-3
Hydrology and Water Quality Calibration Stations for USGR RAA



4.2.2 Water Quality Targets

The RAA is designed to achieve the RWLs and WQBELs of the MS4 Permit, which are derived from applicable TMDLs (see Attachment P of the Permit – RWQCB, 2012) and the Basin Plan (see Receiving Water Limitations, Section V of the Permit – RWQCB, 2012). In particular, the RAA addresses the Water Quality Priorities identified in Section 2. The RWLs and WQBELs serve as the "water quality targets", or loads or concentrations to be achieved through implementation of the control measures specified by the EWMP. Not all pollutants are directly modeled; the pollutants that are the most problematic and generally require the most stormwater treatment are directly modeled – total solids, zinc, copper, lead, nitrogen, phosphorous, and *E. coli*. The targets for *modeled* pollutants are listed in **Table 4-3**, organized by pollutant class. For the remaining (non-modeled) Water Quality Priorities, the RAA uses analyses of monitoring data to demonstrate that control of one or more "limiting pollutants" will address the non-modeled pollutants (as discussed in the next subsection).

4.2.3 Critical Conditions

This following subsections describe the critical conditions for wet weather (stormwater) and dry weather (non-stormwater).

4.2.3.1 Wet Weather Critical Conditions

A key consideration of the RAA is the "critical condition" under which water quality targets must be achieved. Stormwater management for different size storms generally requires different size BMPs. For example, for most pollutants management of a 90^{th} percentile storm requires larger BMPs than management of a median (50^{th} percentile) storm. The RAA Guidelines specify the RAA for final compliance should be based on critical conditions, for example, the 90^{th} percentile flow rates and/or the critical conditions specified by applicable TMDLs (Regional Board, 2014). For the USGR RAA, three primary *wet weather* critical conditions were considered as follows:

1. **90^{th} percentile <u>metals</u> Exceedance Volume:** the SGR metals TMDL uses the 90^{th} percentile daily flow rate as the critical condition. In turn, the USGR RAA analyzes the volume of runoff during each rolling 24-hour period[10] of the 10-year simulation when water quality targets were exceeded, referred to as the "Exceedance Volume" (see **Figure 4-4**). The storm that produces the 90^{th} percentile Exceedance Volume[11] is the critical condition for metals and the overall primary critical condition for management[12] of stormwater by USGR EWMP. The Exceedance Volume differs for each metal (zinc, copper and lead) and for different subwatersheds (end-of-pipe) and assessment areas (instream) depending on land use, imperviousness, slope, etc. Shown in **Figure 4-5** are the zinc Exceedance Volumes for each of the 258 subwatersheds in the EWMP area (end-of-pipe). Shown in **Table 4-4** are the summary statistics for zinc Exceedance Volumes in USGR. The EWMP manages (retains and treats) runoff from each of the 258 subwatersheds in the USGR area to achieve the required reductions in Table 4-4 and attain metals RWLs.
2. **Annual average <u>nutrient and toxics</u> loading:** the USEPA TMDLs for Puddingstone Reservoir (nutrients, mercury and toxics/legacy pollutants) use annual average loading as the critical

[10] A duration of 24-hours was selected for several reasons. First, the SGR metals TMDL uses a daily flow rate as the critical condition and thus 24-hours is an analogous duration. Second, the 24-hour duration allows the Exceedance Volume to be directly compared to the runoff volume from the 85^{th} percentile, 24-hour storm. Finally, stormwater control measures are generally sized to manage an individual storm – and thus the 24-hour Exceedance Volume is much more relevant to BMP sizing than an annual runoff volume.

[11] The Exceedance Volume is an appropriate metric for RAA critical conditions because the *volume* of stormwater to be managed ultimately drives the capacity of control measures in the EWMP. The Exceedance Volume allows the volume to be defined based on applicable RWLs and assures attainment of RWLs. For example, a storm that generates a large volume of stormwater runoff with pollutant concentrations slightly above the RWLs is more difficult to manage than a storm that generates a small volume of runoff with concentrations that greatly exceeds the RWLs. Also, the Exceedance Volume reflects the effect of varying water quality targets / RWLs – if a target / RWL is increased then the volume of stormwater to be managed is decreased.

[12] The term "manage" incorporates both retention and treatment approaches. Retention of the Exceedance Volume assures attainment of RWLs. Treatment of the Exceedance Volumes to concentrations below the RWLs also assures RWL attainment. Furthermore, institutional control measures reduce pollutant build-up on watershed surfaces and thus can also decrease the Exceedance Volume.

condition. For the RAA, the average year was defined as the 2007-08 Water Year. The pollutant loading that occurs over the course of 2007-08 is considered the average annual pollutant loading for the RAA. The EWMP manages (retains and treats) the annual runoff from in the USGR area to achieve WQBELs for nutrients, mercury and toxics/legacy pollutants.

3. **Critical <u>bacteria</u> storm:** for addressing *E. coli* impairments, the "critical bacteria storm" is the 90^{th} percentile wet day when bacteria RWLs apply. Bacteria RWLs were assumed to *not* apply on days subject to the High Flow Suspension (all assessment areas except Puente Creek are subject to the HFS) and Allowable Exceedance Days. Using the Los Angeles River Bacteria TMDL as a template[13], non-HFS and HFS waterbodies are subject to an additional 10 and 15 Allowable Exceedance Days per year, respectively (**Table 4-3**). Shown in **Figure 4-6** are the bacteria Exceedance Volumes for each of the 258 subwatersheds in the EWMP area (end-of-pipe).Within each water year between 2002 and 2012, the HFS days were excluded and then the 11^{th}- or 16^{th}-wettest day was determined (the first day with RWLs apply). For the 10-year simulation, there are 10 of those days (one per year) and the 2^{nd} wettest is the critical bacteria storm (the 2^{nd} highest of 10 values is the 90^{th} percentile). The simulated critical bacteria storm is a 24-hour storm. The EWMP retains[14] the runoff from the critical bacteria storm (from each subwatershed outlet, prior to discharge to receiving waters) to achieve *E. coli* WQBELs.

Additional information regarding the RAA critical conditions including comparison to other 90^{th} percentile metric is presented in **Appendix C-9**.

[13] The Los Angeles River Bacteria TMDL was used as a basis for modeling because it is the most recent bacteria TMDL developed by the Regional Board for a large area. Similar to the SGR watershed, the Los Angeles River watershed is one of the largest watersheds in the region and has a variety of land uses, ranging from open space in the hills to highly urbanized areas in the downstream valley. At the time of RAA development, the SGR Bacteria TMDL had not been released and it is not anticipated to become effective until 2016. The USGR EWMP will be updated during adaptive management, as needed, to reflect the wasteload allocations in the SGR Bacteria TMDL after it is effective.

[14] Addressing bacteria though retention of the critical bacteria storm has several benefits for the RAA. First, the RAA for bacteria is essentially based on *hydrology* rather than prediction of bacteria concentrations / loads, which can be challenging given the variability of bacteria concentrations in the environment and multitude of potential bacteria sources. By emphasizing *retention* prior to discharge to receiving waters, the RAA acknowledges that few stormwater control measures are able to reliably treat bacteria to concentrations below applicable RWLs. In essence, the entire volume of runoff from the critical bacteria storm is assumed to be an Exceedance Volume. Note the depth of rainfall that generates the critical bacteria storm varies by subwatershed based on historic rainfall at rain gages in the EWMP area (e.g., generally larger storms at higher elevations and smaller storms at lower elevations). Subwatersheds where bacteria concentrations are predicted to be below *E. coli* RWLs in 100% of the time steps during the 10-year simulation are excluded from retaining the critical bacteria storm (generally, only watersheds with 0% impervious area meet this exclusion condition).

Table 4-3 (Part 1, Metals)
Targets for Modeled Water Quality Priority Pollutants and RAA Approach for Addressing Pollutants

Pollutant Class	Pollutant	Target for RAA (units are ug/L except when noted otherwise)				Assessment Area where Target Applies to Address Water Quality Priority					
		Dry Weather	Source	Wet Weather	Source	San Gabriel River	Coyote Creek	San Jose Creek	Walnut Creek	Puente Creek	Pudding-stone Reservoir
Metals [1]	Copper	15.05	CTR	23.72	CTR	X		X	X	X	X
		0.941 kg/day	CTR	24.71	TMDL		X				
	Zinc	192.5	CTR	192.5	CTR	X		X	X	X	X
		192.5	CTR	144.57	TMDL		X				
	Lead	6.49	CTR	81.34	TMDL [2]	X		X	X	X	X
		6.49	CTR	96.99	TMDL		X				

1 – Based on total metals. When the SGR Metals TMDL specifies a WLA (the WQO source is "TMDL"), the WLA is used as the target. Where the TMDL does not apply (the WQO source is "CTR"), hardness assumed to be 175 mg/L as CaCO3, which is the hardness used to develop SGR WLAs in the SGR Metals TMDL. When applicable, dry weather targets were based on chronic WQOs and wet weather targets are based on acute WQOs.

2 – The TMDL includes a wet weather lead WLA for San Gabriel River Reach 2. For the limiting pollutant analysis, the RAA also applied this target to Reach 2 tributaries and Puddingstone Reservoir.

Table 4-3 (Part 2, Bacteria, Nutrients and Legacy Pollutants)
Targets for Modeled Water Quality Priority Pollutants and RAA Approach for Addressing Pollutants

Pollutant Class	Pollutant	Target for RAA (units are ug/L except when noted otherwise)				Assessment Area where Target Applies to Address Water Quality Priority					
		Dry Weather	Source	Wet Weather	Source	San Gabriel River	Coyote Creek	San Jose Creek	Walnut Creek	Puente Creek	Pudding-stone Reservoir
Bacteria [1]	*E. coli*	126 Most Probable Number (MPN) /100mL	Basin Plan	235 MPN/ 100mL	Basin Plan	X	X	X	X	X	X
Nutrients	Phosphorous	741 lbs / year			TMDL						X
	Nitrogen	3390 lbs / year			TMDL						X
Legacy [2]	Chlordane	85.3% annual *sediment* reduction			TMDL						X
	PCBs	98.8% annual *sediment* reduction			TMDL						X
	Dieldrin	78.0% annual *sediment* reduction			TMDL						X
	DDT	28.4% annual *sediment* reduction			TMDL						X

1 – The High Flow Suspension applies to all assessment areas except Puente Creek. For the RAA, the targets of the LA River Bacteria TMDL were used – assessment areas that are subject to the HFS receive an additional 10 Allowable Exceedance Days per year, while Puente Creek receives an additional 15 Allowable Exceedance Days. Dry weather target based on 30-day geometric mean WQO while wet weather target is based on single sample maximum WQO. The SGR Bacteria TMDL includes both single sample and geometric mean WLAs for the MS4s, which will be assessed through the CIMP.

2 – Legacy pollutants are modeled based on reductions of TSS, with the percent reduction targets being the same as the required "sediment-associated load" reductions stated in the EPA Los Angeles Area Lakes TMDL for each legacy pollutant.

Figure 4-4
Illustration of How Metals Exceedance Volume is Calculated for Critical Condition Determination

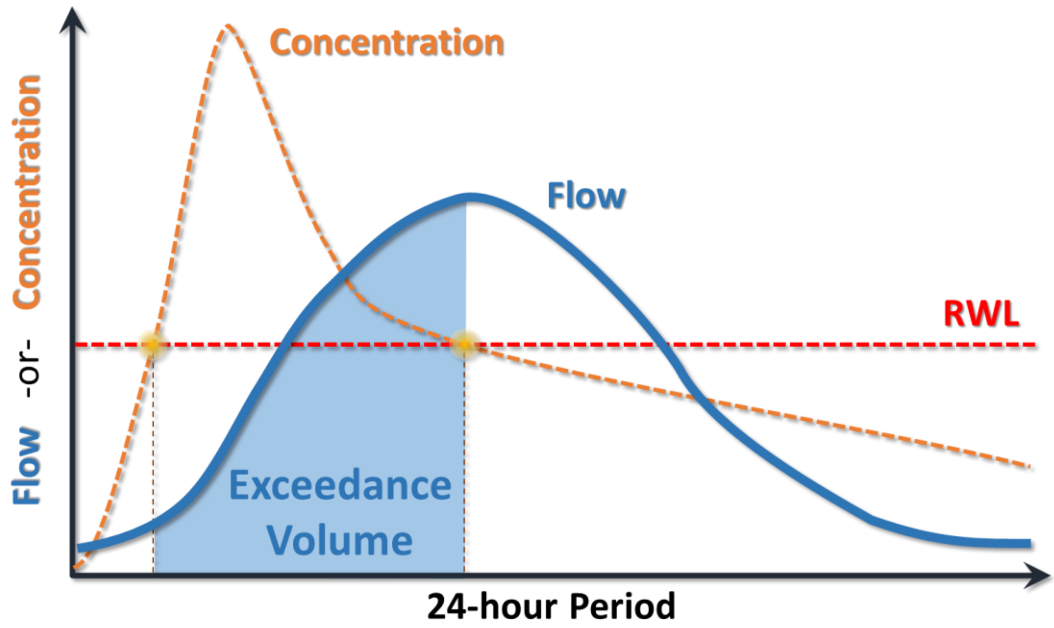


Table 4-4
Instream Zinc Exceedance Volume Summary Statistics for USGR

Total Zinc Exceedance Volume (EV) Statistics (units of acre-feet)	**RAA Assessment Area** (at watershed mouth)					
	San Gabriel River	**Coyote Creek**	**Walnut Creek**	**San Jose Creek**	**Puente Creek**	**Pudding-stone Reservoir**
Number of rolling, 24-hour periods with an EV in 10-year simulation (out of a total of 87,660 periods)	3,505	6,308	3,264	5,898	6,691	4,329
Average EV	40.4	333.2	224.5	342.1	28.4	37.8
10th percentile EV	4.1	43.7	34.2	59.0	2.4	5.2
25th percentile EV	7.8	70.3	89.4	106.5	5.7	12.3
Median EV	21.7	170.3	164.6	200.1	15.9	25.2
75th percentile EV	58.3	415.5	311.1	442.8	35.1	55.3
90th percentile EV	98.0	831.9	458.1	827.0	75.8	88.9

Note: The storm that generates the 90th percentile zinc EV is the critical condition for metals. The storm that generates the average zinc EV is the interim condition for metals.

Figure 4-5
Zinc Exceedance Volumes for each of the 258 Subwatersheds (end-of-pipe) in the USGR EWMP Area

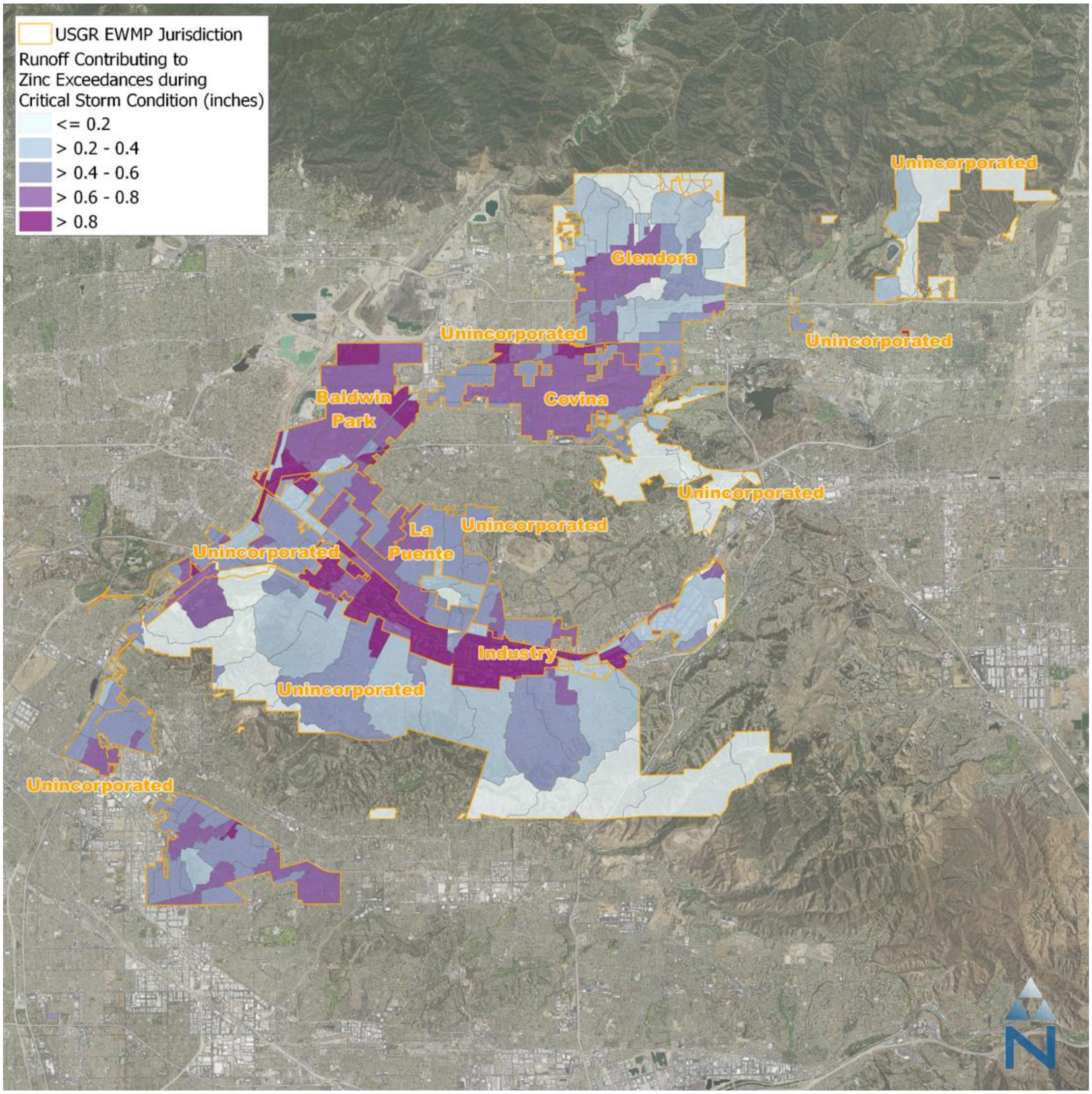
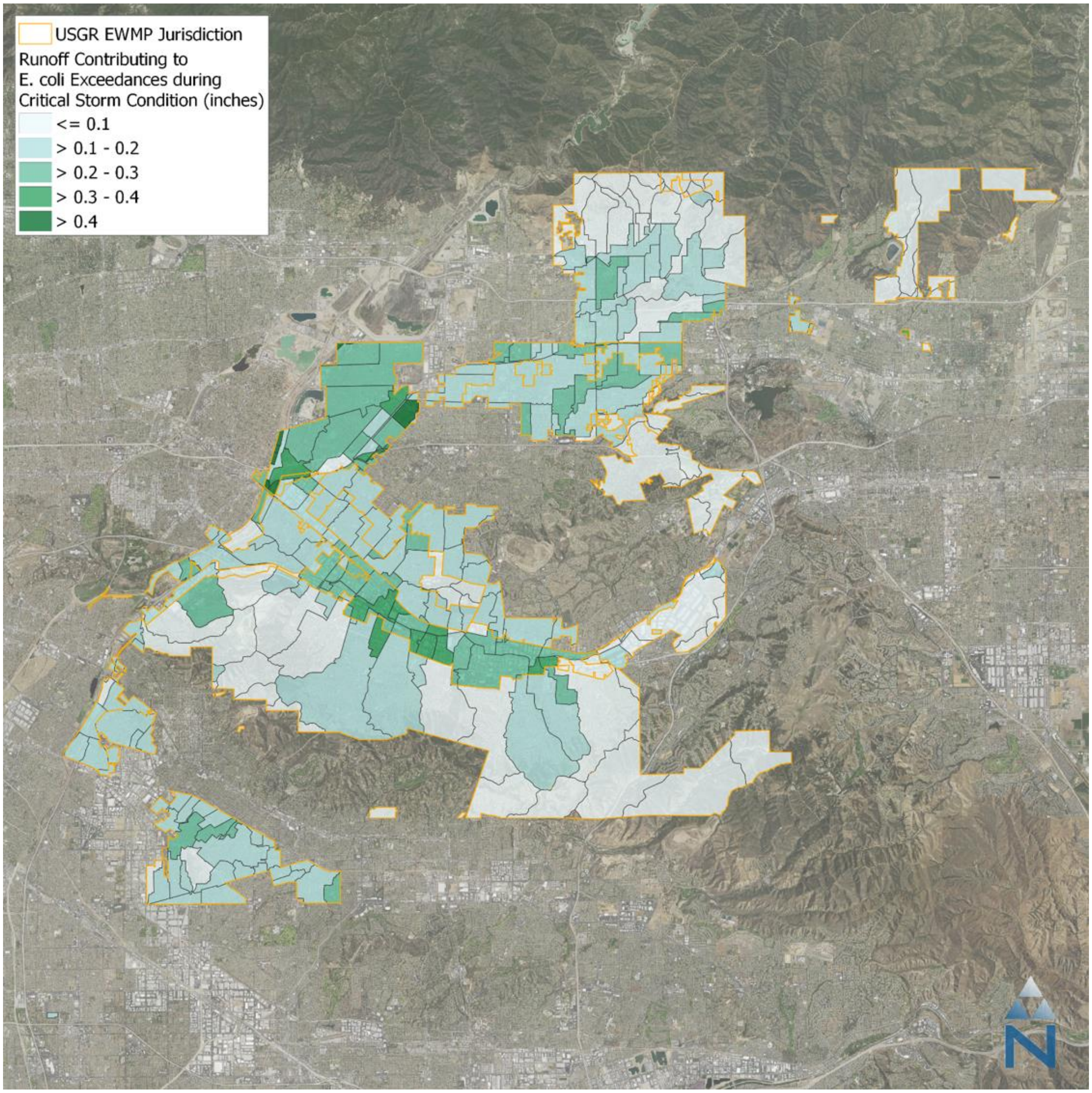


Figure 4-6
Bacteria Exceedance Volumes for each of the 258 Subwatersheds (end-of-pipe) in the USGR EWMP Area



4.2.3.2 Dry Weather Critical Conditions

A separate RAA was performed for dry weather conditions to assure that control measures in the EWMP attain dry weather WQBELs / RWLs and address non-stormwater discharges that are effectively prohibited. This subsection summarizes the development of the non-stormwater model developed for the dry weather RAA. A detailed description of the dry weather RAA is provided in **Appendix C-2**.

