     

Ballona Creek Watershed Management Group

Enhanced Watershed Management Program (EWMP) Final Work Plan

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Acronyms and Abbreviations

APLs	anticipated participation levels
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
BCWMA	Ballona Creek Watershed Management Area
BCWMG	Ballona Creek Watershed Management Group
BMPs	Best Management Practices
CASQA	California Stormwater Quality Association
CDFW	California Department of Fish and Wildlife
CIMP	Coordinated Integrated Monitoring Program
CO	Current Organics
CTR	California Toxics Rule
CWA	Clean Water Act
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
e. coli	*Escherichia coli*
EMCs	event mean concentrations
ESCP	Erosion and Sediment Control Plans
EWMP	Enhanced Watershed Management Program
GIS	geographic information system
GPCD	gross per capita water demand
gpd	gallons per day
HO	Historical Organics
I&I	infiltration and inflow
IBD	International BMP Database
IC/ID	Illicit Connection and Illicit Discharges
I/F	interim and/or final
IPM	Integrated Pest Management
IPs	Implementation Plans
IRWMP	Integrated Regional Watershed Management Plan
LACDPW	Los Angeles County Department of Publics Works
LACFCD	Los Angeles County Flood Control District
LADWP	Los Angeles Department of Water and Power
LARWQCB	Regional Water Quality Control Board, Los Angeles
LID	Low Impact Development
LSPC	Loading Simulation Program C++

Acronyms and Abbreviations

MCMs	minimum control measures
MS4	Municipal Separate Storm Sewer System
NA	not applicable
NOI	Notice of Intent
NOTF	North Outfall Treatment Facility
NPDES	National Pollutant Discharge Elimination System
NS	not sampled
NURP	National Urban Runoff Program
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
RAA	Reasonable Assurance Analysis
RWLs	Receiving Water Limitations
SCCWRP	Southern California Coastal Water Research Project
SCSC	Southern California Stormwater Committee
SMB	Santa Monica Bay
SUSMP	Standard Urban Stormwater Mitigation Plan
SUSTAIN	System for Urban Stormwater Treatment and Analysis INtegration
TBD	To be determined
TMDL	Total Maximum Daily Load
TMDLIP	Total Maximum Daily Load Implementation Plan
USEPA	US Environmental Protection Agency
WERF	Water Environment Research Federation
WLA	Wasteload Allocation
WMA	Watershed Management Area
WMG	Watershed Management Groups
WMMS	Watershed Management Modeling System
WQ	Water Quality
WQBELs	Water-Quality Based Effluent Limits

Executive Summary

The Municipal Separate Storm Sewer System (MS4) Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001) for Los Angeles County provides an innovative approach to Permit compliance through the development of Enhanced Watershed Management Programs (EWMPs). Through a collaborative approach, an EWMP for the Ballona Creek Watershed Management Area (WMA) is being developed by the Cities of Los Angeles (lead coordinating agency), Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood, the County of Los Angeles, and the Los Angeles County Flood Control District (LACFCD). In general, the EWMP for Ballona Creek will touch on multiple elements of municipal stormwater programs and communities, and emphasize multi-benefit stormwater projects that also provide environmental, aesthetic, recreational, water supply and/or other community enhancements.

This document is a Work Plan for the Ballona Creek EWMP, as required by the Permit. This Work Plan describes the work efforts and analyses that have been and will be conducted to develop an EWMP for the Ballona Creek WMA that addresses the Permit requirements. The planning area for the EWMP is approximately 123 square miles and Ballona Creek and Estuary are collectively 9.5 miles long. The Ballona Creek watershed has been subject to numerous water quality planning and compliance efforts and the EWMP will leverage those efforts and identify additional projects to address water quality issues in the watershed.

Major components of the Ballona Creek EWMP are described in this Work Plan along with details on some of the processes that will be used to develop the EWMP. Much of the process supports the ultimate selection of water quality control measures (often referred to as best management practices [BMPs]) that will be included in the EWMP to address water quality issues in the Ballona Creek WMA. The major components of the EWMP include the following:

- **Stakeholder Outreach:** a critical component of EWMP development is stakeholder outreach, and a series of workshops are being held by the Ballona Creek Watershed Management Group (WMG) to solicit input and ideas from other municipal agencies, environmental and community organizations, and state and federal agencies.