The Permit effectively prohibits discharges of non-stormwater[15] (dry weather runoff) and states that EWMPs shall "ensure that discharges…do not include non-stormwater discharges that are effectively prohibited." In addition, the Permit includes dry weather WQBELs for the San Gabriel River Metals TMDL. A baseline non-stormwater model was developed for the USGR EWMP based on the following components:

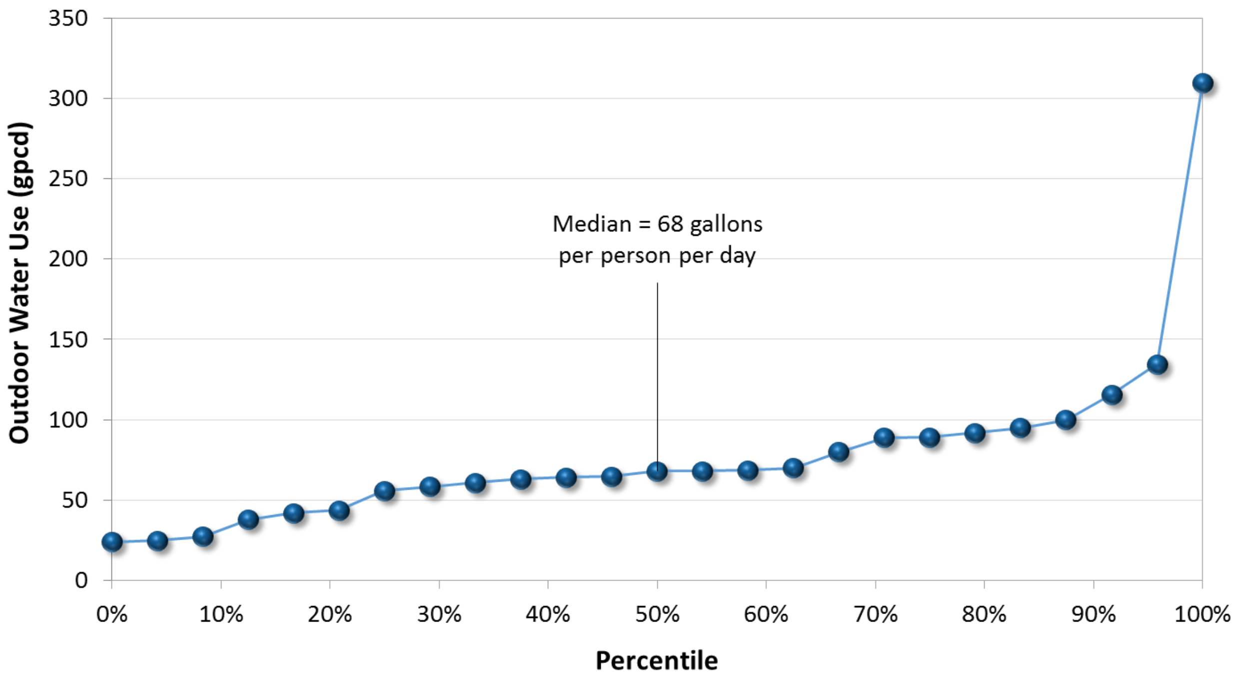
- **Simulation of non-stormwater sources that generate dry weather runoff:** the primary source of non-stormwater is outdoor water use. As such, the dry weather RAA is based on a simulation of non-stormwater whose *source* is outdoor water use[16] in each of the subwatersheds within the EWMP area and whose *sink* is evapotranspiration and retention by wet weather EWMP control measures.
- **Non-stormwater generated by outdoor water use based on extensive literature review:** the amount of non-stormwater generated in each USGR subwatershed was estimated as the product of [1] the estimated population based on U.S. census blocks and [2] the estimated per capita outdoor water use based on compilation of 25 estimates relevant to southern California (see **Figure 4-7**). The use of median historic outdoor water use is likely conservatively high, as outdoor water use has likely fallen during the recent drought.
- **Thirty (30) day simulation of critical dry period:** the period of the simulation was a critical dry period identified in the average water year (August 21, 2007 to September 20, 2007). This portion of the year (late August to September) historically receives the least amount of rainfall. The evapotranspiration during this period provides the weather boundary condition for the non-stormwater simulation.

While the critical conditions for dry and wet weather are uniquely defined, it is important that dry and wet weather conditions not be evaluated in separate silos – the EWMP includes a large network of wet weather BMPs that will eliminate a majority of non-stormwater discharges. The dry weather RAA quantifies the reduction of wet weather BMPs on non-stormwater discharges, and assures that TMDL milestones are attained on the required implementation timeline. The EWMP Implementation Plan for non-stormwater is presented in Section 5.

[15] Non-stormwater does not include all dry weather runoff. For example, permitted dry weather discharges (e.g., dewatering) and groundwater baseflow are exempted/allowed by the Permit.

[16] Non-stormwater volumes are not necessarily equal to dry weather runoff volumes in the EWMP area. Non-stormwater is the portion of dry weather runoff that is effectively prohibited by the Permit. Dry weather runoff would also include groundwater that is discharged through the MS4 system (if any), which is allowed by the Permit. By focusing on the non-stormwater portion of dry weather runoff, the non-stormwater analysis and dry weather RAA are focused on the portion of dry weather runoff that is required to be controlled by MS4s.

Figure 4-7
Outdoor Water Use Estimates from Literature Review



4.2.4 Limiting Pollutant Selection

The RAA Guidelines allow the EWMP to be developed with consideration of a "limiting pollutant", or the pollutant that drives BMP capacity (i.e., control measures that address the limiting pollutant will also address other pollutants). The detailed limiting pollutant selection and justification for each Water Quality Priority pollutant is provided in **Table 4-5**. The limiting pollutants are as follows:

- **Wet weather – zinc and *E. coli***: according to the Exceedance Volume analysis and review of monitoring data, control of zinc and *E. coli* requires BMP capacities that are the largest among the Water Quality Priority pollutants, and thus control of zinc and *E. coli* has assurance of addressing the other USGR wet weather Water Quality Priorities. The RAA for USGR first identifies the control measures to attain zinc RWLs (during the zinc critical condition) and then identifies additional capacity, if any, needed to achieve bacteria WQBELs (through retention of the critical bacteria storm).
- **Dry weather – *E. coli***: among all the pollutants monitored during dry weather at mass emission stations in the County, *E. coli* most frequently exceeds RWLs. During monitoring "snapshots" of over 100 outfalls along the LA River, over 85% of samples exceeded WQBELs for *E. coli* during dry weather the Bacteria Source Identification Study along the Los Angeles River (CREST, 2008). Of the 416 samples compiled from receiving water monitoring along San Gabriel River and San Jose Creek in the last five years, 188 (45%) exceeded the RWL for *E. coli*. Attainment of dry weather RWLs for *E. coli* will require extensive control measures and/or significant reductions in non-stormwater discharges. As such, control of *E. coli* during dry weather has assurance of addressing the other USGR dry weather Water Quality Priorities.

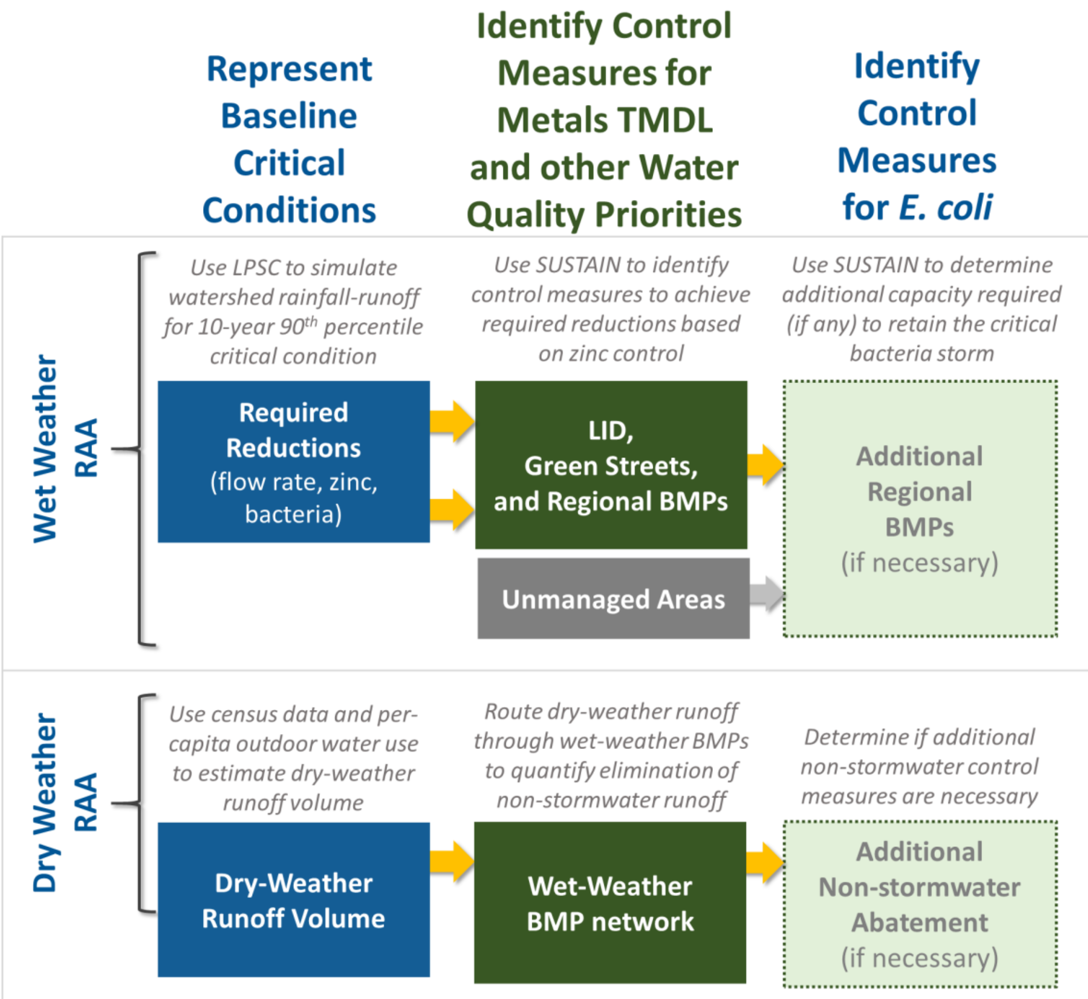
As shown in **Figure 4-8**, the RAA sequentially addresses the limiting pollutants in stormwater (wet weather RAA) and non-stormwater (dry weather RAA) based on the limiting pollutant analysis.

It is important to distinguish between reasonable assurance and required implementation actions when considering limiting pollutants. While control of zinc and *E. coli* has reasonable assurance of addressing other Water Quality Priorities, it is not *necessary* to fully control zinc and *E. coli* to address the other Water Quality Priorities. For example, as shown in **Table 4-5**, exceedances of metals during dry weather are rare and thus existing MCMs and control measures have reasonable assurance of attaining metals RWLs during dry weather. As such, if exceedances of metals during dry weather occur during EWMP implementation, then compliance determination should *not* be based on the status of implementation of zinc and *E. coli* control measures. Instead, compliance determination should be based on evaluation of whether the existing level of implementation for MCMs and control measures (as of June 2015) has been maintained.

Table 4-5
Limiting Pollutant Selection and Justification for RAA

Pollutant Class	Pollutant	RAA approach to Addressing Pollutant			
		Wet Weather RWLs: Addressed by	Justification for control approach	Dry Weather RWLs: Addressed by	Justification for control approach
Metals [1]	Zinc	Zinc controls	Zinc is one of two wet weather limiting pollutants.	Existing MCMs and BMPs	Exceedances of metals during dry weather are rare. Of 337 samples compiled from receiving water monitoring efforts in San Gabriel River and San Jose Creek during the last five years, a total of six samples exceeded the RWL for total copper. Of 227 samples for total zinc, zero exceeded the RWL. Of 219 samples for total lead, zero exceeded the RWL. Of 423 samples for selenium, five exceeded the RWL. Of 217 samples for total cadmium, zero exceeded the RWL.
	Copper		A large portion of copper loading is being phased out through brake pad replacement (AB346). The reduction will cause zinc to become limiting.		
	Lead		The volumes of stormwater to be managed for zinc control are greater than volumes for control of these metals.		
	Nickel				
	Selenium				
	Mercury				
	Cadmium				
Bacteria [2]	*E. coli*	*E. coli* controls	*E. coli* is one of two wet weather limiting pollutants.	*E. coli* controls	*E. coli* is the dry weather limiting pollutant.
Salts	Sulfate	Not applicable – not a Water Quality Priority for wet weather conditions.		*E. coli* controls	Volumes of non-stormwater to be managed for *E.coli* control are greater than volumes for control of these salts.
	Chloride				
	TDS				
Nutrients	Phosphorous	Annual load reduction achieved through zinc controls			Nutrient WQBELs apply to EWMP areas that drain to Puddingstone Reservoir, which will be subject to zinc controls. The volumes of stormwater to be managed for zinc control are greater than volumes for nutrient control.
	Nitrogen				
Legacy	Chlordane	Annual load reduction achieved through zinc controls (and residual source controls, if necessary)			These legacy pollutant WQBELs apply to EWMP areas that drain to Puddingstone Reservoir, which will be subject to zinc controls. The volumes of stormwater to be managed for zinc are greater than volumes for legacy pollutant control. Residual source controls will be implemented after zinc control implementation, if needed.
	PCBs				
	Dieldrin				
	DDT				
	PAHs	Annual load reduction achieved through zinc controls (and residual source controls, if necessary)			The volumes of stormwater to be managed for zinc control are greater than volumes for legacy pollutant control. Residual source controls will be implemented after zinc control implementation, if needed.
	Lindane				
	A.Endosulfan				

Figure 4-8
RAA Process for Establishing Critical Conditions and Addressing Water Quality Priorities



4.2.5 Required Interim and Final Pollutant Reductions

The RAA Guidelines specify that required pollutant reductions should be determined by comparing baseline/current pollutant loading to the allowable pollutant loading (RWQCB, 2014). With a set of defined critical conditions and identified limiting pollutants for USGR (as described in the previous two subsections), the required pollutant reductions for USGR can be determined, as shown in **Table 4-6**. The control measures to be implemented by the EWMP are designed to achieve these reductions, and the RAA provides assurance the required reductions will be achieved by the selected control measures. Each jurisdiction in the USGR EWMP Group is held to achieving the equitable reductions for the receiving waters / assessment areas to which they discharge.

An important consideration for the RAA and scheduling of control measures is the difference between interim and final requirements. While the *critical* condition (90^{th} percentile) is used to define the required reductions for final compliance, interim compliance is based on *average* conditions according to the RAA Guidelines (RWQCB, 2014):

> "For interim WQBELs and/or receiving water limitations, the percent reduction based on annual average baseline loading may be used to set targets/goals for

> BMPs/watershed control measures. A gradual phasing of percent load reduction for interim WQBELs/RWLs to final WQBELs/RWLs shall be applied over the course of the implementation schedule." [page 7]

For the USGR RAA, the gradual phasing is achieved by determining the ratio of loading during average to 90th percentile conditions, as shown in **Table 4-6**. Zinc loading during the interim/average condition is between 29% and 53% of the loading that occurs during the final/90th percentile condition. The approach for applying this ratio during scheduling of control measures for EWMP/TMDL milestones is described in **Section 2**.

Table 4-6
Required USGR Pollutant Reductions for Interim and Final Compliance

Condition and Pollutant Addressed	Reduction Metric	RAA Assessment Area					
		San Gabriel River	Coyote Creek	Walnut Creek	San Jose Creek	Puente Creek	Pudding-stone Reservoir
Final Compliance with Metals and Other Water Quality Priorities (except *E. coli*)	Loading during 90th percentile/final condition (pounds) [1]	293	1,335	918	1,500	158	198
	Allowable Loading during 90th percentile/final condition (pounds) [2]	105	441	349	495	38	44
	Required Load Reduction [3]	64%	67%	62%	67%	76%	78%
Interim Compliance with Metals and Other Water Quality Priorities (except *E. coli*)	Loading during average/interim condition (pounds) [4]	124	702	427	434	53	94
	Ratio used to gradually phase from interim to final required reduction	0.42	0.53	0.47	0.29	0.34	0.47
Final Compliance with *E. coli*	Runoff volume to be retained	Runoff from critical bacteria storm is retained prior to discharge to receiving water (excluding open space subwatersheds)					

1 – Loading of zinc at mouth of watershed from storm that generates the 90th percentile zinc Exceedance Volume
2 – Allowable loading of zinc at the mouth of the watershed from the storm that generates the 90th percentile zinc Exceedance Volume based on targets presented in **Table 4-3**
3 – Based on control of zinc during storm that generates the 90th percentile zinc Exceedance Volume
4 – Loading of zinc at mouth of watershed from storm that generates the average zinc Exceedance Volume

4.3 REPRESENTATION OF EWMP CONTROL MEASURES

Once the model is set up to accurately simulate baseline hydrology and water quality conditions, the targets have been calculated, and the required reductions estimated, the next stage of the RAA determines the optimal combination of BMP types to achieve applicable RWLs and WQBELs. This step requires a robust set of assumptions to define the watershed-wide extent and configuration of each of the types of control measures (an overview of control measure categories is provided in Section 3).

The representation of control measures in the model is an important element of the RAA, as it provides the link between future watershed activities, model-predicted water quality improvement, and, ultimately, compliance. Since the BMP modeling parameters will greatly influence the outcome of the RAA, it is imperative that the suite of BMP assumptions are based on the best available data and represent the opportunity and limitations that will be faced by designers, contractors, and maintenance crews in the field as these BMPs are implemented over time, Further, the technical rigor of the analysis must be appropriately balanced with the resolution of the modeling system and the accuracy of the key datasets.

This section will present and review the three primary elements for representing BMPs in the RAA model, as follows:

- ***Opportunity*** – Where can these BMPs be located and how many can be accommodated?
- ***System Configuration*** – How is the runoff routed to and through the BMP and what is the maximum BMP size?
- ***Cost Functions*** – What is the relationship between BMP volume/footprint/design elements and costs?

The following sections provide an overview of methods, summarize key assumptions, and highlight potential data limitations. Cost functions used for BMP optimization are presented in Section 7. **Appendices C-3** through **C-6**, as summarized in the following subsections, contain additional information including details on how each type of control measure (LID, green streets, regional BMPs) was represented in the modeling system (SUSTAIN).

4.3.1 BMP Opportunities

BMPs can only feasibly be implemented at certain locations in the watershed and foremost, BMPs may only be implemented within certain practical bounds throughout the watershed. While physical constraints may limit implementation in some areas (e.g., high slopes, insufficient space), practical or preferential constraints are also an important consideration for each jurisdiction (e.g., parcel ownership, redevelopment rates). To ensure that the spatial and temporal extent of BMP opportunities were accurately accounted for in the model, a BMP opportunity assessment was customized for each individual BMP category and type. The best available data and GIS layers were specifically selected to screen out inappropriate opportunities and/or identify high priority project opportunities (e.g. regional projects on public parcels). A summary of these methods was provided earlier in **Section 3** and detailed methods and screening results are provided in **Appendix C-3**.

In addition to the spatial opportunity screening process which highlighted on potential roadblocks to BMP implementation, the preferences of the Group (presented in Section 3.5) were incorporated into the RAA to allow the EWMP Implementation Plan to be customized to each jurisdiction.

4.3.2 System Configuration

BMP configuration is determined by a combination of [1] physical watershed properties that are generally unchangeable (e.g., location of parcels or streets, soil types, drainage areas, space available for BMPs) and [2] BMP design assumptions which are at the discretion of the responsible agency (e.g., standard BMP profiles, underdrain configurations, soil media mixes). **Table 4-7** provides a brief overview of BMP configuration assumptions and **Appendix D-4** provides details on how variables were defined for each BMP categories/types, including the following:

- **Drainage Area –** Determined by the physical setup of the watershed and the placement of the BMP, drainage area ultimately defines how much water and pollutant load could possibly arrive at the site. A typical (or specific, where possible) drainage area is estimated for each category of BMP in **Appendix C-3** and **C-4**.
- **Infiltration Rate –** Determined by the soil types in the area, infiltration rate defines the rate at which water exits the BMP into the soil. **Appendix C-3** provides details for how infiltration rates were spatially estimated.
- **Routing –** Determined by the drainage network in the local area, the runoff conveyance method is critical to determining how much of the runoff and associated pollutants are accessible to the BMP. Conveyance systems that are underground or well below-grade often require pumping to lift the runoff to a BMP. **Table 4-7** provides details on when pumping is assumed.
- **BMP Design –** Determined by the physical space available at the site and the standard profile assumed, BMP design defines the spatial footprint, depth, and internal hydraulic routing of runoff through the BMP. **Appendix C-4** provides BMP design details for each individual BMP category and type.
- **BMP Efficacy –** Determined by the BMP type selected, BMP efficacy defines the pollutant removal rates for overflow or underdrain effluent from the BMP. **Appendix C-4** provides BMP efficacy details.

Careful analyses were performed to specifically tailor each of the above variables for every individual BMP category and type. This required a thorough understanding of the watershed setting (to determine common available BMP footprints, typical drainage areas, and conditions that warranted pumping), innovative use of existing datasets to estimate spatially varied infiltration rates, familiarity with local codes and standard BMP design practices to set design profiles, and access to a large database of BMP performance metrics to estimate pollutant load removal effectiveness. The results of these analyses has yielded a robust and defensible suite of BMP configuration assumptions that truly and reasonably represent future BMP implementation in the watershed.

Table 4-7
Summary of BMP Design Assumptions for Final Compliance RAA

BMP Category	Type	Key Design Parameters
Institutional	MCMs and/or Enhanced MCMs	None, not modeled explicitly.
Low Impact Development	LID Ordinance (New/Redevelopment)	Bioretention/Biofiltration sized to capture 85th percentile runoff from parcel. Underdrains required if subsoil infiltration rate less than 0.3 in/hr.
	Existing and Planned BMPs	Bioretention/Biofiltration sized to capture 85th percentile runoff from parcel. Underdrains required if subsoil infiltration rate less than 0.3 in/hr.
	Residential LID	Bioretention sized to approximately 4% of parcel area (typical sizing to capture 85th percentile runoff)
	LID on Public Parcels (Retrofits)	Bioretention/Biofiltration sized to capture 85th percentile runoff from parcel. Underdrains required if subsoil infiltration rate less than 0.3 in/hr.
Green Streets	Green Streets	Bioretention/biofiltration is 4-ft wide. Permeable pavement/subsurface storage is 5-ft wide and used in tandem with bioretention/biofiltration. 50% of street length retrofittable. Underdrains required if subsoil infiltration rate less than 0.3 in/hr.
Regional	Tier 1 projects on Public Parcels	BMP footprint delineated and ponding depth specified based on site configuration, topography, depth to groundwater, and infrastructure. Pump specified if greater than 100 ft from major storm drain using optimum diversion rate (0.07 cfs/ac). For Duck Pond, 15 acres of stormwater wetland, with 1-ft temporary ponding depth and 2-5 day drawdown period. Pump specified with optimum diversion rate (0.07 cfs/ac).
	Tier 2 Projects on Public (Group-Owned) Parcels and Tier 3 projects on Public (School) Parcels	Same as Tier 1 except ponding depth was assumed to be 3 ft (rather than based on site-specific configuration). Also, drainage areas and footprints are coarser due to the large number of these projects.
	on Private Parcels	Assumed 3-ft-deep infiltration basin at subwatershed outlets. Pumping assumed with no diversion limitations. Maximum footprint = 5% of contributing area.

4.3.3 Cost Functions

As discussed in the next section, the RAA selects a cost-effective combination of BMPs by weighing long-term implementation costs versus the attained load reduction benefits. Because the assumed BMP unit costs can greatly impact the spatial and temporal compliance strategy, the cost functions must be robust and consider life-cycle costs in addition to construction. Unit cost functions for optimization were therefore specified for each BMP type based on best-available local data and included 20 years of O&M costs. Details on the cost functions are provided in the documentation for the WMMS model (http://dpw.lacounty.gov/wmd/wmms/res.aspx).

4.4 SELECTION OF CONTROL MEASURES FOR POLLUTANT REDUCTION PLAN

The RAA process is an important tool for assisting EWMP agencies with selection of control measures for EWMP implementation (known as the EWMP Implementation Plan). A major challenge associated with stormwater planning is the multitude of potential types and locations of control measures and the varying performance and cost of each scenario. This subsection describes the process for selecting the control measures for the EWMP Implementation Plan by each jurisdiction.

4.4.1 Selection of Control Measures for Final Wet Weather Compliance

The SUSTAIN model within WMMS provides a powerful tool for considering millions of scenarios of control measures and recommending a solution based on cost-effectiveness. The cost functions described in the previous subsection are used to weigh the cost of different BMP scenarios with benefits in terms of pollutant load reduction. As shown in **Figure 4-6**, the RAA process for USGR first determines the control measures to achieve zinc RWLs under critical conditions and then determines the additional capacity (if any) to retain the critical bacteria storm. The optimization modeling is conducted stepwise to determine the control measures for final compliance that are selected for the EWMP Implementation Plan, as follows:

1. **Determine the cost-effective BMP solutions <u>for each subwatershed</u> in the EWMP area:** an example set of "BMP solutions" is shown in **Figure 4-9**, which shows thousands of scenarios considered for an individual subwatershed in the EWMP area. The scenarios are based on the available opportunity (e.g., the available footprints for regional BMPs and length of right-of-way for green streets) and predicted performance for controlling zinc if BMPs were implemented at those opportunities with varying sizes. The most cost-effective BMP solutions for each of the 258 subwatersheds in the EWMP area provide the basis for cost optimization.
2. **Determine the cost-effective scenarios <u>for each jurisdiction</u> in the EWMP Group:** by rolling up the BMP solutions at the subwatershed level, the most cost-effective scenarios for each jurisdiction can be determined for a wide range of required zinc reductions. These "cost optimization curves" provide a potential EWMP Implementation Plan for a range of required reductions. **Figure 4-10** shows example cost optimization curves for the jurisdictions that drain to the mainstem of the San Gabriel River. Each scenario is a "recipe for compliance" for all the subwatersheds in the jurisdictional area (for a given percent reduction). The complete set of cost optimization curves for the USGR EWMP is presented in **Appendix C-7**.
3. **Extract the cost-effective scenarios <u>for the required reduction</u>:** the required zinc reductions specified in **Table 4-4** determine the specific scenario that is selected from the cost optimization curves. All jurisdictions within the assessment areas are held to the same percent reduction. The selected scenarios become the EWMP Implementation Plan. **Figure 4-11** illustrates the process for extracting the control measures to achieve zinc RWLs from the cost optimization curve. The extracted control measures comprise a detailed recipe for compliance with RWLs for metals and other Water Quality Priorities for each subwatershed in the jurisdictional area.
4. **Route the critical bacteria storm through the control measures in the extracted scenario:** the effectiveness of the selected control measures for retaining the critical bacteria storm is evaluated. The additional capacity (if any) to retain the critical bacteria storm is determined for each subwatershed.

The resulting EWMP Implementation Plan for final compliance is presented in **Section 5**.

Figure 4-9
Example BMP Solutions for a Selected Subwatershed and Advantage of Cost-Benefit Optimization

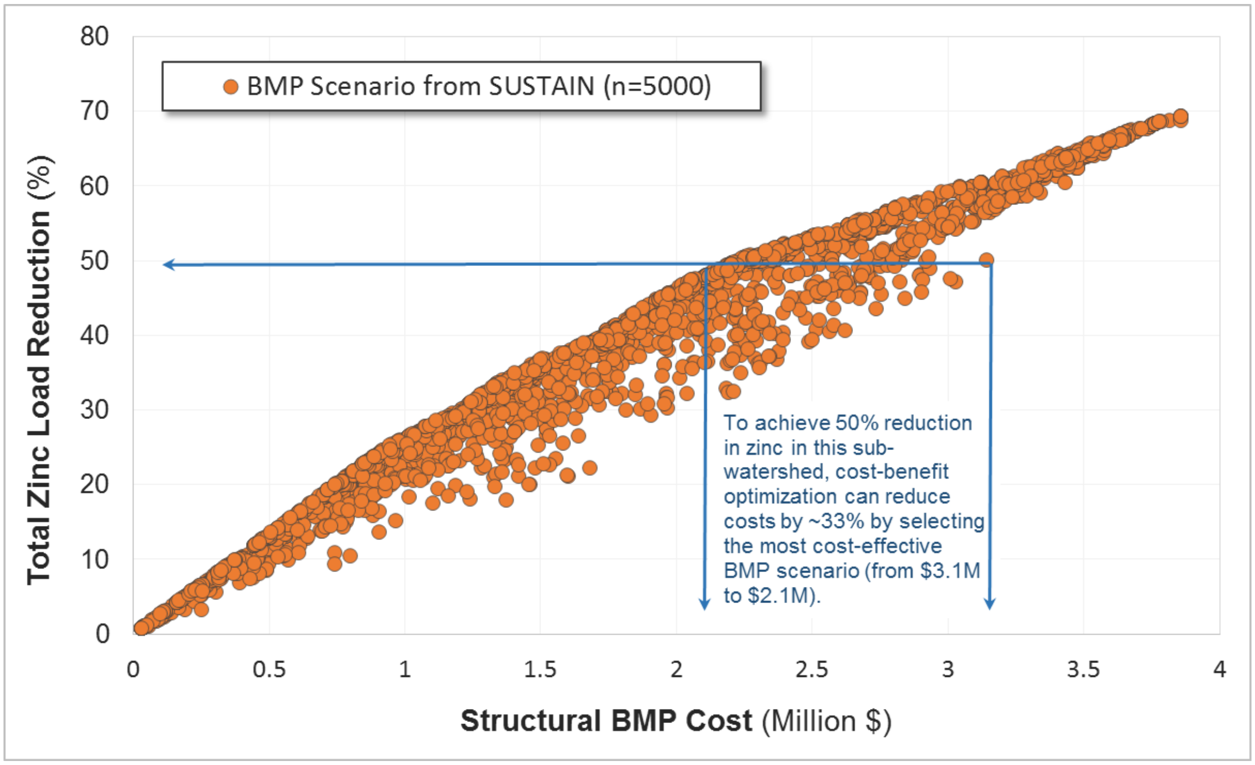


Figure 4-10
Example Cost Optimization Curves for a Watershed: San Gabriel River (mainstem)

This example for San Gabriel River shows the set of optimized BMP solutions for USGR EWMP jurisdictions that drain directly to the mainstem San Gabriel River. Each optimization curve represents over 1 million BMP scenarios that were evaluated for cost-effectiveness. See Appendix C-7 for the complete set of cost optimization curves. All jurisdictions are held to an equitable 64% reduction, but the curves differ among jurisdictions due to differing BMP opportunities.

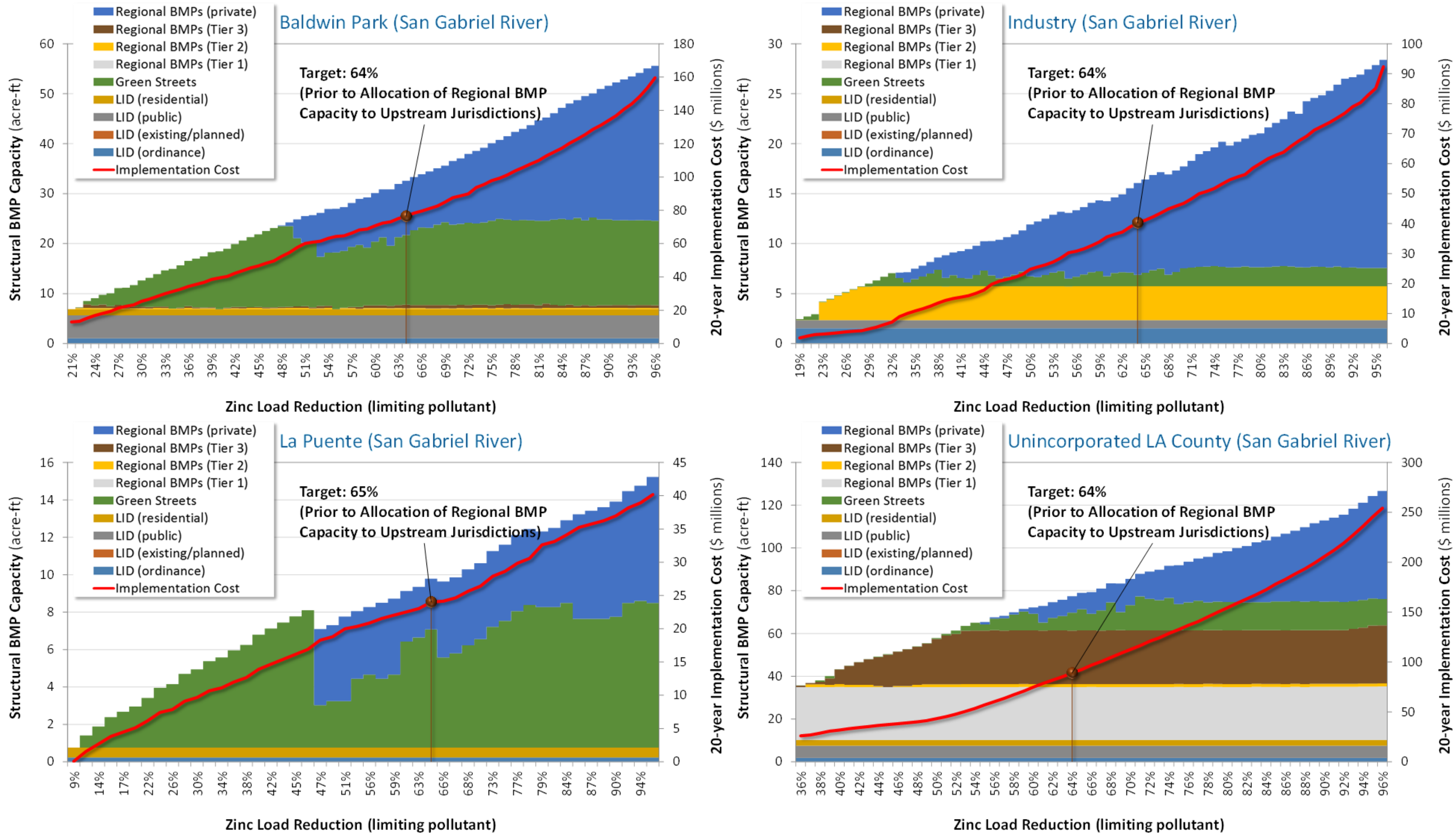
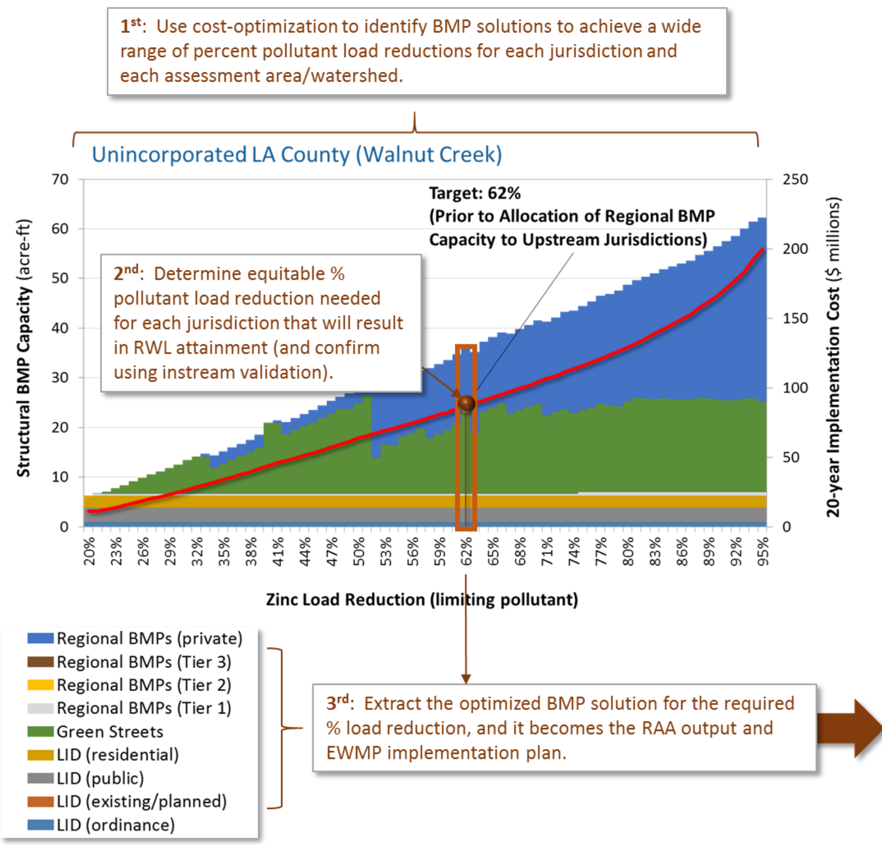


Figure 4-11
Illustration of how the EWMP Implementation Plan is Extracted from a Cost Optimization Curve

This illustration uses the Unincorporated LA County jurisdiction in Walnut Creek watershed as an example. Three steps are shown for RAA development: cost-optimized BMP solutions are developed for a wide range of % load reductions (1st, uppermost text box), followed by determination of the equitable % load reduction needed to attain RWLs for the corresponding receiving water (2nd, middle text box), and then the corresponding BMP solution is extracted to complete the RAA and determine the EWMP Implementation Plan for the jurisdictional area (3rd, bottom text box). The EWMP Implementation Plan for all jurisdictions and assessment areas is presented in Section 5. Note that while all jurisdictions in an assessment area/watershed are held to an equivalent % reduction, subwatersheds *within* a jurisdiction may have variable reductions based on optimization (which is why some subwatersheds have high % reductions [red shaded rows in table] and others have low % reductions).



Subwatershed ID	COMPLIANCE TARGET: BMP GOAL		EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)														
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026													For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs								
	24-hour Volume Managed (acre-ft)	Additional 24-hour Volume to be Managed (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)			Regional BMPs (private)	Total BMP Capacity (acre-ft)
536083	0.14	0.68	13%	0.09	---	---	0.00	0.00	0.00	0.00	0.00	0.00	**0.1**			0.68	**0.8**
536283	6.84	0.24	68%	0.08	---	0.43	0.36	4.96	0.34	0.00	0.00	0.00	**6.2**			0.24	**6.4**
536383	0.03	0.16	13%	0.02	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.16	**0.2**
536483	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
536683	0.01	0.05	14%	0.01	---	---	0.00	0.00	0.44	0.00	0.00	0.00	**0.4**			0.05	**0.5**
536783	0.02	0.01	35%	0.00	---	---	0.00	0.02	0.01	0.00	0.00	0.00	**0.0**			0.01	**0.0**
537183	0.03	0.09	13%	0.01	---	---	0.02	0.00	0.00	0.00	0.00	0.00	**0.0**			0.09	**0.1**
537683	0.07	0.19	14%	0.01	---	---	0.06	0.00	0.00	0.00	0.00	0.00	**0.1**			0.19	**0.3**
538483	0.00	0.01	10%	0.00	---	---	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**			0.01	**0.0**
538683	0.27	0.03	26%	0.01	---	---	0.05	0.15	0.00	0.00	0.00	0.00	**0.2**			0.03	**0.2**
538783	1.11	0.13	52%	0.02	---	0.00	0.07	0.84	0.01	1.58	0.00	0.00	**2.5**			0.13	**2.7**
538983	3.92	0.38	64%	0.05	---	1.11	0.14	0.00	0.33	0.00	0.00	0.00	**1.6**			0.38	**2.0**
539083	8.43	0.00	91%	0.11	---	---	0.24	3.52	11.27	0.00	0.00	2.51	**17.6**			0.00	**17.6**
539183	0.03	0.07	15%	0.01	---	---	0.03	0.00	0.00	0.00	0.00	0.00	**0.0**			0.07	**0.1**
539283	1.67	0.44	40%	0.06	---	---	0.13	1.27	0.00	0.00	0.00	0.00	**1.5**			0.44	**1.9**
539383	0.24	0.24	26%	0.02	0.00	0.00	0.01	0.30	0.00	0.34	0.00	0.00	**0.7**			0.24	**0.9**
539483	1.96	0.06	65%	0.03	---	0.00	0.13	1.43	0.00	0.00	0.00	0.00	**1.6**			0.06	**1.6**
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮			⋮	⋮
541283	0.00	0.00	11%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
541683	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
542383	19.32	0.00	86%	0.22	0.00	1.30	0.81	4.54	0.00	0.00	0.17	9.12	**16.2**			0.00	**16.2**
542883	0.08	0.06	15%	0.01	---	---	0.05	0.01	0.00	0.00	0.00	0.00	**0.1**			0.06	**0.1**
543283	0.28	0.23	14%	0.05	0.00	---	0.21	0.00	0.00	0.00	0.00	0.00	**0.3**			0.23	**0.5**
543883	0.00	0.00	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
544083	0.00	0.00	17%	0.00	---	---	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
544683	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
544983	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
545083	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
545383	0.03	0.02	15%	0.01	---	---	0.02	0.00	0.00	0.00	0.00	0.00	**0.0**			0.02	**0.1**
545483	0.01	0.01	13%	0.00	---	---	0.01	0.00	0.00	0.00	0.00	0.00	**0.0**			0.01	**0.0**
545883	0.00	0.00	15%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
545983	0.00	0.01	11%	0.00	---	---	0.00	0.00	0.00	0.00	0.00	0.00	**0.0**			0.01	**0.0**
546083	0.00	0.00	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
546183	0.18	0.02	46%	0.00	---	---	0.00	0.12	0.00	0.00	0.00	0.00	**0.1**			0.02	**0.2**
546383	0.19	0.01	56%	0.00	---	---	0.00	0.13	0.00	0.00	0.00	0.00	**0.1**			0.01	**0.1**
546883	0.15	0.06	50%	0.00	---	---	0.01	0.10	0.00	0.00	0.00	0.00	**0.1**			0.06	**0.2**
546983	0.00	0.00	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
547283	0.00	0.00	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
548483	0.00	0.00	10%	0.00	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
548583	0.00	0.01	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.01	**0.0**
548683	0.00	0.01	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.01	**0.0**
548783	0.00	0.02	10%	0.00	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.02	**0.0**
548883	0.00	0.00	10%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
548983	0.00	0.00	10%	0.00	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
570183	0.00	0.00	0%	---	---	---	---	0.00	0.00	0.00	0.00	0.00	**0.0**			0.00	**0.0**
Total	**45.8**	**3.**	**62%**	**0.9**	**0.0**	**2.9**	**2.4**	**17.9**	**12.4**	**1.9**	**0.2**	**11.6**	**50.3**			**3.7**	**54.0**

RED = Subwatersheds with highest required % load reductions
BLUE = Subwatersheds with highest BMP capacities within a BMP category

4.4.2 Selection of Control Measures for Interim Wet Weather Compliance

With the EWMP Implementation Plan for final compliance determined, the remaining step for the wet weather RAA is scheduling of control measures over time to achieve interim milestones. The following wet weather milestones were utilized for development of the USGR EWMP, primarily based on the milestones of the SGR Metals TMDL:

- 2017 - Achieve 10% of the reduction for zinc[17]
- 2020 - Achieve 35% of the reduction for zinc and Puddingstone Reservoir constituents[18]
- 2023 - Achieve 65% of the reduction for zinc and Puddingstone Reservoir constituents[18]
- 2026 - Final compliance with zinc RWLs and Puddingstone Reservoir constituents[18]
- 2036 - Final compliance with bacteria WQBELs

As described in **Section 4.2.5**, the applicable critical condition gradually phases from average conditions for interim milestones to critical conditions (90^{th} percentile) for final compliance. The approach for determining the control measures that correspond to each milestone was as follows:

1. **Simulate the BMP performance of increasing levels of control measure implementation:** multiple increments of "percent completion" of the final EWMP Implementation Plan were simulated to determine the relative performance as control measures are implemented toward final compliance. The result is a curve of Percent of Final Reduction versus Percent of Final Capacity (see **Figure 4-12**).
2. **Incorporate the gradual phasing from average the critical conditions:** the gradual phasing was accomplished by applying the average: final ratios in **Table 4-6** to the BMP sequencing. An illustration of the phasing approach is shown in **Figure 4-12**. The orange "translator" from average to final phases from relying entirely on average conditions at 0% completion and phases to relying entirely on final conditions at 100% completion. The formulation of the orange translator line is based on the quadratic equation, as detailed in **Appendix D-8**.