- **Water Quality Priorities:** the first step in the EWMP process follows the steps of the Permit to determine the Water Quality Priorities for the Ballona Creek WMA. Over 55,000 data records were compiled and analyzed to determine three categories of Water Quality Priorities based on whether total maximum daily loads (TMDLs) have been developed for waterbody-pollutants and whether exceedances have occurred in the last ten years.

- **EWMP Control Measures**: this Work Plan establishes a terminology for describing BMPs that can be used to improve water quality, presents "Fact Sheets" for different types of BMPs that could potentially be included in the EWMP, and a process for selecting regional BMPs that can capture the 85th percentile, 24-hour storm, which is an important compliance metric in the Permit.

- **Reasonable Assurance Analysis (RAA):** the approach for demonstrating that selected BMPs will address the Water Quality Priorities is described in this work plan. The RAA will use the Watershed Management Modeling System (WMMS) to select among the many potential options for BMPs and quantitatively demonstrate whether control measures will be effective.

This Work Plan charts the course forward for developing an EWMP for the Ballona Creek WMA that addresses Permit requirements while also providing multiple other benefits to communities. The EWMP offers an opportunity to develop a comprehensive stormwater management plan that optimizes the stormwater and financial resources under the stewardship of the Ballona Creek WMG members. The Ballona Creek WMG looks forward to engaging the Los Angeles Regional Water Quality Control Board (LARWQCB) and other interested parties on this Work Plan. The Ballona Creek WMG will follow up with interested parties, as needed, to discuss received comments and ideas.

Section 1
Introduction

The Ballona Creek Enhanced Watershed Management Program (EWMP) Work Plan describes the path that Municipal Separate Storm Sewer System (MS4) Permittees in the watershed will utilize to complete the Watershed Management Program process of the 2012 MS4 Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001). The Work Plan describes the work efforts and analysis that will be conducted to develop an EWMP that addresses the Permit requirements as well as the stakeholder coordination process.

The MS4 Permittees completed a Notice of Intent (NOI) for the development of an EWMP and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed (Appendix 1.A). The NOI was approved by the Los Angeles Regional Water Quality Control Board (LARWQCB) on February 26, 2014. All MS4 Permittees in the Ballona Creek watershed have agreed to a collaborative approach in meeting the requirements of the new MS4 Permit.

1.1 Applicability of the Work Plan

The Ballona Creek EWMP Work Plan and the resulting EWMP apply to areas covered by the MS4 Permit within the Ballona Creek Watershed Management Area, shown in Figure 1-1. EWMP applies to the following MS4 Permittees, which comprise the Ballona Creek Watershed Management Group (BCWMG): Cities of Los Angeles (lead coordinating agency), Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood, Los Angeles County, and the Los Angeles County Flood Control District (LACFCD) (Figure 1-1).

The Work Plan identifies and outlines a path to developing control measures to address Water Body-Pollutant Combinations (WBPCs) that have been observed to exceed water quality objectives within the receiving waterbodies. Prioritization of water quality issues is an important element of the EWMP; thus the basis for the EWMP will be most influenced by high priority WBPCs and urban sources. The EWMP Work Plan will support the development program elements that are applicable to MS4 Permit requirements for receiving water limitations (RWLs) (Section V.A) and Total Maximum Daily Load (TMDL) provisions (Section VI.E) by setting a path for compliance. Also, the EWMP is applicable to Minimum Control Measures (MCMs) (Section VI.D), which may be modified to more effectively address the highest priority water quality conditions.