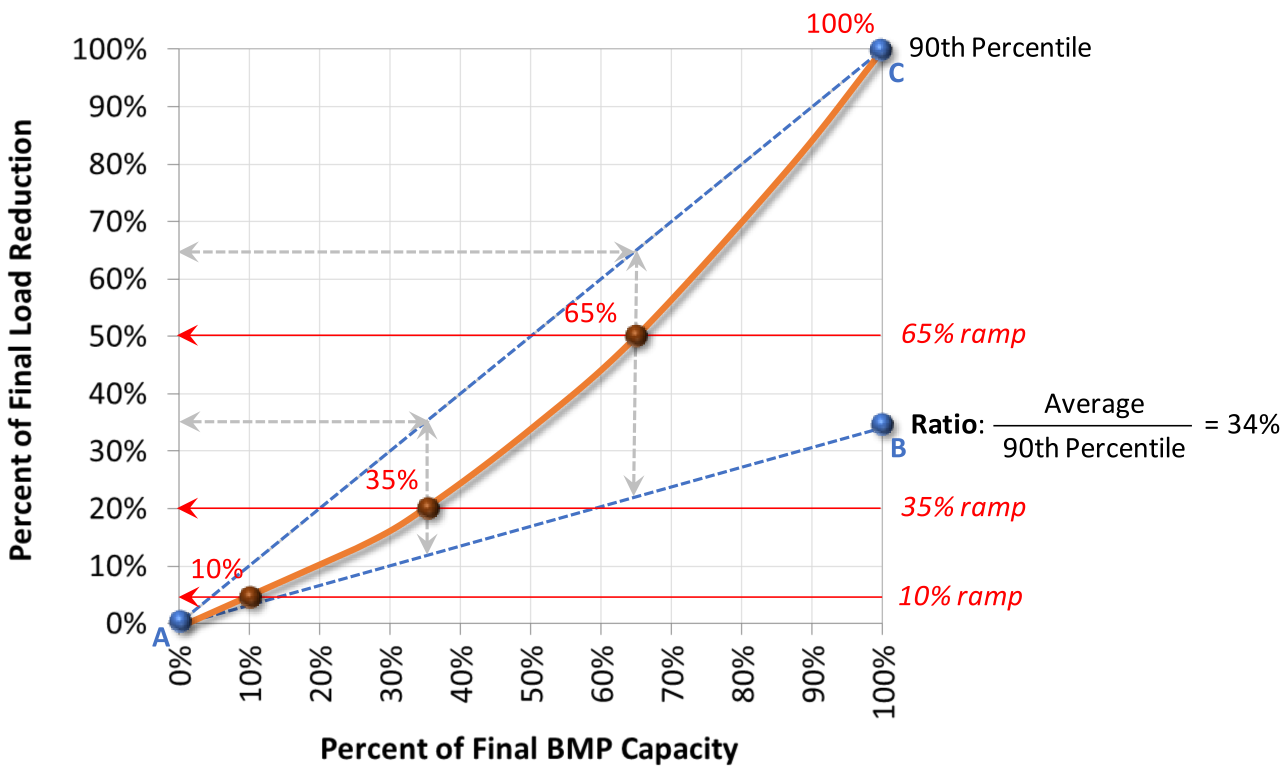
The scenario of control measures that corresponds to each of the EWMP / TMDL milestones was extracted and used for scheduling of the EWMP Implementation Plan, as presented in the next section. Additional information regarding a validation of the simulated BMP performance (pre- and post-implementation) is presented in **Appendix C-9**.

[17] While these milestones are expressed as reduction in zinc, because zinc is a limiting pollutant (see Section 4.2.4), achievement of zinc RWLs by these dates assures even greater reduction in other Water Quality Priority pollutants.

[18] Puddingstone TMDL milestones are only applicable to County and LACFCD.

Figure 4-12
Illustration of Gradually Phasing from Average to Critical Conditions for Interim Milestones

The orange “translator” line phases from average to final by relying entirely on average conditions at 0% final BMP capacity and then phases to relying entirely on final conditions at 100% BMP capacity. In the example, the average to final ratio is 0.34 (see right hand side of figure). The percent BMP completion based on the final compliance target (critical conditions) is represented by the top blue line [segment A→C], while percent BMP completion based on the interim target (average conditions) is represented by bottom blue line [segment A→B]. The orange curve represents the “translator” for phasing of the pollutant reduction target from average to critical conditions to match the approach recommended by the RAA Guidelines (and account for the average to final ratio of 0.34). A reduction of 35% under average conditions represents a 20% reduction under final conditions. A 65% reduction under average conditions represents a 50% reduction under final conditions. The relative difference depends on the average to final ratio, which is watershed-specific (see **Table 4-6**). As the ratio approaches 1.0, average and final conditions become identical.



5 EWMP Implementation Plan

The EWMP Implementation Plan is the "recipe for compliance" of 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. The EWMP Implementation Plan includes individual recipes for each jurisdiction and each watershed/assessment area – San Gabriel River (mainstem), Coyote Creek, San Jose Creek, Puente Creek and Walnut Creek (see **Figure 4-1** for a map of these assessment areas). Implementation of the EWMP Implementation Plan will provide 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:

- Elements of the EWMP Implementation Plan (5.1)
- Stormwater control measures to be implemented by 2036 for final compliance (5.2)
- Scheduling of stormwater control measures to achieve TMDL and EWMP milestones (5.3)
- Non-stormwater control measures (5.4)

5.1 ELEMENTS OF THE EWMP IMPLEMENTATION PLAN

The EWMP Implementation Plan is expressed in terms of [1] the volumes[19] of stormwater and non-stormwater to be managed by each jurisdiction to address Water Quality Priorities and [2] the control measures that will be implemented to achieve those volume reductions. The two primary elements of the EWMP Implementation Plan are as follows:

- **Compliance Targets**: for MS4 compliance determination purposes, the ultimate metric for EWMP implementation is the volume of stormwater managed by implemented control measures. The stormwater volume to be managed[20] is considered a measurable goal that could be used to assess BMP-based compliance. To support future compliance determination and adaptive management, the volume of stormwater is reported along with the capacities of control measures to be implemented by each jurisdiction in the EWMP Implementation Plan.
- **EWMP Implementation Plan**: the network of control measures that has reasonable assurance of achieving the Compliance Targets is referred to as the EWMP Implementation Plan. The

[19] Volume is used rather than pollutant loading because volume reduction is more readily tracked and reported by MS4 agencies. As described in Section 4.2.3, the volume reductions are actually a *water quality* improvement metric based on required pollutant reductions.

[20] The volume is determined by reporting the amount of water that would be retained (infiltrated) by BMPs over the course of a 24-hour period under the critical 90th percentile storm condition. Additional volume would be *treated* by these BMPs, but that additional treatment is *implici*t to the reported Compliance Targets.

[19] While the EWMP Implementation Plan reports the *total* BMP capacity to be implemented, that capacity is not a compliance target because some BMP capacities are sized to reflect a BMP program rather than sized to achieve the required reduction. For example, the BMPs implemented by the LID ordinance and the residential LID program were sized to retain the 85th percentile, 24-hour storm but that volume may be larger than is needed to achieve zinc RWLs. If those BMPs were replaced by a different type of BMP (e.g., regional BMP), the total BMP capacity may be smaller but just as effective.

identified BMPs (and BMP preferences) will likely evolve over the course of adaptive management in response to "lessons learned". As such, it is anticipated the BMP capacities within the various subcategories will be reported to the Regional Board but *not* tracked explicitly by the Regional Board for compliance determination. As BMPs are substituted over the course of EWMP implementation (e.g., replace green street capacity in a subwatershed with additional regional BMP capacity), the Group will show equivalency for achieving the corresponding Compliance Target.

5.2 STORMWATER CONTROL MEASURES TO BE IMPLEMENTED BY 2036 FOR FINAL COMPLIANCE

The EWMP will guide stormwater management for the coming decades, and the control measures to be implemented have the potential to transform communities including widespread green infrastructure. The EWMP Implementation Plan identifies the location and type of control measures to be implemented by each jurisdiction for final compliance by 2036, which includes to addressing all Water Quality Priorities including the limiting pollutants zinc and *E. coli* (as described in Section 4.2.4). The EWMP Implementation Plan for final compliance is presented as the following components:

- **Summary of total capacity of control measures to be implemented by each jurisdiction <u>across the entire EWMP area</u>:** bar graphs are used to summarize the control measure capacities that comprise the EWMP Implementation Plan. Shown in **Figure 5-1** are the bar graphs that detail the various sub-categories of control measures to be implemented by each jurisdiction across the entire EWMP area.
- **Summary of total capacity of control measures to be implemented <u>in each assessment area</u>:** the control measures to be implemented within each watershed/assessment are shown in **Figure 5-2**, organized by jurisdiction.
- **Detailed recipe for compliance including volumes of stormwater to be managed and control measure capacities:** the EWMP Implementation Plan is detailed for each subwatershed in the EWMP area (generally 1 to 2 square mile drainages). Shown in **Figure 5-3** is a map of the "density" of control measure capacities to be implemented to address metals and other Water Quality Priorities (through controlling zinc) and **Figure 5-4** shows the additional capacity to address *E. coli*. The maps are shown in detailed tables in **Appendix D-1** which present for each jurisdiction the volumes of stormwater to be managed in each subwatershed (Compliance Targets) and the control measures to achieve those volume reductions (EWMP Implementation Plan). Separate Compliance Targets and EWMP Implementation Plans are provided for Metals and Other Water Quality Priorities and *E. coli*. For reference, the additional control measure capacity to address *E. coli*, beyond those needed for zinc is presented in **Figure 5-5.**

The network of control measures in the EWMP Implementation Plan is extensive and its implementation would represent a sea change in how stormwater will be managed in the USGR. The next subsection describes the timeline/sequencing for implementing the EWMP Implementation Plan. The costs and financial strategy for the EWMP are presented in **Section 7**.

Figure 5-1
USGR EWMP Implementation Plan for Final Compliance by 2036

The two panels show the total structural BMP capacity required for each USGR EWMP jurisdiction to attain RWLs. The top panel groups the BMP types into LID, green streets and regional BMPs, while the bottom panel provides more resolution for the BMP subcategories.

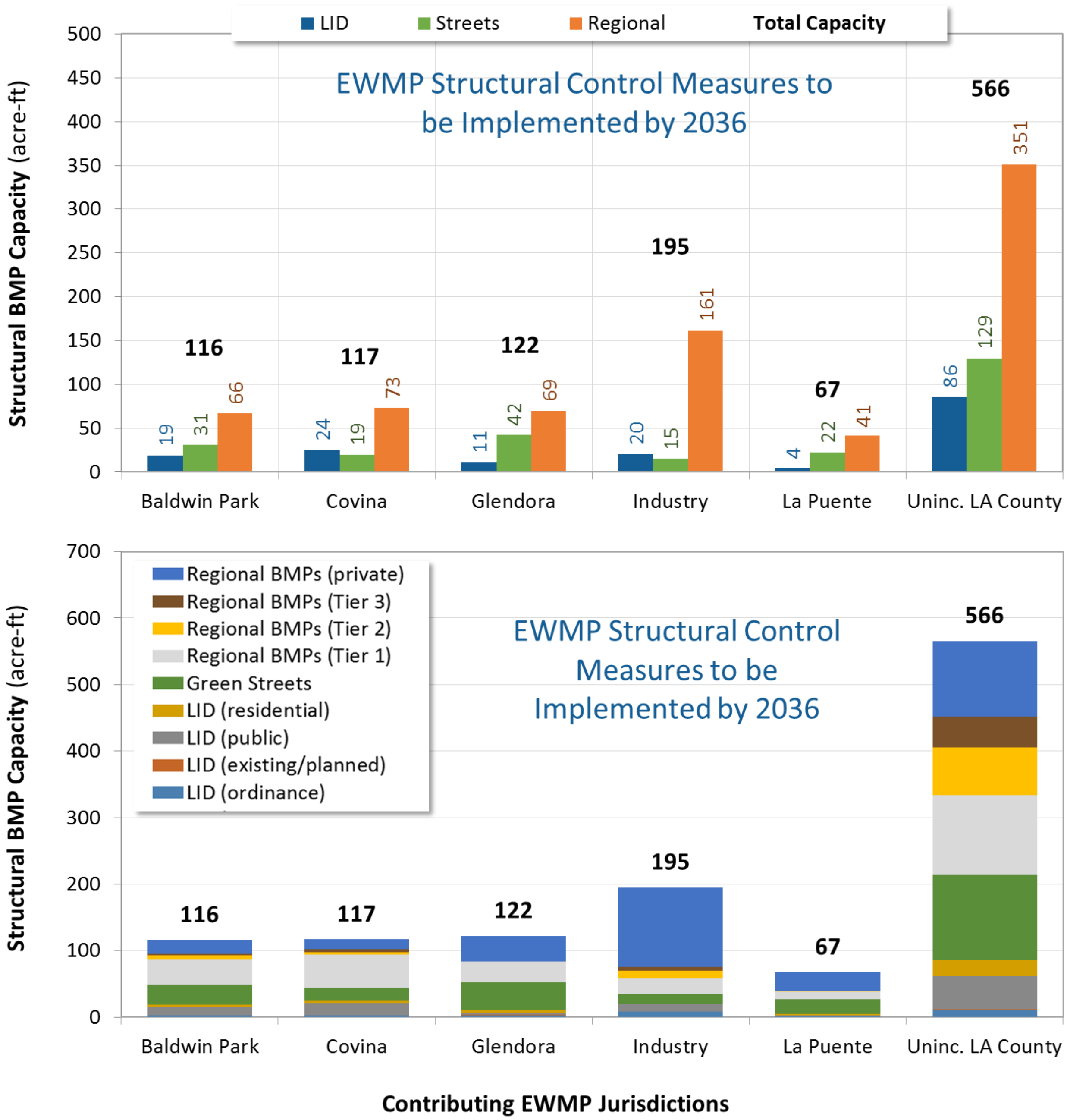


Figure 5-2
EWMP Implementation Plan for each Watershed / Assessment Area in the USGR

This figure shows the same control measure capacities as the previous figure, except organized by watershed / assessment area.

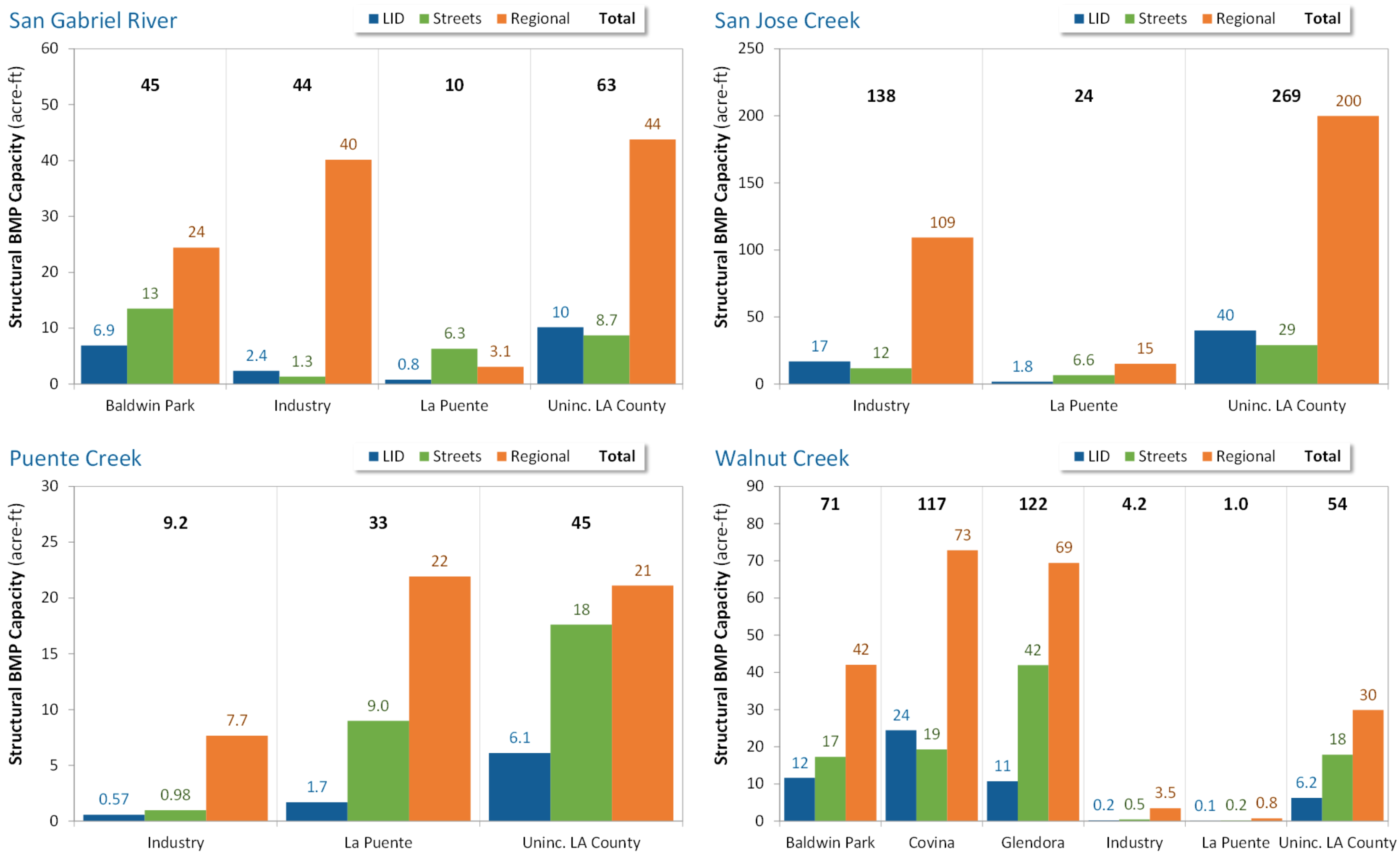


Figure 5-2 (continued)
EWMP Implementation Plan for each Watershed / Assessment Area in the USGR

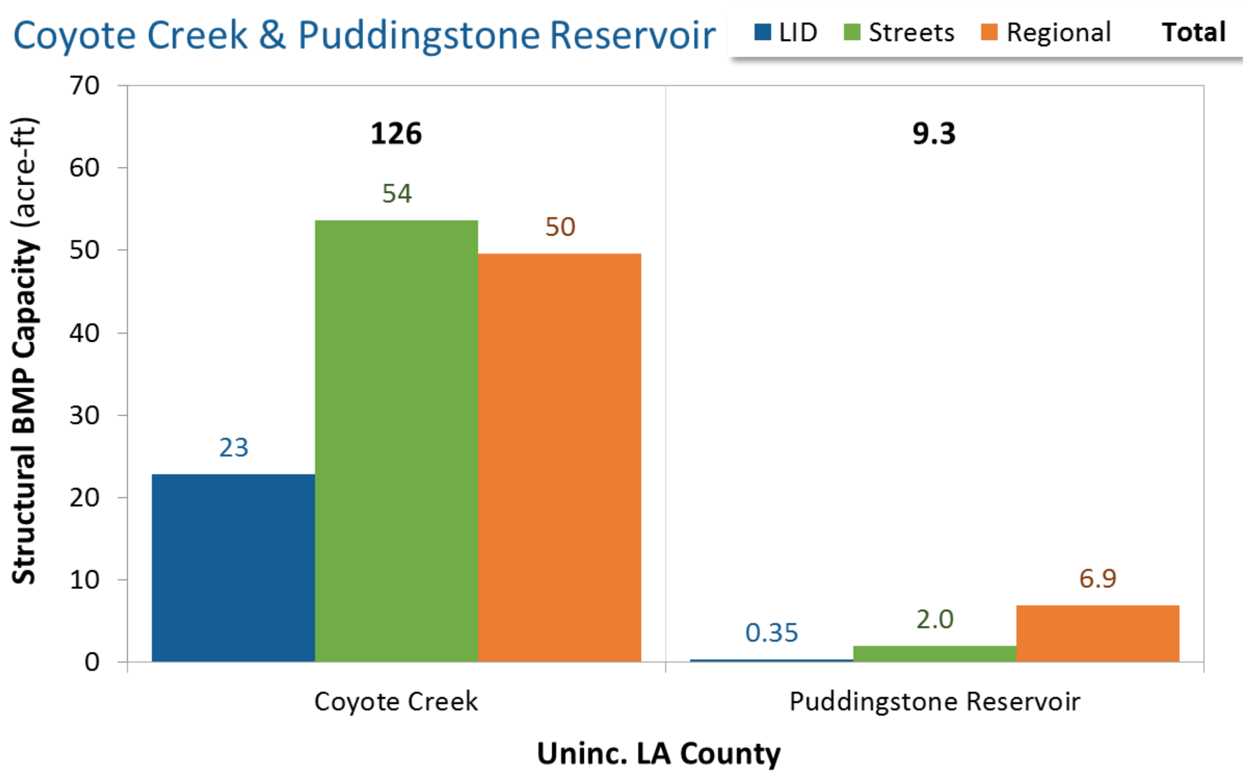


Figure 5-3
EWMP Implementation Plan by Subwatershed for Metals and Other Water Quality Priorities (except *E. coli*)

This map presents the EWMP Implementation Plan for Metals and Other Water Quality Priorities as control measure "density" by subwatershed. The BMP density is higher in some areas [dark blue] because either [1] relatively high load reductions are required or [2] BMPs in those areas were relatively cost-effective (e.g., due to high soil infiltration rates). The BMP capacities are normalized by area (i.e., the BMP capacity for each subwatershed [in units of acre-feet] was divided by the subwatershed area [in units of acres] to express the BMP capacity in units of depth [inches]). The tabular version of this map is presented as a series of tables in in **Appendix D-2**. Note that while all jurisdictions in an assessment area/watershed are held to an equivalent % reduction, subwatersheds *within* a jurisdiction may have variable reductions based on optimization (another reason why some subwatersheds within a jurisdiction are dark blue while others are light blue).