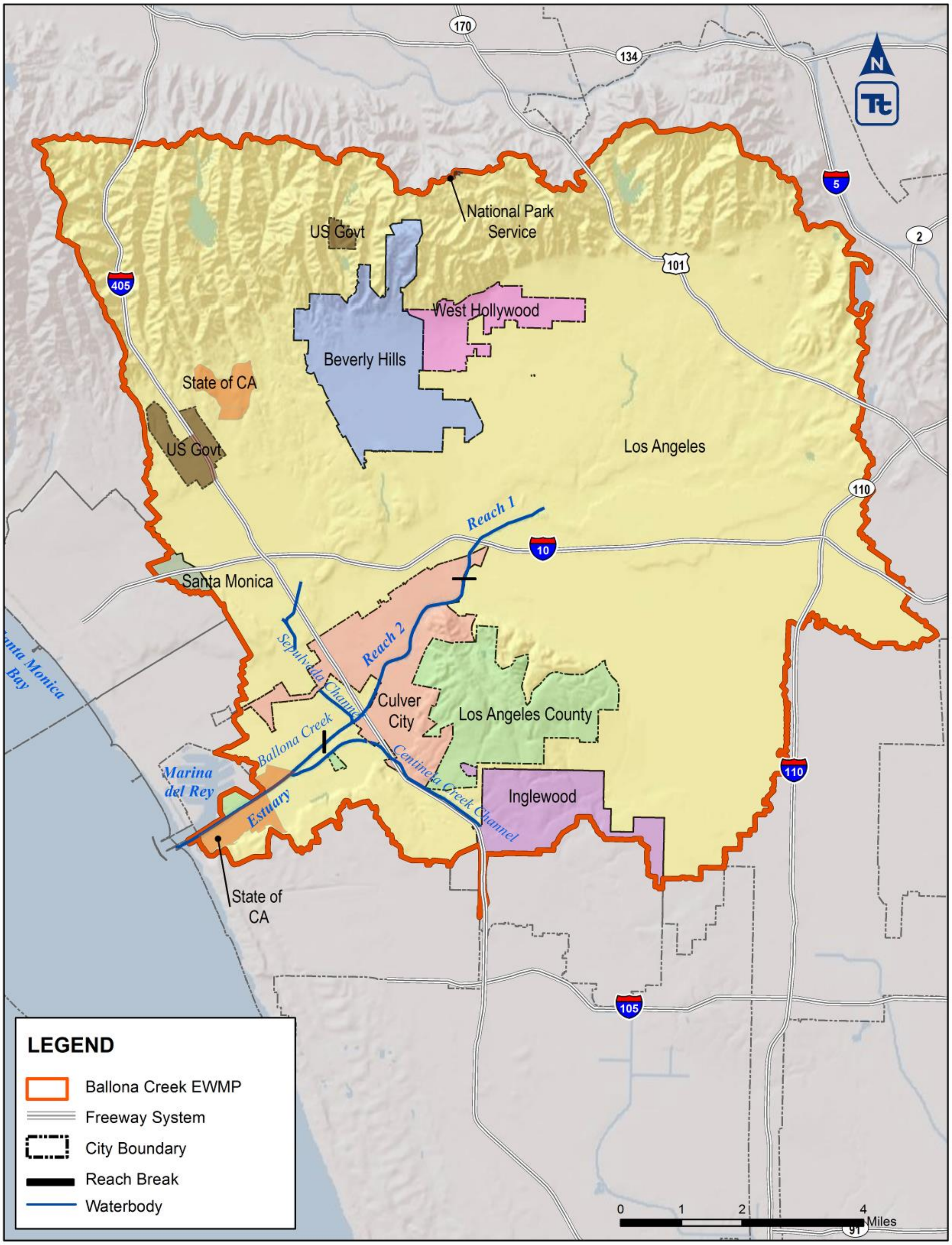


Figure 1-1 Ballona Creek Watershed Management Area

1.2 Geographical Scope and Characteristics

The Ballona Creek watershed is approximately 123 square miles and comprises the Cities of Beverly Hills and West Hollywood, and portions of the Cities of Los Angeles, Inglewood, Culver City, and Santa Monica as well as unincorporated areas of the County of Los Angeles. Additionally, the Los Angeles County Flood Control District (LACFCD) owns and operates drainage infrastructure within incorporated and unincorporated areas in the watershed (see Appendix 1.B for additional information about LACFCD). Figure 1-1 provides a map of the watershed boundaries and the delineations of the land areas of the MS4 permittees and other entities within the watershed.

Ballona Creek and Estuary are collectively approximately 9.5 miles long and divided in three hydrological units:

- Ballona Creek Reach 1 is approximately two miles long from Cochran Avenue to National Boulevard. This portion of the creek is channelized with vertical concrete walls.
- Ballona Creek Reach 2 is approximately four miles long between National Boulevard and Centinela Avenue where Ballona Estuary starts. Reach 2 is also channelized for the most part with trapezoidal walls.
- Ballona Estuary starts at Centinela Creek and continues to the Pacific Ocean. This portion is approximately 3.5 miles of soft bottom channel and experiences tidal inundation.