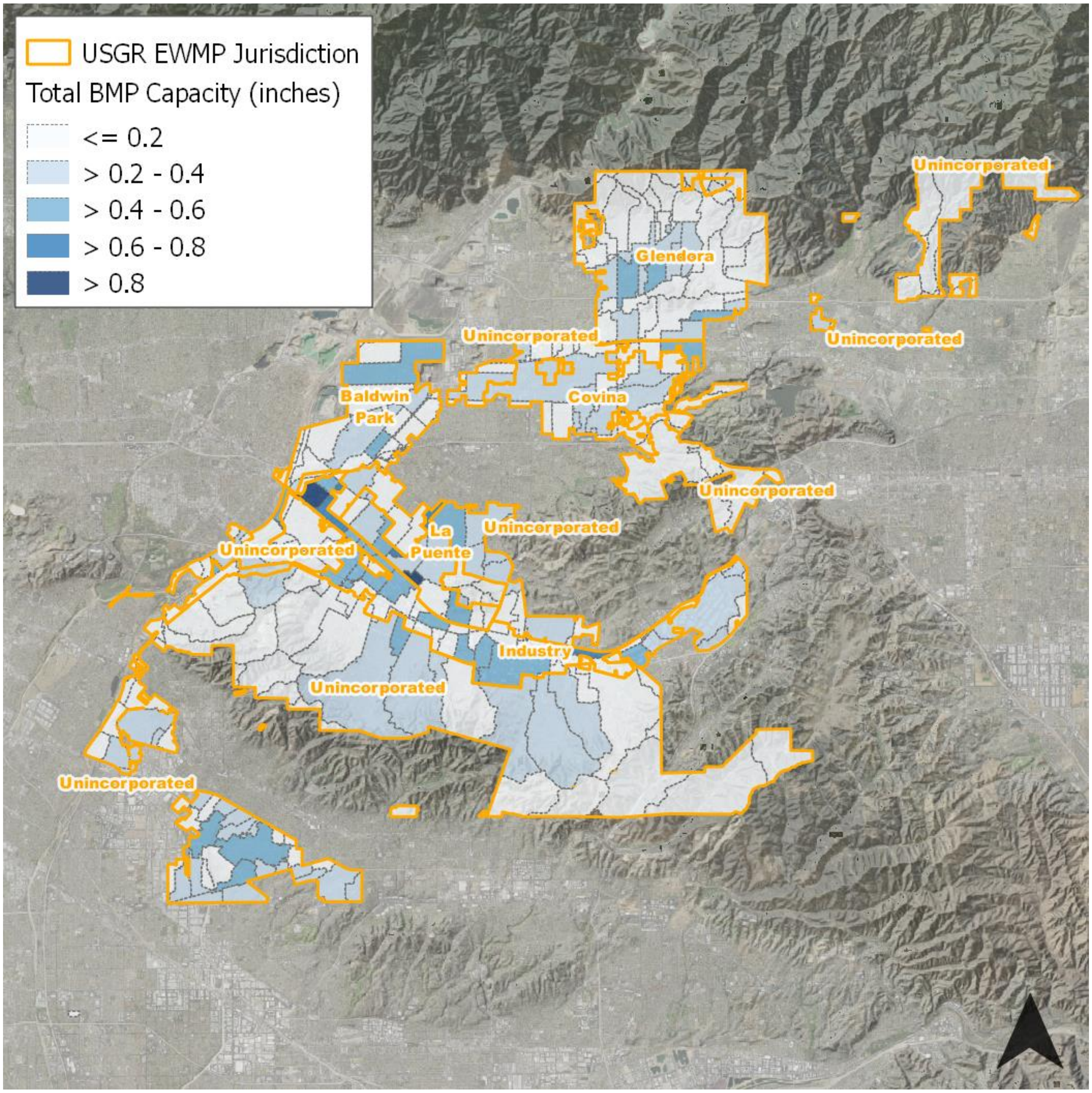


Figure 5-4
Additional Control Measures in EWMP Implementation Plan to Address *E. coli*

This map uses the same approach as **Figure 5-4** to presents the additional capacity in the EWMP Implementation Plan to address *E. coli* (beyond the control measures to be implemented to address Metals and Other Water Quality Priorities). Note the BMP capacities are much less than in **Figure 5-4** because the control measures for Metals and Other Water Quality Priorities retain much of the critical bacteria storm. Some subwatersheds are not shaded because zero additional capacity is required. The tabular version of this map is presented as a series of tables in in **Appendix D-2.**

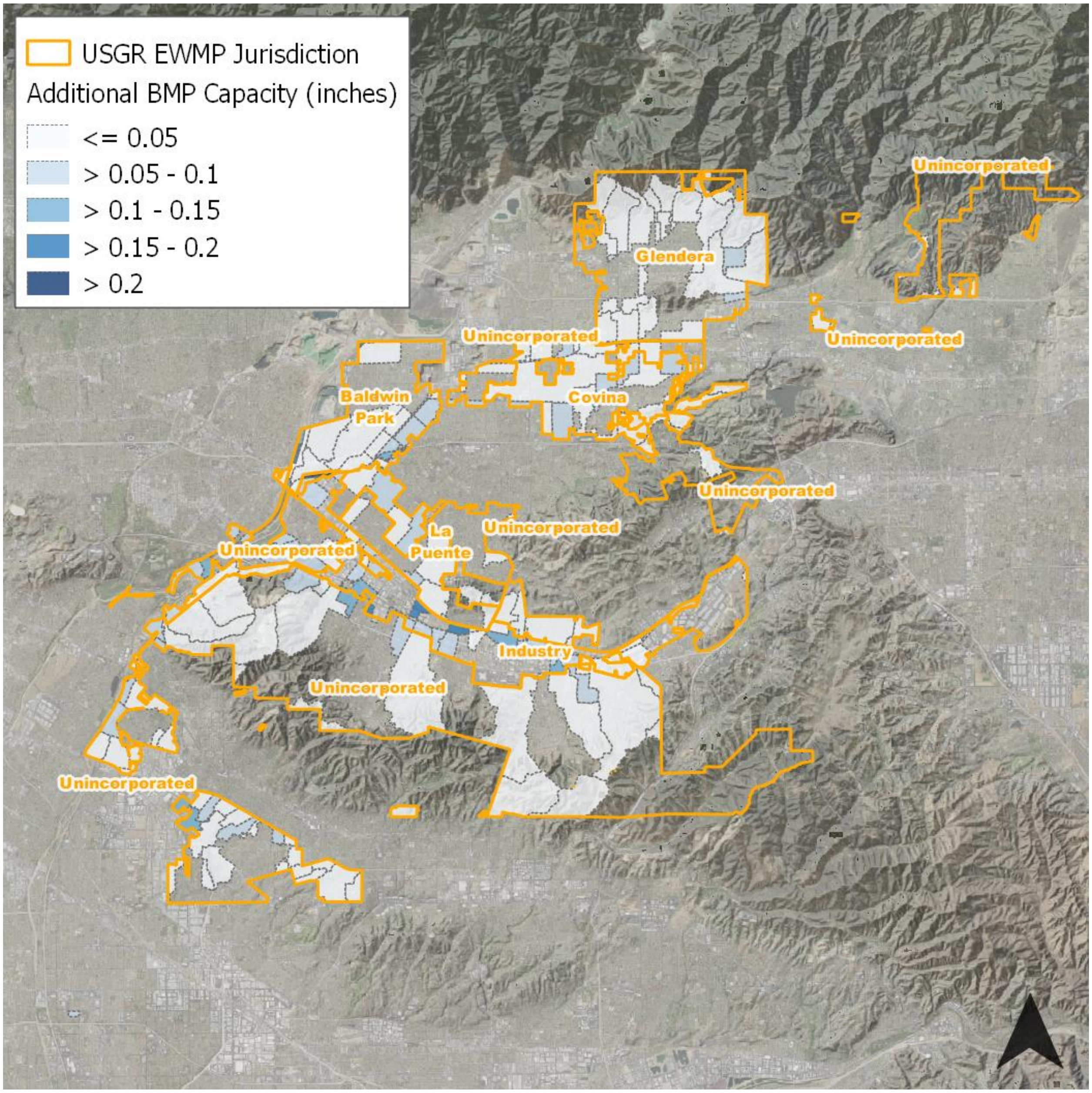
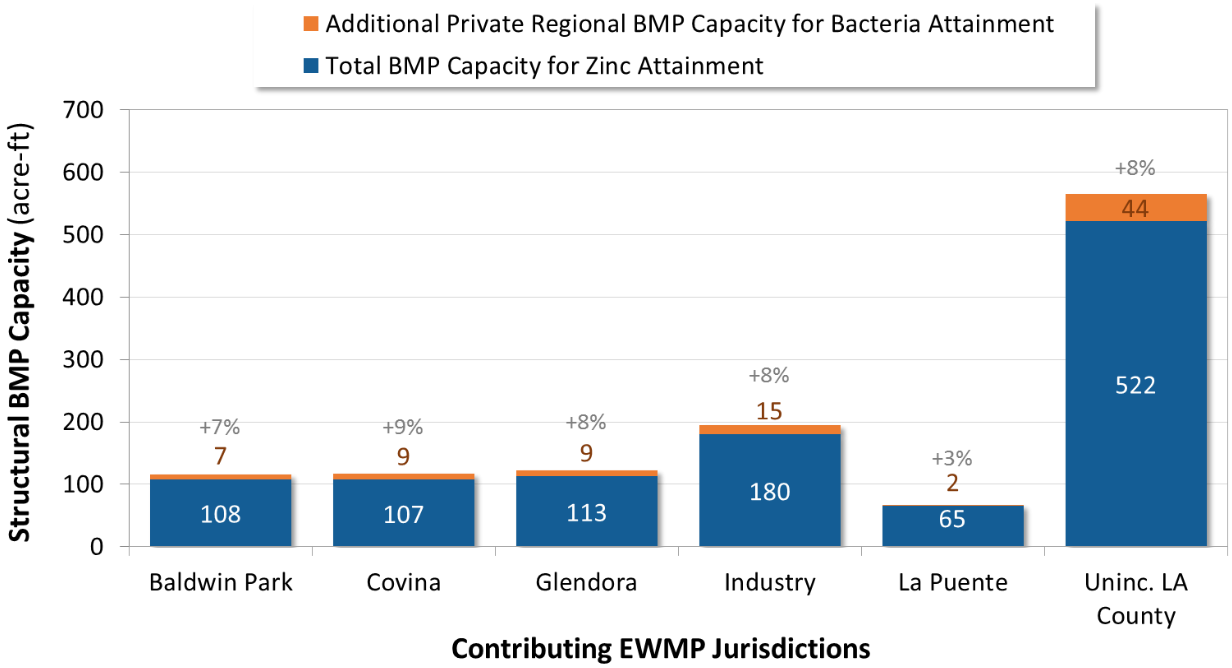


Figure 5-5
Additional Control Measures in EWMP Implementation Plan to Address *E. coli*



5.3 SCHEDULING OF STORMWATER CONTROL MEASURES TO ACHIEVE EWMP AND TMDL MILESTONES

As described in Section 2, scheduling of control measure implementation by the EWMP Implementation Plan is based on the milestones of the SGR Metals TMDL and an additional implementation period to address Puddingstone Reservoir TMDLs by 2032 and SGR-wide *E. coli* impairments by 2036, as follows:

- Achieve 10% of the reduction for zinc[21] (2017)
- Achieve 35% of the reduction for zinc (2020) and Puddingstone Reservoir constituents[22]
- Achieve 65% of the reduction for zinc (2023) and Puddingstone Reservoir constituents[22]
- Final compliance with zinc RWLs (2026) and Puddingstone Reservoir constituents[22]
- Final compliance with bacteria WQBELs (2036)

The scheduling of the EWMP Implementation Plan is presented as the following components:

- **Summary of control measure capacities to be implemented by each jurisdiction by assessment area/watershed:** the LID, green streets and regional BMP capacities that will be implemented over time to achieve milestones are shown in **Figure 5-6**. Separate panels are

[21] While these milestones are expressed as reduction in zinc, because zinc is a limiting pollutant (see Section 4.2.4), achievement of zinc RWLs by these dates assures an even greater reduction in all metals and other Water Quality Priority pollutants (except *E. coli*).

[22] Puddingstone TMDL milestones are only applicable to County and LACFCD.

shown for each assessment area/watershed – San Gabriel River (mainstem), Coyote Creek, San Jose Creek, Puente Creek and Walnut Creek. **Table 5-1** summarizes BMP capacity by type and jurisdiction.

- **Detailed scheduling for each jurisdiction including volumes of stormwater to be managed and control measure capacities:** detailed tables that present the scheduling by assessment area and jurisdiction including volumes of stormwater (Compliance Targets) to be managed are presented in **Appendix D-3**. Each jurisdiction has a standalone recipe for each assessment area/watershed.

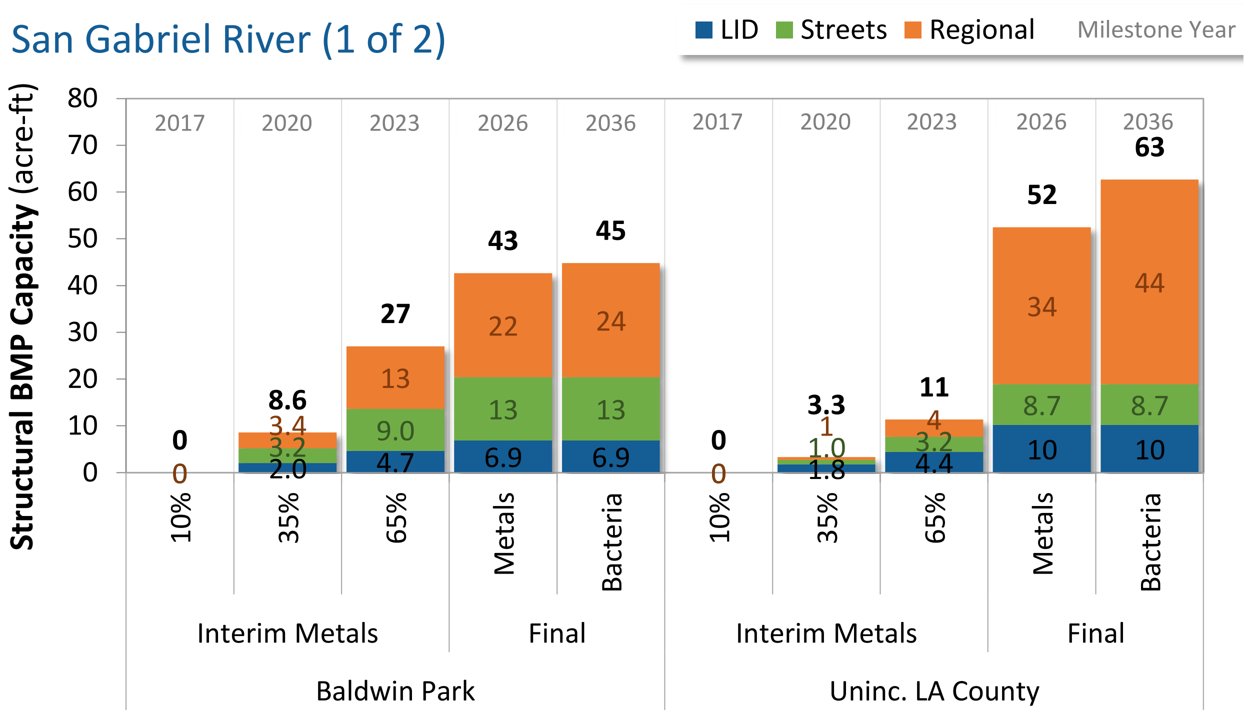
The pace of implementation for the EWMP Implementation Plan is rapid due to the milestones of the SGR Metals TMDL. The pace of implementation is directly proportional to required internal and financial resources, and the additional required resource to implement the EWMP will be significant. The costs and financial strategy for the EWMP are presented in **Section 7**.

Table 5-1
Summary of BMP Capacity by BMP Type and Jurisdiction

Jurisdiction/ Goal		Low-Impact Development				Green Streets	Regional BMPs				Total
		Ordin-ance	Plan-ned LID	Public LID	Resi-dential LID		Tier 1	Tier 2	Tier 3	Private	
Baldwin Park	2017 -10%	0	0	0	0	0	0	0	0	0	**0**
	2020 - 35%	0.71	0	2.2	0.96	5.09	6.1	0	0	0	**15.06**
	2023 - 65%	1.34	0	5.52	1.84	14.41	25.65	0.61	0.3	2.82	**52.49**
	2026 - Final Metals	2.7	0	12.07	3.73	30.77	37.79	5.79	1.75	13.72	**108.32**
	2036 - Final Bacteria	2.7	0	12.07	3.73	30.77	37.79	5.79	1.75	21.17	**115.77**
Covina	2017 -10%	0	0	0	0	0	0	0	0	0	**0**
	2020 - 35%	0.57	0.38	2.41	0.84	2.15	9.34	0	0	0	**15.69**
	2023 - 65%	0.91	0.38	5.17	1.35	6.29	26.25	0.65	0	0	**41**
	2026 - Final Metals	2.45	0.38	17.98	3.64	19.31	50.4	3.36	4.86	4.78	**107.16**
	2036 - Final Bacteria	2.45	0.38	17.98	3.64	19.31	50.4	3.36	4.86	14.24	**116.62**
Glendora	2017 -10%	0	0	0	0	0	0	0	0	0	**0**
	2020 - 35%	0.65	0.99	0.38	1.33	6.5	4.85	0	0	0	**14.7**
	2023 - 65%	1.69	0.99	1.24	3.38	25.61	30.76	0.22	0	0	**63.89**
	2026 - Final Metals	2.57	0.99	2	5.16	41.95	30.76	0.29	0	29.08	**112.8**
	2036 - Final Bacteria	2.57	0.99	2	5.16	41.95	30.76	0.29	0	38.37	**122.09**
Industry	2017 -10%	0	0	0	0	0	0	0	0	0	**0**
	2020 - 35%	2.81	0	2.71	0.01	3.49	8.44	0.51	0	0	**17.97**
	2023 - 65%	6.49	0	7.9	0.01	10.27	23.86	10.53	2.52	32.65	**94.23**
	2026 - Final Metals	8.71	0	11.29	0.03	14.5	23.86	11.05	5.72	105.02	**180.18**
	2036 - Final Bacteria	8.71	0	11.29	0.03	14.5	23.86	11.05	5.72	119.94	**195.1**
La Puente	2017 -10%	0	0	0.01	0	0.02	0	0	0	0	**0.03**
	2020 - 35%	0.34	0	0.27	0.74	5.54	1.21	0.14	0	0	**8.24**
	2023 - 65%	0.78	0	0.72	1.66	15.82	12.3	0.95	0	6.2	**38.43**
	2026 - Final Metals	1.06	0	1.02	2.26	22.03	12.3	0.97	0	25.77	**65.41**
	2036 - Final Bacteria	1.06	0	1.02	2.26	22.03	12.3	0.97	0	27.64	**67.28**
Uninc. LA County	2017 -10%	0	0	0	0	0	0	0	0	0	**0**
	2020 - 35%	2.49	0.45	6.41	5.53	18.4	3.45	0.45	0	0	**37.18**
	2023 - 65%	5.51	0.45	22.59	12.77	71.45	84.49	12.53	0.91	9.25	**219.95**
	2026 - Final Metals	10.88	0.45	49.69	24.6	128.9	119.7	71.82	45.27	70.67	**521.98**
	2036 - Final Bacteria	10.88	0.45	49.69	24.6	128.9	119.7	71.82	45.27	114.42	**565.73**

Figure 5-6
Scheduling of EWMP Implementation Plan to Achieve EWMP / TMDL Milestones

This panel presents the LID, green streets and regional BMP capacities to be implemented by each jurisdiction in San Gabriel River (mainstem). The bold number is the total capacity.



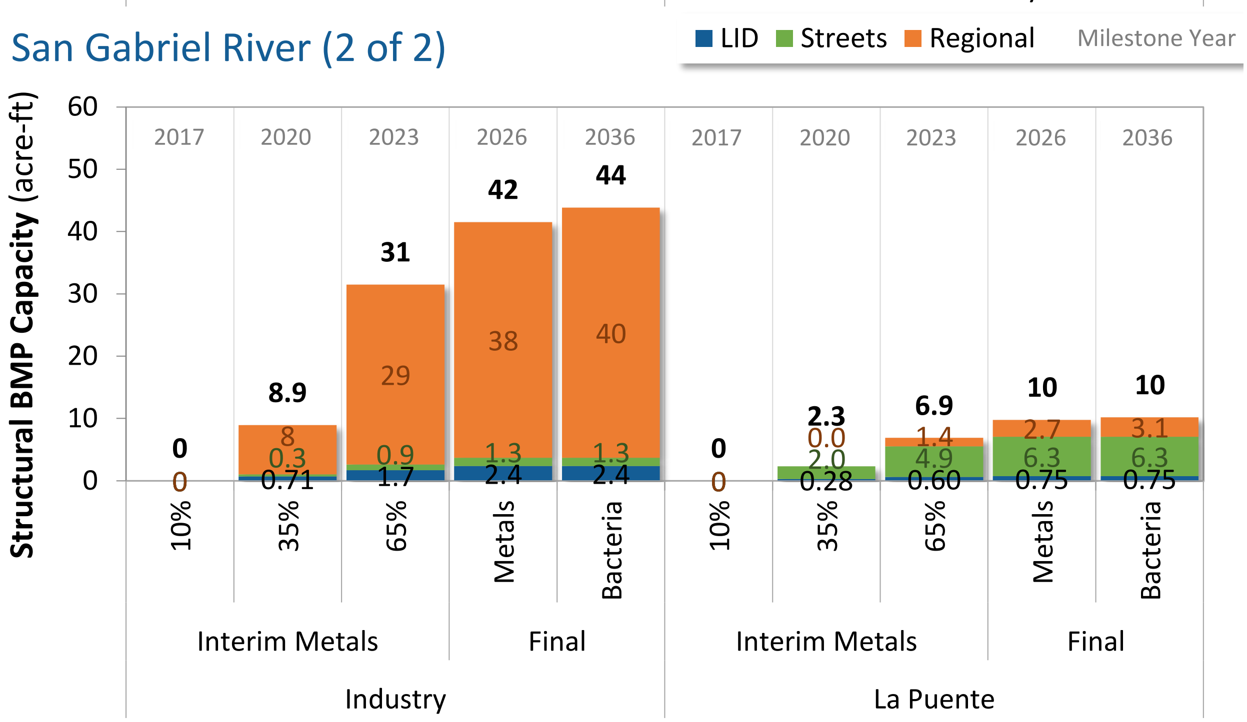


Figure 5-6 (continued)
Scheduling of EWMP Implementation Plan to Achieve EWMP / TMDL Milestones

This panel presents the LID, green streets and regional BMP capacities to be implemented by each jurisdiction in Walnut Creek. The bold number is the total capacity.

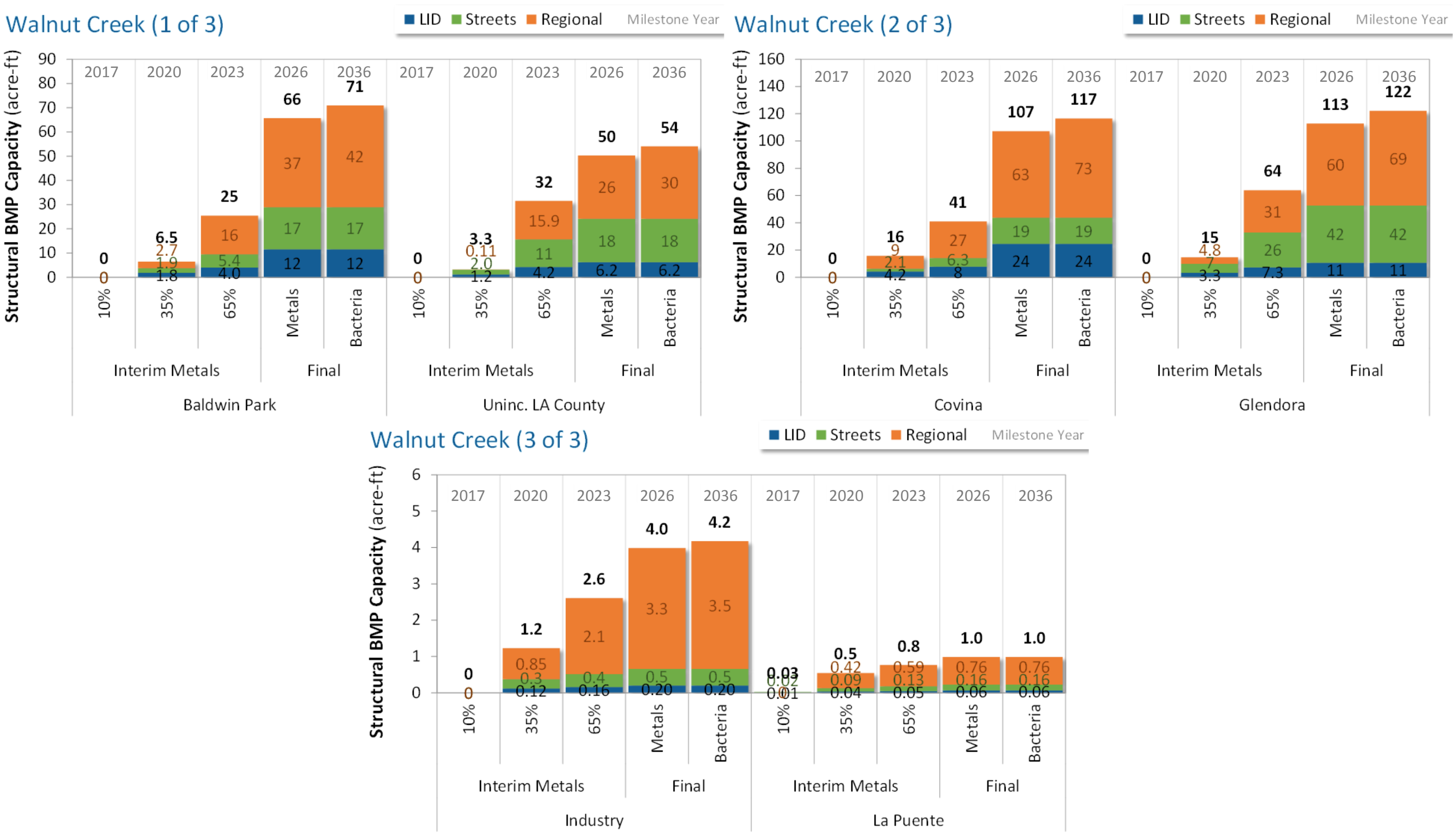


Figure 5-6 (continued)
Scheduling of EWMP Implementation Plan to Achieve EWMP / TMDL Milestones

This panel presents the LID, green streets and regional BMP capacities to be implemented by each jurisdiction in San Jose Creek (top) and Puente Creek (bottom). The bold number is the total capacity.

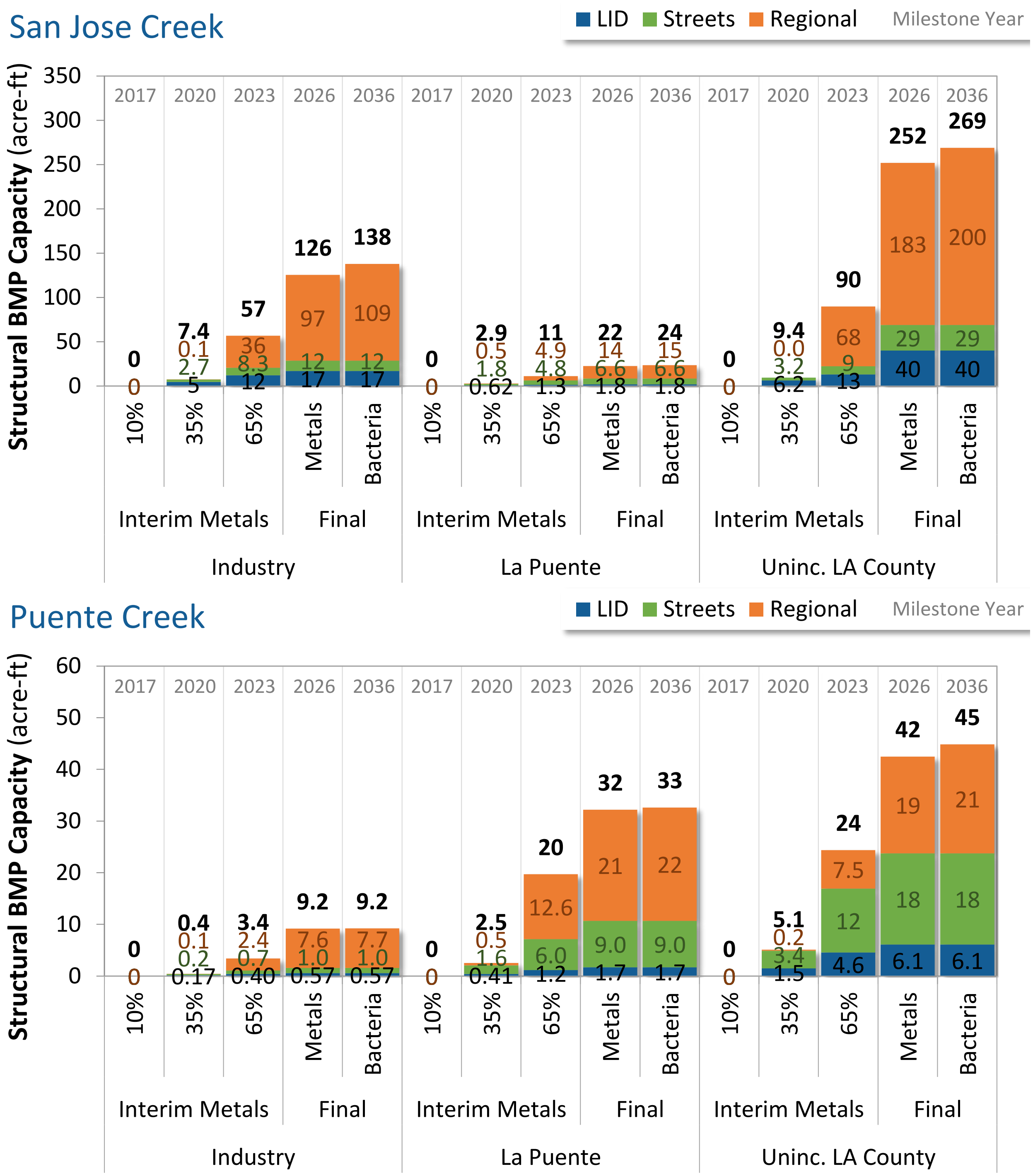
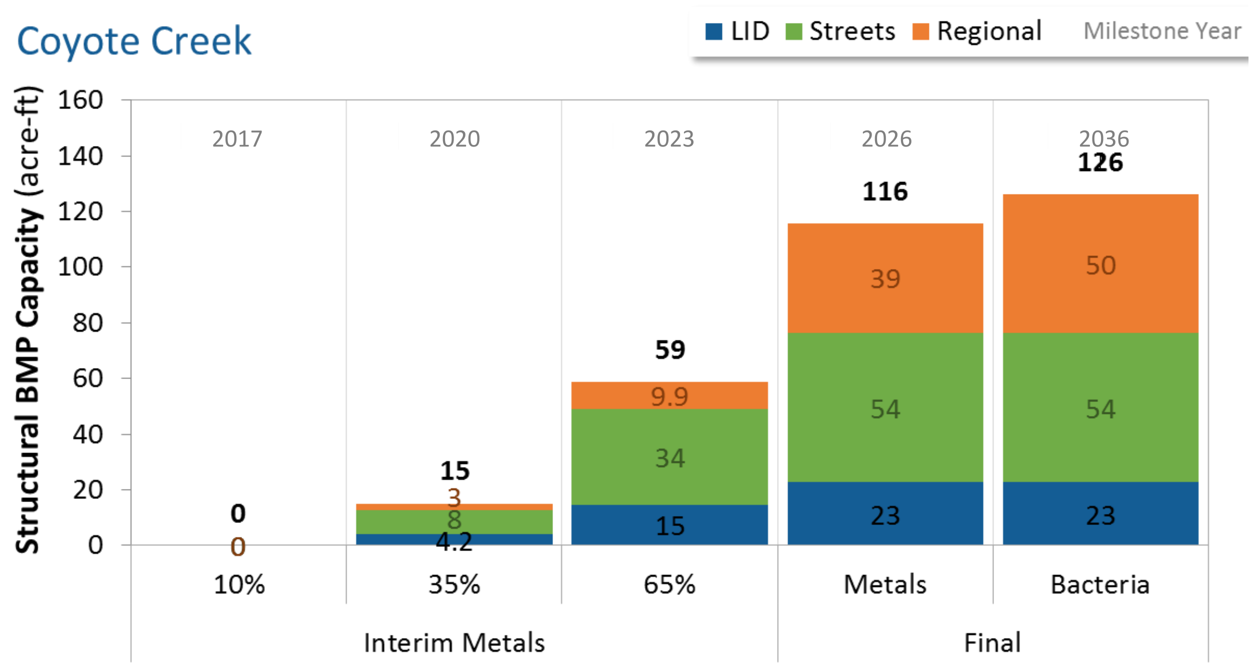
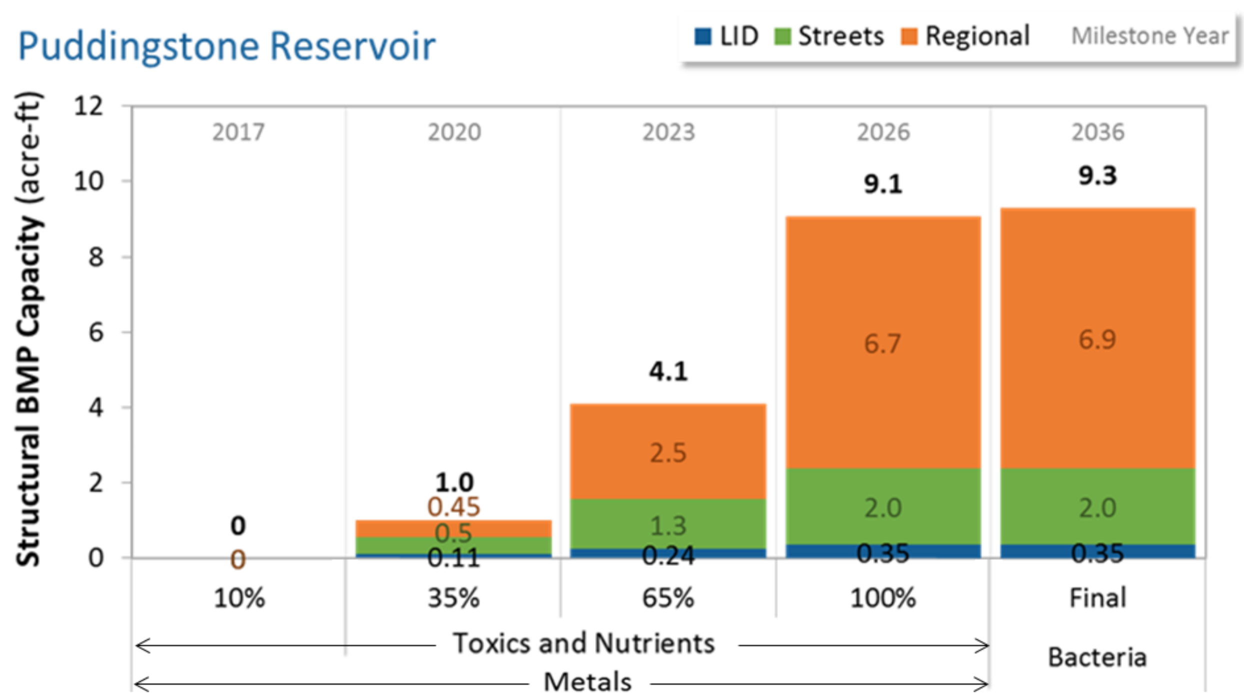


Figure 5-6 (continued)
Scheduling of EWMP Implementation Plan to Achieve EWMP / TMDL Milestones

This panel presents the LID, green streets and regional BMP capacities to be implemented by Unincorporated LA County in Coyote Creek (top) and Puddingstone Reservoir (bottom). The bold number is the total capacity.





5.4 NON-STORMWATER CONTROL MEASURES

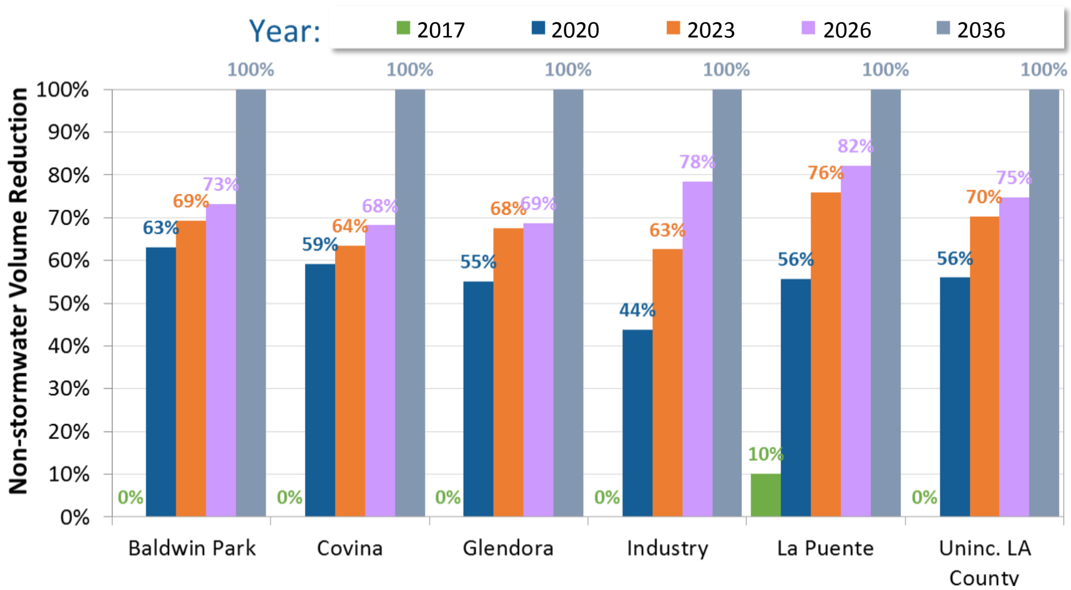
The MS4 permit effectively prohibits non-stormwater discharges and the SGR Metals TMDL includes milestones for attainment of dry weather RWLs. The EWMP Implementation Plan has assurance of eliminating non-stormwater discharges through implementation of the network of wet weather control measures. As shown in **Figure 5-7**, the EWMP Implementation Plan achieves 100% elimination of non-stormwater flows by 2036. The dry weather milestones of the SGR Metals TMDL have assurance of being addressed for the following reasons:

1. During dry weather, exceedances of metals RWLs are rare, as described in Section 4.2.4. As such, existing MCMs and control measures have reasonable assurance of attaining metals RWLs (see **Table 4-5**).
2. By 2020, which is the 70% reduction milestone of the Metals TMDL, between 44% and 66% of non-stormwater flows will be completely eliminated.
3. By 2023, which the final compliance date for the Metals TMDL, approximately 70% of non-stormwater flows will be eliminated in USGR, which is sufficient for TMDL attainment.
4. By 2026, the final dry weather compliance date in the draft SGR Bacteria TMDL, between 62% and 82% of non-stormwater flows will be eliminated in USGR, which is sufficient for TMDL attainment.
5. The non-stormwater screening, investigation and abatement programs being conducted under the CIMP for the Group will increase the rate of eliminating non-stormwater flows beyond the reductions provided by the control measures of the EWMP Implementation Plan. In other words, the non-stormwater abatement programs provide a "margin of safety" for the assurance demonstrated in **Figure 5-7**.
6. An additional margin of safety is provided by the assumed outdoor water use in the dry weather RAA (**Appendix D-2**). The non-stormwater volumes in the non-stormwater analysis were based on existing median outdoor water use rates. Most water supply agencies have initiatives to significantly reduce outdoor water use in the coming years and thus the rate of elimination of non-stormwater flows should be more rapid than shown in **Figure 5-7**.

Overall, the EWMP Implementation Plan and related non-stormwater reduction programs are expected to effectively eliminate non-stormwater flows in USGR consistent with Parts II I.A, VI.D.4.d, and VI.D.10 of the LA County MS4 Permit to prevent or eliminate non-stormwater discharges to the MS4 that are a source of pollutants from the MS4 to receiving waters.

Figure 5-7
Schedule for Eliminating Non-Stormwater Discharges in USGR

The figure shows the effect of the EWMP Implementation Plan on non-stormwater discharges in USGR. The top panel shows the schedule for volume reductions in non-stormwater discharges, while the bottom panel shows the non-stormwater volumes remaining. Over time, the wet weather control measures will eliminate non-stormwater discharges. The reductions to be achieved by the dry weather compliance dates from the SGR Metals TMDL are sufficient to achieve the milestones.