Major tributaries to Ballona Creek include Sepulveda Canyon Channel (Reach 2) and Centinela Creek (Ballona Estuary). Other water bodies in the watershed include the Del Rey Lagoon and the Ballona Wetlands, which are both connected to the Ballona Estuary through tide gates. Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed. The City of Los Angeles is the responsible agency for the Del Rey Lagoon whose tributary area is approximately 25 acres. The Ballona Wetlands encompass approximately 626 acres (541 acres of natural wetlands area and 85 acres of roads, parking lots, levees and other structures). Approximately 460 acres of the Ballona Wetlands are located within the Ballona Creek watershed and the remaining portion is located in the Marina Del Rey watershed. The Ballona Wetlands are owned and/or managed by the California Department of Fish and Wildlife (CDFW) and the State Land Commission. The relevant water bodies named in the Basin Plan are summarized in Table 1-1.

Table 1-1 Waterbodies Associated with the Ballona Creek Watershed Management Area EWMP

Mainstem	Associated Waterbodies
Ballona Creek Reach 1	
Ballona Creek Reach 2	Sepulveda Channel
Ballona Creek Estuary	Centinela Creek Channel
Lagoons and Wetlands	
Del Rey Lagoon	Ballona Creek Wetlands
Downstream Waters	
Santa Monica Bay	

The BCWMG agencies have agreed to collectively develop the EWMP. Therefore, the EWMP covers all of the areas owned by the MS4 permittees within the watershed. The total area of the Ballona Creek watershed is 123 square miles and a breakdown of areas by MS4 Permittee and other agencies is provided in Table 1-2. Collectively, the MS4 permittees in the Ballona Creek watershed have jurisdiction over 123 square miles or 96 percent of the total watershed area. The EWMP agencies have no jurisdiction over the land that is owned by the State of California (*i.e.*, CDFW, the State Lands Commission, and the California Department of Transportation [Caltrans]) or the US Government. All drainage infrastructures operated and maintained by the LACFCD within the Ballona Creek watershed management area (WMA) will be covered under this EWMP.

Table 1-2 Ballona Creek Watershed Land Area Distribution and EWMP Participation

Agency	EWMP Agency	Land Area (Acres)	% of EWMP Area
City of Los Angeles	Yes	65,272.89	83.21
County of Los Angeles	Yes	3,164.76	4.03
Los Angeles County Flood Control District	Yes	NA	
City of Beverly Hills	Yes	3,618.95	4.61
City of Culver City	Yes	3,125.00	3.98
City of Inglewood	Yes	1,907.72	2.43
City of West Hollywood	Yes	1,135.00	1.45
City of Santa Monica	Yes	217.31	0.28
Area of EWMP Agencies		**78,441.63**	**100**
Caltrans	No	1,651.33	
State of California	No	909.34	
US Government	No	674.49	
Total Ballona Creek Watershed Area		**81,676.79**	

1.3 Regulatory Framework

1.3.1 MS4 Permit

On November 8, 2012, the LARWQCB adopted Waste Discharge Requirements for MS4 discharges within the Coastal Watersheds of Los Angeles County, except those discharges originating from the City of Long Beach (Order No. R4-2012-0175; NPDES Permit No. CAS004001). The MS4 Permit, which became effective on December 28, 2012, applies to the LACFCD, Los Angeles County and 84 incorporated cities within Los Angeles County, including the cities in the Ballona Creek watershed. The 2012 MS4 Permit replaces the 2001 MS4 Permit.

The MS4 Permit contains effluent limitations, (RWLs), MCMs, TMDL provisions, and outlines the process for developing watershed management programs, including the EWMP. The MS4 Permit incorporates the TMDL Wasteload Allocations (WLAs) applicable to dry and wet weather as water quality based effluent limits (WQBELs) and/or RWLs. Section V.A of the Permit requires compliance with the WQBELs as outlined by the respective TMDLs.

1.3.2 Role of EWMP for Permit Implementation

The BCWMG has elected to collaborate on preparing an EWMP Plan that achieves the water quality objectives of the receiving waters. The BCWMG members intend to use the EWMP process to formulate a strategy that will remove or reduce pollutants from dry and wet weather urban runoff in a cost-effective manner, while providing multi-purpose projects that provide not only water quality improvement but other benefits to the region and the local communities.