6 Assessment and Adaptive Management Framework

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.

6.1 ADAPTIVE MANAGEMENT PROCESS

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 address changing conditions. The adaptive management process includes a re-evaluation of water quality priorities, an updated source assessment, an effectiveness assessment of watershed control measures, and a RAA. The CIMP will gather additional data on receiving water conditions and stormwater/non-stormwater quality to inform these analyses. This process will be repeated every two years as part of the adaptive management process.

6.1.1 Re-characterization of Water Quality Priorities

Water quality within the WMP area will be re-characterized using data collected as a result of the CIMP implementation to include the most recent data available. WBPCs may be updated as a result of changing water quality. These classifications will be important for refocusing 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 constituents will be re-evaluated based on new information from the CIMP implementation efforts. The identification of non-MS4 and MS4 pollutant sources is an essential component of the WMP 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 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 adaptive management process and the overall WMP. Implementation of the CIMP can 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. In addition, the adaptive management process is a required step for the customization of MCMs as detailed in Section 4. Effectiveness assessment 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 WMP implementation. As described in Section 5, the RAA is an iterative process that depends on the continuous refinement and calibration of the watershed models used.

6.1.4.1 RAA Adaptive Management Considerations

While the BMP representation in the model is based upon the latest data, tailored to specific agency preferences, and designed for optimization, the following limitations should be noted:

- **BMP Opportunity Input Data** – Identifying watershed-wide BMP opportunities is based upon GIS layers, such as land ownership, street types, and soil contamination. While these data are useful, more details about the suitability of each site (e.g., GIS layers of parkway widths, BMP barriers) may be necessary to further screen or prioritize opportunities – especially for green streets and regional projects**.**
- **Model Resolution** – Input parameters for the model are set up and summarized at the subwatershed scale. While this is helpful for computational efficiency, this also ensures that the analysis does not outstrip the resolution and accuracy of the data. As a result of this resolution, BMP opportunities are lumped together in hundreds of parcels or streets. This may ignore the fact that some opportunities at the sub-subwatershed scale are superior to others. It is likely that more refined strategic identification of project-scale opportunities could yield significant cost savings for BMP implementation.
- **Design Assumptions** – Routing, drainage areas, and site-scale BMP footprints are generally assumed to be uniform for individual BMP types. Many BMPs are represented as “typical” versions of green infrastructure or regional BMPs throughout the watershed (with the notable exception of Tier 1 regional BMPs). It is likely that the range of BMP implementation will vary greatly to include high- and low-efficiency versions of the typical representation at the site scale.

These limitations provide ample opportunity for adaptive management and are possible focus areas for constructive feedback and data collection that might further improve the efficiency of BMP implementation and reduce the overall costs of the EWMP. Specifically, as the EWMP is implemented over time, it is likely that refined strategies will identify a different suite of opportunities or a divergent

BMP design from that which was assumed for the RAA. It will, therefore, be necessary to track BMP implementation so adjustments can be made when checking progress towards compliance with the EWMP water quality objectives. An example of how this might work is provided below.

Adaptive Management Example

Figure 6-2 defines the current EWMP compliance recipe for subwatershed 516442 (per **Appendix D-1**) with a series of example adaptive management scenarios. The table is split to emphasize that the compliance targets (on the left-hand side) are BMP goals, which may be updated based on monitoring data from the CIMP, and the plan (on the right-hand side) may be adjusted through adaptive management. The objective is for each agency to meet the compliance target of capturing a certain amount of runoff in a 24-hour period (left-hand side) with a suite of BMPs. The right-hand side represents the "optimized" suite of BMPs identified by the model based on the assumptions described in Section 4. However, as discussed above, there remains ample opportunity to improve and/or customize the BMP opportunities and design assumptions in such a way that the overall constructed size (and associated cost) of the suite of BMPs shrinks.

For subwatershed 516442 (the top portion of **Figure 6-2**), note that the plan currently identifies 2.00 ac-ft of storage necessary for green streets. Consider Adaptive Management Scenario 1 – a hypothetical example scenario where a street-scale analysis reveals that an additional 2 ac-ft of high-efficiency green street opportunities exist in the subwatershed, bringing the total green street implementation to 4.00 ac-ft. The Scenario 1 row in **Figure 6-2** demonstrates how this additional green street capacity can offset the need for other BMPs in the subwatershed; in this case, Tier 2 regional capacity. It is important to realize, however, that an even exchange of BMP volumes between programs is not appropriate (e.g. green street capacity increases by 2 ac-ft, but Tier 2 regional capacity is reduced by nearly 4 ac-ft). This discontinuity exists because (1) green streets perform differently than regional BMPs, (2) the BMPs treat different land uses, and (3) the BMPs experience different infiltration rates. Adaptive management therefore requires a reasonable assurance "translator" to demonstrate that, together, the new suite opportunities satisfy the compliance goals on the left-hand side of the table (particularly when filtration practices remove pollutants but do not reduce a commensurate amount of runoff volume).

Taking the example a step further, Scenario 2 demonstrates a scenario where residential LID programs progress at twice the pace assumed in the RAA (a hypothetical adoption rate of 2 percent of residential parcels per year versus the planned 1 percent). The additional capacity offsets the required regional capacity for metals compliance in lieu of constructing regional BMPs on private parcels. Again in this scenario, the additional residential volume (0.4 ac-ft) translates to an offset of 0.23 ac-ft of regional capacity because residential LID perched high in the watershed is less efficient per unit volume than regional BMPs located near the subwatershed outlet. Despite requiring double the structural capacity, substantial cost savings could be realized from this hypothetical adaptive management scenario because the unit cost of residential LID is less than 5 percent that of private regional BMPs.

In Scenario 3, consider a situation where a private parcel is acquired at the outlet of the subwatershed. Assuming redevelopment and residential LID will progress in the subwatershed regardless of other control measures; a BMP could be installed on the private parcel and optimized to satisfy the remaining compliance target runoff volume, eliminating the need for any other remaining BMPs in the subwatershed. The upstream BMPs are not perfectly efficient, yet the cumulative BMP capacity is less than the 24-hour compliance target due to infiltration in the BMP during storm events. In this scenario the overall construction, operational, and maintenance costs for BMPs would be greatly reduced for this subwatershed.

The above scenarios provide only a handful of examples where adaptive management can significantly improve implementation efficiency and reduce EWMP implementation costs. It is anticipated that, over the course of implementation, agencies will continue to innovate, customize BMP configurations, and strategically locate BMP opportunities that will shrink the overall burden of BMP implementation. This adaptive management must rely on tools that can easily translate between BMP volumes to assure that changes in the implementation plan relate back to the intent of the EWMP.

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. **Figure 6-1** below shows the CIMP monitoring locations.

Figure 6-1
CIMP Monitoring Locations

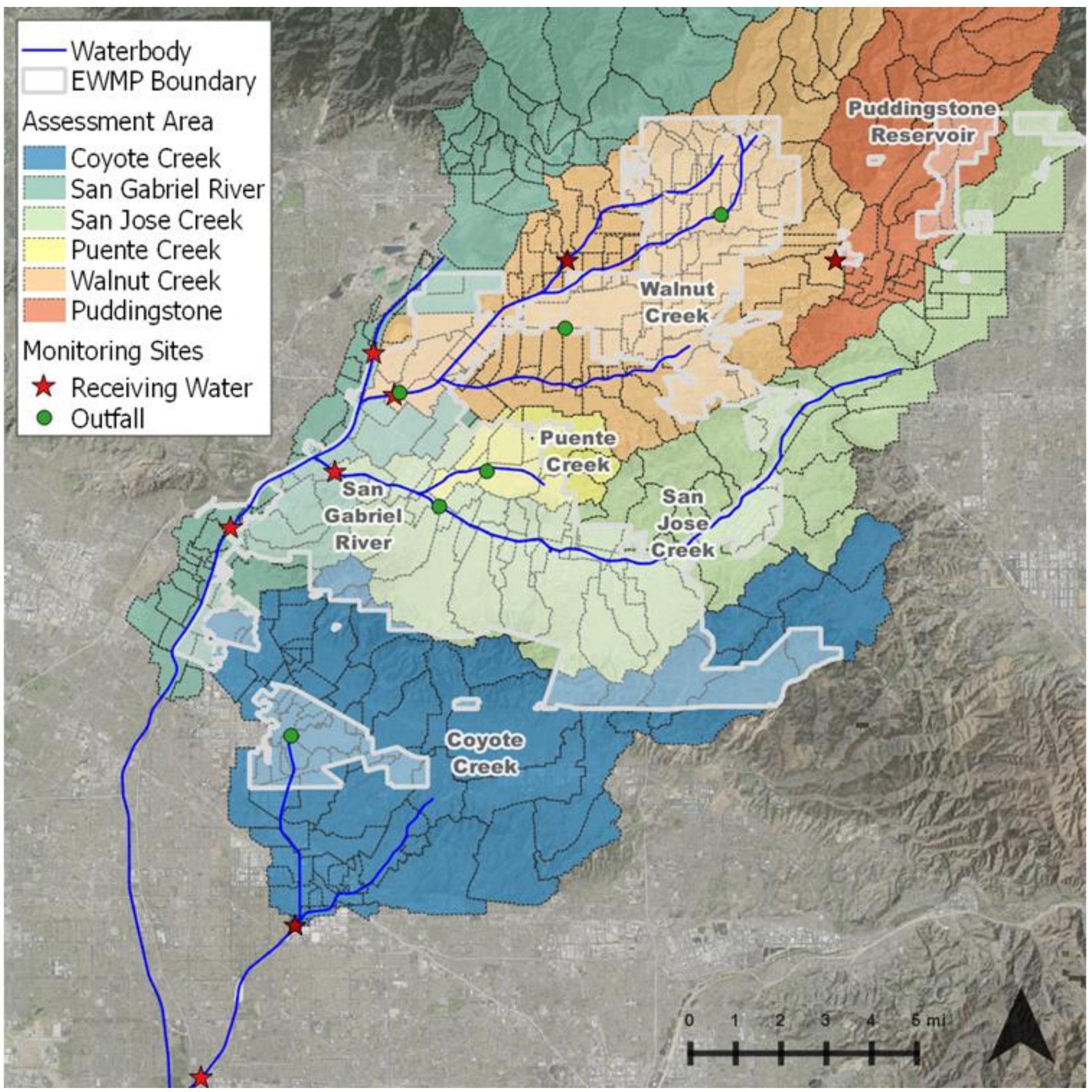


Figure 6-2
Hypothetical Alternative Scenarios for Subwatershed 516442 to Attain the Compliance Targets

(Update per CIMP) — COMPLIANCE TARGETS: BMP GOAL

(Flexible) — EWMP IMPLEMENTATION PLAN: APPROACH TO ACHIEVE COMPLIANCE TARGETS, SUBJECT TO ADAPTIVE MANAGEMENT (BMP capacity expressed in units of acre-feet)

	COMPLIANCE TARGETS: BMP GOAL		EWMP IMPLEMENTATION PLAN												
	For Metals by 2026	For Bacteria by 2036	For Metals Attainment by 2026											For Bacteria Attainment by 2036	
				Low-Impact Development				Streets	Regional BMPs						
	24-hour Volume Retained (acre-ft)	Additional 24-hour Volume to be Retained (acre-ft)	% Load Reduction Critical Condition	Ordinance	Planned LID	Public LID	Residential LID	Green Streets, All Components	Tier 1 (public, owned)	Tier 2 (public, owned)	Tier 2 (public, non-owned)	Private	Total BMP Capacity (acre-ft)	Regional BMPs (private)	Cummul-ative BMP Capacity (acre-ft)
	7.93	0.23	86%	0.15	---	0.31	0.39	2.00	0.00	4.98	0.00	0.00	**7.8**	0.23	**8.1**
Scenario 1:			86%	0.15	---	0.31	0.39	4.00	0.00	1.00	0.00	0.00	**5.85**	0.23	**6.08**
Scenario 2:			86%	0.15	---	0.31	0.90	2.00	0.00	4.98	0.00	0.00	**8.3**	---	**8.3**
Scenario 3:			86%	0.15	---	---	0.39	---	---	---	---	6.00	**6.5**	---	**6.5**

Adaptive Management: Burden Transferred from Regional Projects to Newly Identified High-Efficiency Green Street Opportunities (Scenario 1)

Adaptive Management: Additional Capacity for Bacteria Treatment is Provided by Residential LID (Scenario 2)

Adaptive Management: Regional BMP Located at Subwatershed Outlet Manages Remaining Runoff to Achieve Compliance Target (Scenario 3)

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 to implement the extensive set of BMPs or "recipe for compliance", identified in Section 6. This section identifies the estimated cost of the activities and funding sources that will be pursued by Group Members to fund the EWMP implementation.

7.1 BASIS OF EWMP COST ESTIMATES

The costs for structural BMPs provided here are considered to be planning level and can be refined as EWMP implementations progresses with the use of actual BMP implementation costs. The following assumptions were made when developing the costs for EWMP implementation:

- BMP capacity is assumed to be constructed at an even rate between BMP milestones.
- BMP geometry based on typical values for each type, as discussed in Section 3.
- Costs provided are in 2015 dollars.
- Costs for enhanced minimum control measures and other institutional BMPs have not been included.
- Routine maintenance was assumed to occur annually, while intermittent maintenance activities were assumed to occur every four years.
- Replacement costs were not considered under the assumption that systems will be properly maintained and functional throughout and beyond the implementation schedule.

The costs are based on generic, modular cost functions developed for various BMP types specific to Los Angeles County. For structural BMP projects, costs include planning, design, permits, construction, operation and maintenance (O&M), and post construction monitoring. To support BMP optimization, cost functions were developed for each type of structural BMP. A summary of the BMP cost functions, expressed as a function of BMP geometry is presented in **Table 7-1**.

Table 7-1
Summary of BMP Cost Functions for Final Compliance RAA

BMP Category	BMP types	Functions for Estimating Total Costs [1]	
		Capital Costs	Annual O&M
LID and Green Streets	Bioretention with Underdrain	*Cost = 9.438 (A) + 2.165 (Vt) + 2.64 (Vm) + 3.3 (Vu)*	*Cost = 2.54 (A)*
	Bioretention without Underdrain	*Cost = 9.438 (A) + 2.165 (Vt) + 2.64 (Vm)*	*Cost = 2.54 (A)*
	Residential LID	*Cost = 4.000 (A)*	--
	Permeable Pavement with Underdrain	*Cost = 65.849 (A) + 3.3 (Vu)*	*Cost = 1.74 (A)*
	Permeable Pavement without Underdrain	*Cost = 57.599 (A)*	*Cost = 1.74 (A)*
Regional BMPs	Pump	*Cost = 56,227*(Pump Capacity$_{cfs}$) + $1,207,736*	
	Regional Project on Public Parcel	*Cost = 10.01 (A) + 2.296 (Vt) + 2.8 (Vm)*	*Cost = 1.918 (A)*
	Regional Project on Private Parcel	*Cost = 10.01 (A) + 2.296 (Vt) + 2.8 (Vm) + 139.01 (A)*	*Cost = 1.918 (A)*

1 – Formulas describe annualized life cycle costs including routine and intermittent O&M using the following variables: (A) is the area of the BMP footprint in square feet, (Vt) is the total volume of the BMP in cubic feet, (Vm) is the volume of the BMP soil media in cubic feet, and (Vu) is the volume of the BMP underdrain in cubic feet.

2 – The resolution of WMMS output precludes the certain estimation of pump station quantity and capacity. Note that incidental costs associated with pump station operation will likely be incurred during implementation.

7.2 ESTIMATED EWMP PROGRAM COSTS

The EWMP described in earlier sections of this document identifies a variety of watershed control measures (BMPs) including non-structural methods, regional projects, and distributed projects. The purpose of this section is to present the cost estimates for implementing the EWMP including all of the various BMPs.

The estimated costs are based on the total structural BMP capacity of the USGR EWMP implementation plan of 1,183 acre-feet, which is equivalent to the volume of nearly four Rose Bowl stadiums. **Appendix D-1** provides the summaries of BMP capacities for each jurisdiction by assessment area.

Based the RAA result, the total cost for the EWMP Group for implementation through 2036 including operation and maintenance is approximately $1.92 billion. **Table 7-2** and **Figure 7-1** provide a cost estimate summary, and **Table 7-3** through **Table 7-8** and **Figure 7-2** and **Figure 7-3** provide a breakdown by jurisdiction. The costs provided here are considered to be planning level and can be refined as EWMP implementations progresses with the use of actual BMP implementation costs.

Table 7-2
EMWP Implementation Cost Summary by Jurisdiction

Jurisdiction	Total BMP Capacity (acre-feet)	Total Capital Costs	Total O&M Costs	Total Cost of Implementation
Baldwin Park	116	$103,709,000	$71,079,000	$174,788,000
Covina	117	$66,238,000	$69,973,000	$136,211,000
Glendora	122	$121,193,000	$87,762,000	$208,955,000
Industry	195	$324,932,000	$118,569,000	$443,501,000
La Puente	67	$75,935,000	$47,854,000	$123,789,000
Uninc. LA County	566	$441,764,000	$389,543,000	$831,307,000
Grand Total	**1,183**	**$1,133,771,000**	**$784,780,000**	**$1,918,551,000**

Figure 7-1
EWMP Implementation Cost Breakdown

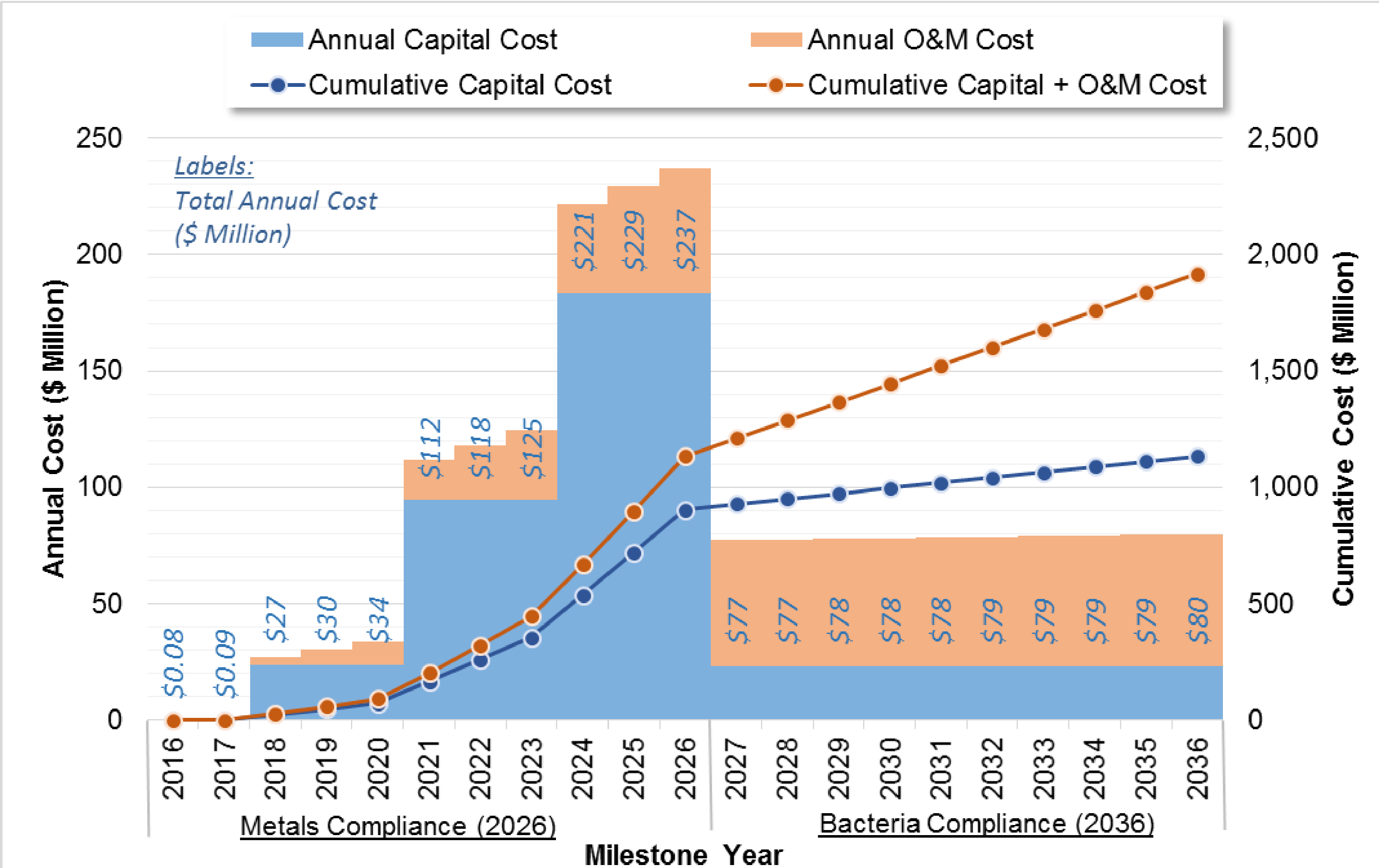


Table 7-3
EWMP Implementation Cost for Baldwin Park

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0	$ -	$ -	$ -
2017	0	$ -	$ -	$ -
2018	5	$ 2,430,000	$ 384,000	$ 2,814,000
2019	10	$ 2,430,000	$ 768,000	$ 3,198,000
2020	15.1	$ 2,430,000	$ 1,152,000	$ 3,582,000
2021	27.5	$ 5,644,000	$ 1,687,000	$ 7,331,000
2022	40	$ 5,644,000	$ 2,221,000	$ 7,865,000
2023	52.5	$ 5,644,000	$ 2,755,000	$ 8,399,000
2024	71.1	$ 18,589,000	$ 3,442,000	$ 22,031,000
2025	89.7	$ 18,589,000	$ 4,128,000	$ 22,717,000
2026	108.3	$ 18,589,000	$ 4,815,000	$ 23,404,000
2027	109.1	$ 2,372,000	$ 4,844,000	$ 7,216,000
2028	109.8	$ 2,372,000	$ 4,872,000	$ 7,244,000
2029	110.6	$ 2,372,000	$ 4,901,000	$ 7,273,000
2030	111.3	$ 2,372,000	$ 4,930,000	$ 7,302,000
2031	112.1	$ 2,372,000	$ 4,958,000	$ 7,330,000
2032	112.8	$ 2,372,000	$ 4,987,000	$ 7,359,000
2033	113.6	$ 2,372,000	$ 5,016,000	$ 7,388,000
2034	114.3	$ 2,372,000	$ 5,044,000	$ 7,416,000
2035	115.1	$ 2,372,000	$ 5,073,000	$ 7,445,000
2036	115.8	$ 2,372,000	$ 5,102,000	$ 7,474,000
			Total	**$ 174,788,000**