Implementation Plans have been developed that include strategies for demonstrating compliance with the Ballona Creek and Ballona Estuary TMDLs. The Implementation Plans and strategies for compliance are based on a multi-pollutant approach that maximizes the retention and use of urban runoff as a resource for groundwater recharge and irrigation.

The EWMP offers an opportunity to develop a comprehensive stormwater management plan that optimizes the stormwater and financial resources under the stewardship of the BCWMG members. By leveraging past regional planning efforts and investments, including TMDL Implementation Plans, while exploring additional project opportunities to satisfy the predicted load reductions to meet the BCWMA's numeric goals, the EWMP will include projects that provide not only water quality improvement but also environmental, aesthetic, recreational, water supply and/or other community enhancements.

The EWMP will comprehensively evaluate opportunities, within the participating Permittees' collective jurisdictional area in a WMA, for multi-benefit regional projects that, wherever feasible, 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, while also achieving other benefits including flood control and water supply, among others. In drainage areas within the EWMP area where retention of the 85th percentile, 24-hour storm event is not feasible, the EWMP shall include a Reasonable Assurance Analysis (RAA) to demonstrate that applicable WQBELs and RWLs shall be achieved through implementation of other watershed control measures. Specific requirements of an EWMP are defined in the Permit (Section VI.C.1.g.) as follows:

i. *Be consistent with the provisions in Part VI.C.1.a.-f and VI.C.5-C.8;*

ii. *Incorporate applicable State agency input on priority setting and other key implementation issues;*

iii. *Provide for meeting water quality standards and other CWA obligations by utilizing provisions in the CWA and its implementing regulations, policies and guidance;*

iv. *Include multi-benefit regional projects to ensure that MS4 discharges achieve compliance with all final WQBELs set forth in Part VI.E. and do not cause or contribute to exceedances of receiving water limitations in Part V.A. by retaining through infiltration or capture and reuse the stormwater volume from the 85th percentile, 24-hour storm for the drainage areas tributary to the multi-benefit regional projects.;*

v. *In drainage areas where retention of the stormwater volume from the 85th percentile, 24-hour event is not technically feasible, include other watershed control measures to ensure that MS4 discharges achieve compliance with all interim and final WQBELs set forth in Part VI.E. with compliance deadlines occurring after approval of a EWMP and to ensure that MS4 discharges do not cause or contribute to exceedances of receiving water imitations in Part V.A.;*

vi. *Maximize the effectiveness of funds through analysis of alternatives and the selection and sequencing of actions needed to address human health and water quality related challenges and non-compliance;*

vii. *Incorporate effective innovative technologies, approaches and practices, including green infrastructure;*

viii. *Ensure that existing requirements to comply with technology-based effluent limitations and core requirements (e.g., including elimination of non-stormwater discharges of pollutants through the MS4, and controls to reduce the discharge of pollutants in stormwater to the maximum extent practicable) are not delayed;*

ix. *Ensure that a financial strategy is in place.*

1.3.3 Applicable TMDLs and Implementation Schedules

A TMDL represents an amount of pollution that can be released by anthropogenic and natural sources in a watershed into a specific water body without causing a decline in water quality and a concomitant impairment of beneficial uses. The Federal Clean Water Act (CWA) requires the development of water quality standards that identify beneficial uses and criteria to protect beneficial uses for each water body found within its region. Beneficial uses include swimming, fishing, drinking water, navigability, and wildlife habitats and reproduction. Table 1-3 presents the designated beneficial uses in the Ballona Creek watershed as presented in the Water Quality Control Plan, Los Angeles Region (Basin Plan). The LARWQCB carries out its CWA responsibilities through the state's Porter-Cologne Water Quality Control Act and establishes water quality objectives designed to protect beneficial uses contained in the Basin Plan.

Section 303(d) of the CWA requires states to prepare a list of water bodies that do not meet water quality standards and establish for each of these water bodies a TMDL which will ensure attainment of water quality standards.