Table 7-4
EWMP Implementation Cost for Covina

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0	$ -	$ -	$ -
2017	0	$ -	$ -	$ -
2018	5.2	$ 1,852,000	$ 276,000	$ 2,128,000
2019	10.4	$ 1,852,000	$ 553,000	$ 2,405,000
2020	15.7	$ 1,852,000	$ 829,000	$ 2,681,000
2021	24.1	$ 3,454,000	$ 1,335,000	$ 4,789,000
2022	32.6	$ 3,454,000	$ 1,841,000	$ 5,295,000
2023	41	$ 3,454,000	$ 2,346,000	$ 5,800,000
2024	63.1	$ 9,000,000	$ 3,200,000	$ 12,200,000
2025	85.1	$ 9,000,000	$ 4,054,000	$ 13,054,000
2026	107.2	$ 9,000,000	$ 4,908,000	$ 13,908,000
2027	108.1	$ 2,332,000	$ 4,936,000	$ 7,268,000
2028	109.1	$ 2,332,000	$ 4,964,000	$ 7,296,000
2029	110	$ 2,332,000	$ 4,993,000	$ 7,325,000
2030	111	$ 2,332,000	$ 5,021,000	$ 7,353,000
2031	111.9	$ 2,332,000	$ 5,049,000	$ 7,381,000
2032	112.8	$ 2,332,000	$ 5,077,000	$ 7,409,000
2033	113.8	$ 2,332,000	$ 5,105,000	$ 7,437,000
2034	114.7	$ 2,332,000	$ 5,134,000	$ 7,466,000
2035	115.7	$ 2,332,000	$ 5,162,000	$ 7,494,000
2036	116.6	$ 2,332,000	$ 5,190,000	$ 7,522,000
			Total	**$ 136,211,000**

Table 7-5
EWMP Implementation Cost for Glendora

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0	$ -	$ -	$ -
2017	0	$ -	$ -	$ -
2018	4.9	$ 2,655,000	$ 431,000	$ 3,086,000
2019	9.8	$ 2,655,000	$ 862,000	$ 3,517,000
2020	14.7	$ 2,655,000	$ 1,293,000	$ 3,948,000
2021	31.1	$ 8,922,000	$ 2,070,000	$ 10,992,000
2022	47.5	$ 8,922,000	$ 2,847,000	$ 11,769,000
2023	63.9	$ 8,922,000	$ 3,624,000	$ 12,546,000
2024	80.2	$ 21,774,000	$ 4,405,000	$ 26,179,000
2025	96.5	$ 21,774,000	$ 5,186,000	$ 26,960,000
2026	112.8	$ 21,774,000	$ 5,967,000	$ 27,741,000
2027	113.7	$ 2,114,000	$ 5,993,000	$ 8,107,000
2028	114.7	$ 2,114,000	$ 6,018,000	$ 8,132,000
2029	115.6	$ 2,114,000	$ 6,044,000	$ 8,158,000
2030	116.5	$ 2,114,000	$ 6,069,000	$ 8,183,000
2031	117.5	$ 2,114,000	$ 6,095,000	$ 8,209,000
2032	118.4	$ 2,114,000	$ 6,120,000	$ 8,234,000
2033	119.3	$ 2,114,000	$ 6,146,000	$ 8,260,000
2034	120.2	$ 2,114,000	$ 6,172,000	$ 8,286,000
2035	121.2	$ 2,114,000	$ 6,197,000	$ 8,311,000
2036	122.1	$ 2,114,000	$ 6,223,000	$ 8,337,000
			Total	**$ 208,955,000**

Table 7-6
EWMP Implementation Cost for Industry

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0	$ -	$ -	$ -
2017	0	$ -	$ -	$ -
2018	6	$ 5,827,000	$ 681,000	$ 6,508,000
2019	12	$ 5,827,000	$ 1,362,000	$ 7,189,000
2020	18	$ 5,827,000	$ 2,043,000	$ 7,870,000
2021	43.4	$ 37,855,000	$ 2,963,000	$ 40,818,000
2022	68.8	$ 37,855,000	$ 3,883,000	$ 41,738,000
2023	94.2	$ 37,855,000	$ 4,803,000	$ 42,658,000
2024	122.9	$ 50,722,000	$ 5,848,000	$ 56,570,000
2025	151.5	$ 50,722,000	$ 6,893,000	$ 57,615,000
2026	180.2	$ 50,722,000	$ 7,938,000	$ 58,660,000
2027	181.7	$ 4,172,000	$ 7,988,000	$ 12,160,000
2028	183.2	$ 4,172,000	$ 8,039,000	$ 12,211,000
2029	184.7	$ 4,172,000	$ 8,089,000	$ 12,261,000
2030	186.2	$ 4,172,000	$ 8,140,000	$ 12,312,000
2031	187.7	$ 4,172,000	$ 8,190,000	$ 12,362,000
2032	189.1	$ 4,172,000	$ 8,241,000	$ 12,413,000
2033	190.6	$ 4,172,000	$ 8,291,000	$ 12,463,000
2034	192.1	$ 4,172,000	$ 8,342,000	$ 12,514,000
2035	193.6	$ 4,172,000	$ 8,392,000	$ 12,564,000
2036	195.1	$ 4,172,000	$ 8,443,000	$ 12,615,000
			Total	**$ 443,501,000**

Table 7-7
EWMP Implementation Cost for La Puente

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0.015	$ 64,000	$ 10,000	$ 74,000
2017	0.03	$ 64,000	$ 20,000	$ 84,000
2018	2.7	$ 1,841,000	$ 318,000	$ 2,159,000
2019	5.5	$ 1,841,000	$ 617,000	$ 2,458,000
2020	8.2	$ 1,841,000	$ 915,000	$ 2,756,000
2021	18.3	$ 6,639,000	$ 1,277,000	$ 7,916,000
2022	28.3	$ 6,639,000	$ 1,638,000	$ 8,277,000
2023	38.4	$ 6,639,000	$ 2,000,000	$ 8,639,000
2024	47.4	$ 13,909,000	$ 2,402,000	$ 16,311,000
2025	56.4	$ 13,909,000	$ 2,805,000	$ 16,714,000
2026	65.4	$ 13,909,000	$ 3,207,000	$ 17,116,000
2027	65.6	$ 864,000	$ 3,217,000	$ 4,081,000
2028	65.8	$ 864,000	$ 3,228,000	$ 4,092,000
2029	66	$ 864,000	$ 3,238,000	$ 4,102,000
2030	66.2	$ 864,000	$ 3,249,000	$ 4,113,000
2031	66.4	$ 864,000	$ 3,259,000	$ 4,123,000
2032	66.5	$ 864,000	$ 3,270,000	$ 4,134,000
2033	66.7	$ 864,000	$ 3,280,000	$ 4,144,000
2034	66.9	$ 864,000	$ 3,291,000	$ 4,155,000
2035	67.1	$ 864,000	$ 3,301,000	$ 4,165,000
2036	67.3	$ 864,000	$ 3,312,000	$ 4,176,000
Total				**$ 123,789,000**

Table 7-8
EWMP Implementation Cost for Unincorporated Los Angeles County

Year	Cumulative Total Capacity	Annual Capital Costs	Annual O&M	Total Annual Costs
2016	0	$ -	$ -	$ -
2017	0	$ -	$ -	$ -
2018	12.4	$ 8,895,000	$ 1,389,000	$ 10,284,000
2019	24.8	$ 8,895,000	$ 2,777,000	$ 11,672,000
2020	37.2	$ 8,895,000	$ 4,166,000	$ 13,061,000
2021	98.1	$ 32,031,000	$ 7,660,000	$ 39,691,000
2022	159	$ 32,031,000	$ 11,153,000	$ 43,184,000
2023	219.9	$ 32,031,000	$ 14,646,000	$ 46,677,000
2024	320.6	$ 69,352,000	$ 18,812,000	$ 88,164,000
2025	421.3	$ 69,352,000	$ 22,978,000	$ 92,330,000
2026	522	$ 69,352,000	$ 27,144,000	$ 96,496,000
2027	526.4	$ 11,093,000	$ 27,278,000	$ 38,371,000
2028	530.7	$ 11,093,000	$ 27,412,000	$ 38,505,000
2029	535.1	$ 11,093,000	$ 27,546,000	$ 38,639,000
2030	539.5	$ 11,093,000	$ 27,681,000	$ 38,774,000
2031	543.9	$ 11,093,000	$ 27,815,000	$ 38,908,000
2032	548.2	$ 11,093,000	$ 27,949,000	$ 39,042,000
2033	552.6	$ 11,093,000	$ 28,083,000	$ 39,176,000
2034	557	$ 11,093,000	$ 28,217,000	$ 39,310,000
2035	561.3	$ 11,093,000	$ 28,351,000	$ 39,444,000
2036	565.7	$ 11,093,000	$ 28,486,000	$ 39,579,000
			Total	**$ 831,307,000**

Figure 7-2
Total Capital Cost by Jurisdiction

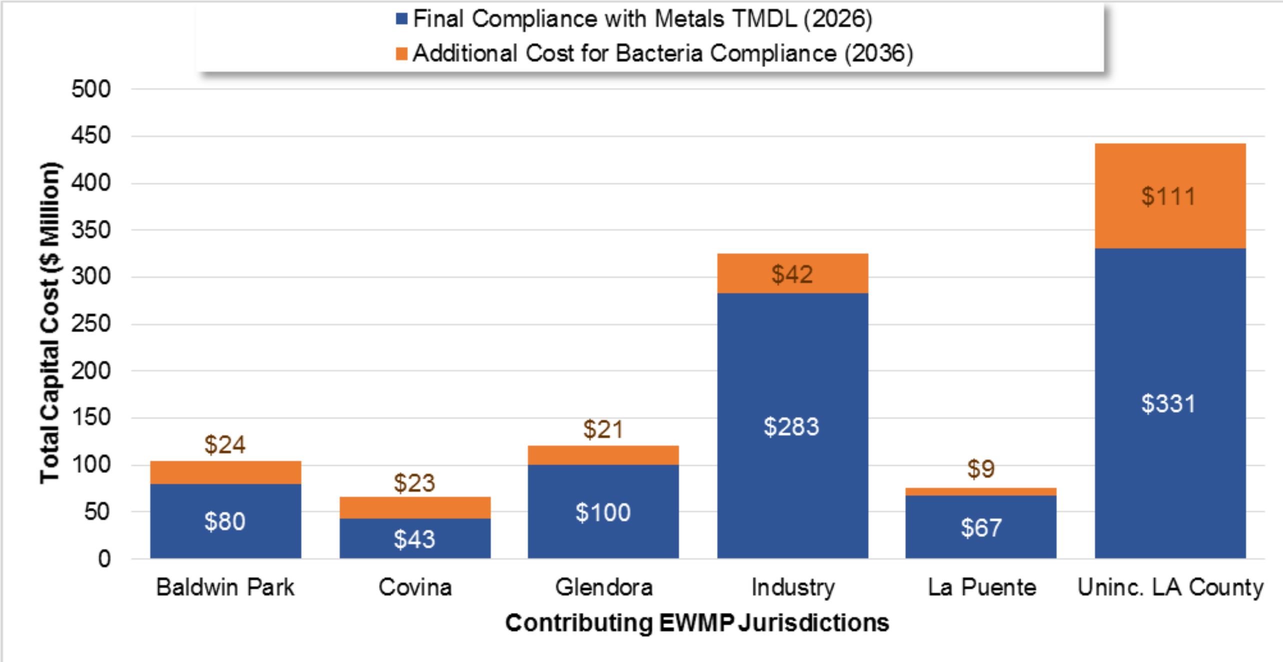
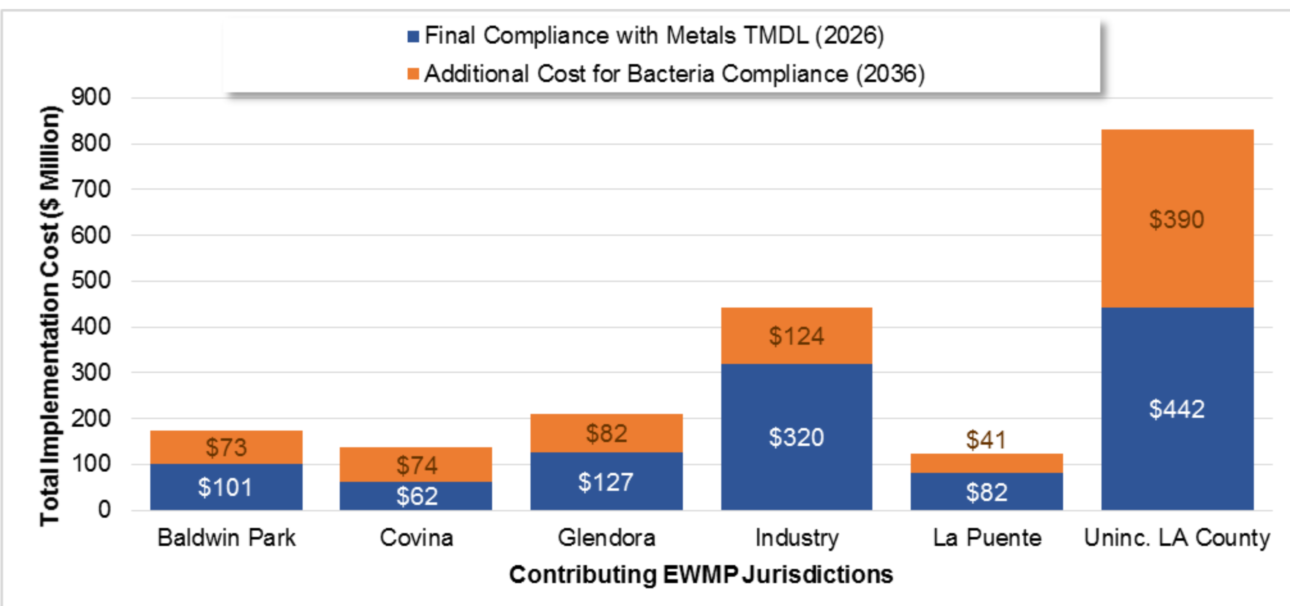


Figure 7-3
Total EWMP Implementation Cost by Jurisdiction



7.3 FUNDING SOURCES

A sound funding strategy, like an engineering or strategy for watershed management requires a coordinated regional approach. Capital, operating, and maintenance costs for watershed programs are significant and often span decades. In addition, projects vary widely in complexity and cost. As such, Group Members have identified the following potential funding sources to supply the funding estimated to be necessary to meet the final cost estimates for the EWMP. 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 (May 21, 2014).

7.3.1 Sanitation Districts of Los Angeles County 2015 Legislative Proposal

Integral to any funding effort is the permittees' ability to receive funding and have authority over their stormwater. The Sanitation Districts of Los Angeles County (Districts) have put forth a 2015 Legislative Policy that reflects this goal. The proposed language would "supplement the existing powers of the Districts and would allow each District to acquire, construct, operate, maintain, and furnish facilities…" in order to manage their stormwater. Specific purposes include:

- Diversion of stormwater and dry weather runoff from the stormwater drainage system;
- Management and treatment of stormwater and dry weather runoff;
- Discharge of the water to the stormwater drainage system or receiving waters; and
- The beneficial use of the water.

The authority sought by the Districts will be key to them securing funding and properly financing their EWMP activities. As such, it will be key for the permittees as the law change would "cost effectively aid jurisdictions in complying with their stormwater related regulatory requirements."

7.3.2 Grants

DESCRIPTION
Apply for grants through the recently passed Prop 1 – 2014 Water Bond. Over $400M is available for stormwater capture, IRWMP and urban creek restoration projects.
Apply for other grants (state and federal) for stormwater improvement, beach water quality improvement, and green infrastructure projects. (e.g. Prop. 84, CBI, etc.)

7.3.3 Fees and Charges

DESCRIPTION
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.
Evaluate increase in solid waste management fees to cover the cost of enhanced street sweeping and other measures to reduce trash for compliance with TMDLs.
Evaluate adopting water conservation fees that would provide funding for reducing irrigated runoff in order to both conserve groundwater and reduce dry weather pollution.
Evaluate assessments on car rentals as some of the pollution in our waterways is from cars driven on local streets.

7.3.4 Legislative and Policy

DESCRIPTION
Continue to pursue a county-wide stormwater parcel tax initiative (modified after the 2012 Clean Water Clean Beaches Initiative). This could be tied to AB 2403 too.
Investigate developing 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.
Investigate forming 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.
Explore the funding opportunities from the 2014 Water Resources Reform and Development Act of 2014 (WRRDA).

7.3.5 Current Funding

Group members have sufficient funds to achieve the activities proposed within this current MS4 Permit cycle, namely implementing enhanced MCMs, and regional project and green streets planning and design through December 2017. The following describes the current funding amount and sources for stormwater management.

The County has an ongoing collective budget of $10.1 million for 140 unincorporated areas. Additional funds for projects are allocated on an annual basis from the General Fund and other sources. In Fiscal Year 2015-16, the total allocation from the General Fund for stormwater management was $23 million. Additional funds from other sources, including the Gasoline Tax, Solid Waste Fund, Prop C, Prop A Local Return Funds, and Measure R, provide for ongoing MCM compliance activities.

The City of Baldwin Park utilizes an existing fund of $1,007,000 from the General Fund, developer fees and grants for stormwater management. The City of Covina utilizes an existing fund of $712,000 from the General Fund and stormwater inspection, plan review, and environmental compliance fees for stormwater management. The City of Glendora utilizes an existing fund of $235,000 from the General Fund for stormwater management. The City of Industry utilizes an existing fund of $1,700,000 from the General Fund for stormwater management. The City of La Puente utilizes an existing fund of $75,000 from the General Fund for stormwater management.

The LACFCD allocated a budget of $33 million from the Flood Fund for all LACFCD territories within the Los Angeles County MS4s in Fiscal Year 2015-16.

7.3.6 Next Steps

Group Members will begin utilizing existing funds to implement the EWMP as well as pursue additional funding in accordance with the below priorities.

GROUP MEMBER	FUNDING PRIORITIES	INTEGRATION WITH EXISTING INFRASTUCTURE IMPROVEMENT PLANS
County	1. Apply for grants 2. Seek allocation in the General Fund 3. Investigate bond and loan opportunities 4. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities	• Development of a stormwater capital improvement plan for existing public facilities by December 2018 • Prioritize locations for green street features by December 2017. • Update infrastructure design guidelines with sustainable practices, including stormwater capture BMPs, for use in implementing green streets by December 2018.
Baldwin Park	1. Apply for grants 2. Seek allocation in the General Fund 3. Investigate bond and loan opportunities 4. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities 5. Encourage State legislators to pass a stormwater fee at the state level	• Development of a stormwater plan for incorporation into the City's CIP for existing public facilities by December 2018 • Development of a Green Street Master plan that incorporates Green Street concepts into street, sewer, and water CIP projects to complement the EWMP and Green Street Policy by December 2018.
Covina	1. Apply for grants 2. Seek allocation in the General Fund 3. Investigate bond and loan opportunities 4. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities 5. Encourage State legislators to pass a stormwater fee at the state level	• Development of a stormwater plan for incorporation into the City's CIP for existing public facilities by December 2018 • Development of a plan that incorporates Green Street concepts into street, sewer, and water CIP projects to complement the EWMP and Green Street Policy by December 2018.
Glendora	1. Apply for grants 2. Seek allocation in the General Fund 3. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities 4. Work with local legislative members on funding avenues 5. Pursue damages from third party lawsuits for violators of the NPDES Permit	• Development of a stormwater capital improvement plan for existing public facilities by December 2018 • Development of a Green Street Master plan to Complement the EWMP and Green Street Policy by December 2018
Industry	1. Apply for grants 2. Seek allocation in the General Fund 3. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities 4. Work with local legislative members on funding avenues	• Development of a stormwater capital improvement plan for existing public facilities by December 2018 • Development of a Green Street Atlas to complement the EWMP and Green Street Policy by December 2017
La Puente	1. Apply for grants 2. Continued participation in stormwater funding advocacy efforts led by the League of California Cities and California Contract Cities 3. Pursue leadership within Sacramento to establish a constant revenue stream for stormwater either by a Constitutional amendment that would have to be put before the voters or by the creation of some other funding source that establishes a monetary value for infiltration of water	• Pursue funding in the 2016-2017 budget to create a capital improvement plan for stormwater projects

GROUP MEMBER	FUNDING PRIORITIES	INTEGRATION WITH EXISTING INFRASTUCTURE IMPROVEMENT PLANS
LACFCD	1. Apply for grants 2. Seek allocation in the Flood Fund	• Development of a stormwater capital improvement plan for existing public facilities by December 2018

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