The TMDL is assigned to non-point (*e.g.*, areal deposition or releases) and point sources (*e.g.*, MS4 Permittees) as load allocations and wasteload allocations, respectively. TMDLs are determined based on the need to protect a narrative or numerical target, which is needed to protect the beneficial use of the receiving waterbody. A narrative target is used in the existing trash TMDL, which states that no trash can enter the Santa Monica Bay. Conversely, a numerical target is set for concentrations of specific water quality constituents including toxics, bacteria, and metals TMDLs. Table 1-4 presents TMDLs developed specifically for the Ballona Creek watershed and TMDLs that apply to the Ballona Creek watershed as a subwatershed of the Santa Monica Bay Watershed Management Area. Table 1-4 includes recent amendments to bacteria, toxics, and metals TMDLs in the Watershed. Table 1-5 presents interim and final compliance deadlines for the relevant TMDLs. Table 1-6 notes where the Permit assigns WQBELs, RWLs, or in the case of U.S. Environmental Protection Agency (USEPA) TMDLs and WLAs, to Permittees within the BCWMG. Table 1-4 through Table 1-6 do not include the Santa Monica Bay Beaches Bacteria TMDLs because the WLAs for these TMDLs for the receiving waters in the Ballona Creek watershed are established in the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL.

Table 1-3 Ballona Creek Watershed Designated Beneficial Uses as Presented in the Los Angeles Region Basin Plan

Water Body	REC1	LREC-1	REC2	HFS	MUN	NAV	COMM	WARM	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET[b]
Ballona Creek Estuary (ends at Centinela Creek)[c,w]	E		E			E	E		E	E	E	E[e]	E[f]	E[f]	E	
Ballona Lagoon[c]	E		E			E	E		E	E	E	E[e]	E[f]	E[f]	E	E
Ballona Wetlands[c]	E		E						E		E	E[e]	E[f]	E[f]		E
Del Rey Lagoon[c]	E		E			E	E		E		E	E[e]	E[f]	E[f]		E
Ballona Creek Reach 2 (Estuary to National Blvd.)	P[s,au]	E	E	Y[av]	P*			P			P					
Ballona Creek Reach 1 (Above National Blvd.)	P[s,au]		E	Y[av]	P*			P			E					

E: Existing beneficial use P: Potential beneficial use

b: Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory action would require a detailed analysis of the area.

c: Coastal waterbodies which are also listed in Coastal Features Table (2-3) or in Wetlands Table (2-4) of the Basin Plan. Ballona Lagoon, while listed in the Basin Plan as part of the Ballona Creek watershed, is actually in the Marina del Rey watershed. In order to be consistent with the Basin Plan, Ballona Lagoon is shown in this table, but recognize that it will be addressed in the Marina del Rey EWMP.

e: One or more rare species utilizes all ocean, bays, estuaries, and coastal wetlands for foraging and/or nesting.

f: Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.

s: Access prohibited by Los Angeles County Department of Public Works.

w: These areas are engineered channels. All references to Tidal Prisms in LARWQCB documents are functionally equivalent to estuaries

* Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date (See pages 2-3, 4 for more details).

au: The REC-1 use designation does not apply to recreational activities associated with the swimmable goal as expressed in the Federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use in the Basin Plan, or the associated bacteriological objectives set to protect those activities. However, water quality objectives set to protect other REC-1uses associated with the fishable goal as expressed in the Federal Clean Water Act section 1010(a)(2) shall remain in effect for waters where the (au) footnote appears.

av: The High Flow Suspension only applies to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, noncontact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use and (2) other REC-2 uses (*e.g.*, uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where the (av) footnote appears.

Table 1-4 TMDLs Applicable to the Ballona Creek Watershed

TMDL	LARWQCB Resolution Number(s)	Effective Date and/or EPA Approval Date
Ballona Creek Trash (BC Trash)	2004-023	08/11/2005
Ballona Creek Estuary Toxic Pollutants (BC Toxics TMDL)	2005-008	01/11/2006
	2013-010	Not Yet Effective
Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria (BC Bacteria TMDL)	2006-011	04/27/2007
	2012-008	Not Yet Effective
Ballona Creek Metals (BC Metals TMDL)	2007-015	10/29/2008
	2013-010	Not Yet Effective
Santa Monica Bay Nearshore and Offshore Debris (Santa Monica Bay [SMB] Trash TMDL)	2010-010	03/20/2012
Santa Monica Bay DDTs and PCBs (SMB Toxics)	NA (USEPA TMDL)	03/26/2012
Ballona Creek Wetlands TMDL for Sediment and Invasive Exotic Vegetation (Wetlands TMDL)		03/26/2012

The numeric WQBELs and RWLs and the WLAs for the USEPA TMDLs listed in Table 1-5 and Table 1-6 can be found in Attachment M of the Permit. The Permit presents alternative WQBELs and RWLs for the BC Bacteria TMDL, which will become effective upon the effective date of the TMDL amendment (*i.e.*, after USEPA approval of the amendment). The BC Toxics TMDL and BC Metals TMDL were amended on December 5, 2013 by the LARWQCB. Revised WQBELs must be incorporated in the Permit by the LARWQCB at some point after the effective date of the TMDL amendment. However, for the purposes of developing the EWMP, the EWMP Work Plan will consider WQBELs based on both the current and amended TMDLs.

The LARWQCB adopted TMDLs presented above required responsible parties to submit a Total Maximum Daily Load Implementation Plan (TMDLIP) to describe how they would achieve compliance with the WLAs. The cities of Los Angeles Culver, Beverly Hills, Inglewood, West Hollywood, Santa Monica, and Caltrans submitted TMDLIPs to address each of the impairments contained within these TMDLs. Additionally, the County of Los Angeles and LACFCD submitted an integrated TMDLIP to address the impairments. Once approved, the EWMP for Ballona Creek will supersede individual TMDLIPs.

1.4 EWMP Development

The goal of the BCWMG is to develop a watershed-wide EWMP that will, once implemented, remove or reduce pollutants from dry and wet weather urban runoff in a cost-effective manner. The RAA demonstrations show that the projects identified in the EWMP will meet the requirements of the MS4 Permit.

1.4.1 EWMP Development Process

Figure 1-2 presents a flowchart of the EWMP development process that make up the Work Plan. The first step is to develop water quality priorities. To achieve the watershed water quality goals, the EWMP must be based on a comprehensive assessment of water quality priorities to develop a strategy that systematically addresses pollutant reduction in accordance with established TMDL compliance schedules while also addressing additional WBPCs identified during the Work Plan development as described in Section 2.

Improvements to water quality will be achieved through implementation of control measures, which consist of structural and non-structural (institutional) Best Management Practices (BMPs). Step 2 involves identifying the existing BMPs to establish an understanding of the current status of stormwater programs implemented by the various BCWMG agencies. Planned BMPs as well as additional, potential BMPs or BMP improvements are also identified in this step and serve as the “tool kit” for achieving the water quality goals. Input from stakeholders will be solicited, as outlined in Section 5.1.

Combinations of existing, planned and selected potential BMPs are then evaluated by an RAA using a watershed model to provide an assessment of the ability of selected BMP scenarios to meet the water quality goals in the watershed (Step 3). A preferred BMP implementation scenario becomes the basis for the EWMP Plan (Step 4).

Table 1-5 Interim and Final TMDL Compliance Milestones Applicable to the Ballona Creek Watershed

TMDL	Water-bodies	Constituents	Compliance Goal	Weather Condition	Compliance Dates and Compliance Milestones (Bolded numbers indicated milestone deadlines within the current Permit term) [1]										
					2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2025
BC Trash	All Water-bodies	Trash	% Reduction	All	**9/30**	**9/30**	**9/30**	**9/30**							
					80%	**90%**	**96.7%**	**100%**							
Santa Monica Bay Trash	Santa Monica Bay	Trash	% Reduction	All					**3/20**	**3/20**	3/20	3/20	3/20		
									20%	**40%**	60%	80%	100%		
BC Toxics	Estuary	Sediment: Copper, Lead, Zinc, Silver,	% of MS4 Area Meets WQBELs	All		**1/11**		**1/11**		**1/11**				1/11	
		DDT, Chlordane, PCBs				**25%**		**50%**		**75%**				100%	
Amended BC Toxics	Estuary	Sediment: Copper, Lead, Zinc, Silver, DDT, Chlordane	% of MS4 Area Meets WQBELs or Reduction in Loading	All		**1/11**			**1/11**	**1/11**				1/11	1/11
						25%			**50%**	**75%**				100%	
		Sediment: PCBs				**25%**			**25%**					50%	100%
BC Metals	Reach 1, 2, Sepulveda Canyon	Copper, Lead, Zinc, Selenium	% of MS4 Area Meets WQBELs	Dry	**1/11**		**1/11**		**1/11**					1/11	
					50%		**75%**		**100%**						
				Wet	**25%**				**50%**					100%	
Amended BC Metals	Reach 1, 2, Sepulveda Canyon	Copper, Lead, Zinc	% of MS4 Area Meets WQBELs or Reduction in Loading	Dry	**1/11**		**1/11**		**1/11**					1/11	
					50%		**75%**		**100%**						
				Wet	**25%**				**50%**					100%	
BC Bacteria	Estuary	Total Coliform, Fecal Coliform, Enterococcus	% of MS4 Area Meets WQBELs	Dry		**4/27**								7/15	
						100%									

Table 1-5 Interim and Final TMDL Compliance Milestones Applicable to the Ballona Creek Watershed

TMDL	Water-bodies	Constituents	Compliance Goal	Weather Condition	Compliance Dates and Compliance Milestones (Bolded numbers indicated milestone deadlines within the current Permit term) [1]										
					2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2025
	Reach 1, 2, Sepulveda Canyon, Centinela Creek, Benedict Canyon[2]	*Escherichia coli (e. coli)*		Wet										100%	
Santa Monica Bay DDTs and PCBs	Santa Monica Bay	PCBs and DDT	Meet WLAs	All	USEPA TMDLs, which do not contain interim milestones or implementation schedule. The Permit (Part VI.E.3.c, pg. 145) allows MS4 Permittees to propose a schedule in an EWMP.										
BC Wetlands Sediment and Invasive Exotic Vegetation	Wetlands	Sediment and Invasive Species	Meet WLAs	All											

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

[2]Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed.

Table 1-6 Applicability of WQBELs, RWLs, and/or WLAs Associated with TMDLs as Identified in the Permit[1]

TMDL	Constituent	BC Estuary	BC Wetlands	BC Reach 1	BC Reach 2	Centinela Creek	Sepulveda Canyon Channel	Benedict Canyon[2]	Santa Monica Bay
BC Trash TMDL and SMB Trash TMDL	Trash	E	--	E	E	E	E	--	E
BC Estuary Toxics TMDL	Cadmium (sediment)	E	--	--	--	--	--	--	--
	Copper (sediment)	E	--	--	--	--	--	--	--
	Lead (sediment)	E	--	--	--	--	--	--	--
	Zinc (sediment)	E	--	--	--	--	--	--	--
	Silver (sediment)	E	--	--	--	--	--	--	--
	Polycyclic aromatic hydrocarbons (PAHs) (sediment)[3]	E	--	--	--	--	--	--	--
	Chlordane (sediment)	E	--	--	--	--	--	--	--
	DDT (sediment)	E	--	--	--	--	--	--	--
	PCBs (sediment)	E	--	--	--	--	--	--	--
Santa Monica Bay DDTs and PCBs TMDL	DDT (sediment)	--	--	--	--	--	--	--	WLA
	PCBs (sediment)	--	--	--	--	--	--	--	WLA
BC, Estuary, and Sepulveda Channel Bacteria TMDL	Total Coliform	E/R	--	--	--	--	--	--	--
	Fecal Coliform	E/R	--	--	--	--	--	--	--
	Enterococcus	E/R	--	--	--	--	--	--	--
	E. coli	--	--	E/R	E/R	E/R	E/R	E/R	--
BC Metals TMDL	Copper	--	--	E	E	--	E	--	--
	Lead	--	--	E	E	--	E	--	--
	Zinc	--	--	E	E	--	E	--	--
	Selenium[2]	--	--	E	E	--	E	--	--
BC Wetlands Sediment and Invasive Exotic Vegetation TMDL	Sediment	--	WLA	--	--	--	--	--	--

[1]Unless explicitly stated as sediment, constituents are associated with the water column.
[2]Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed.
[3]The BC Toxics and Metals TMDLs were amended on December 5, 2013 and WLAs associated with these constituents were removed. Associated WQBELs would be expected to be removed when the Permit is updated to incorporate these two TMDLs once they become effective.
E. Effluent limit established based on a TMDL.
R. RWL established based on a TMDL.
WLA. Wasteload Allocation assigned in a USEPA TMDL, but not included as effluent or RWLs.

As EWMP projects are implemented over time (Step 5), monitoring data are collected (Step 6) and used in a feedback loop to reassess and refine the compliance scenario established in the EWMP (Step 7). As part of an adaptive management process, modifications to the EWMP Plan will be reflected in updates over two-year cycles.

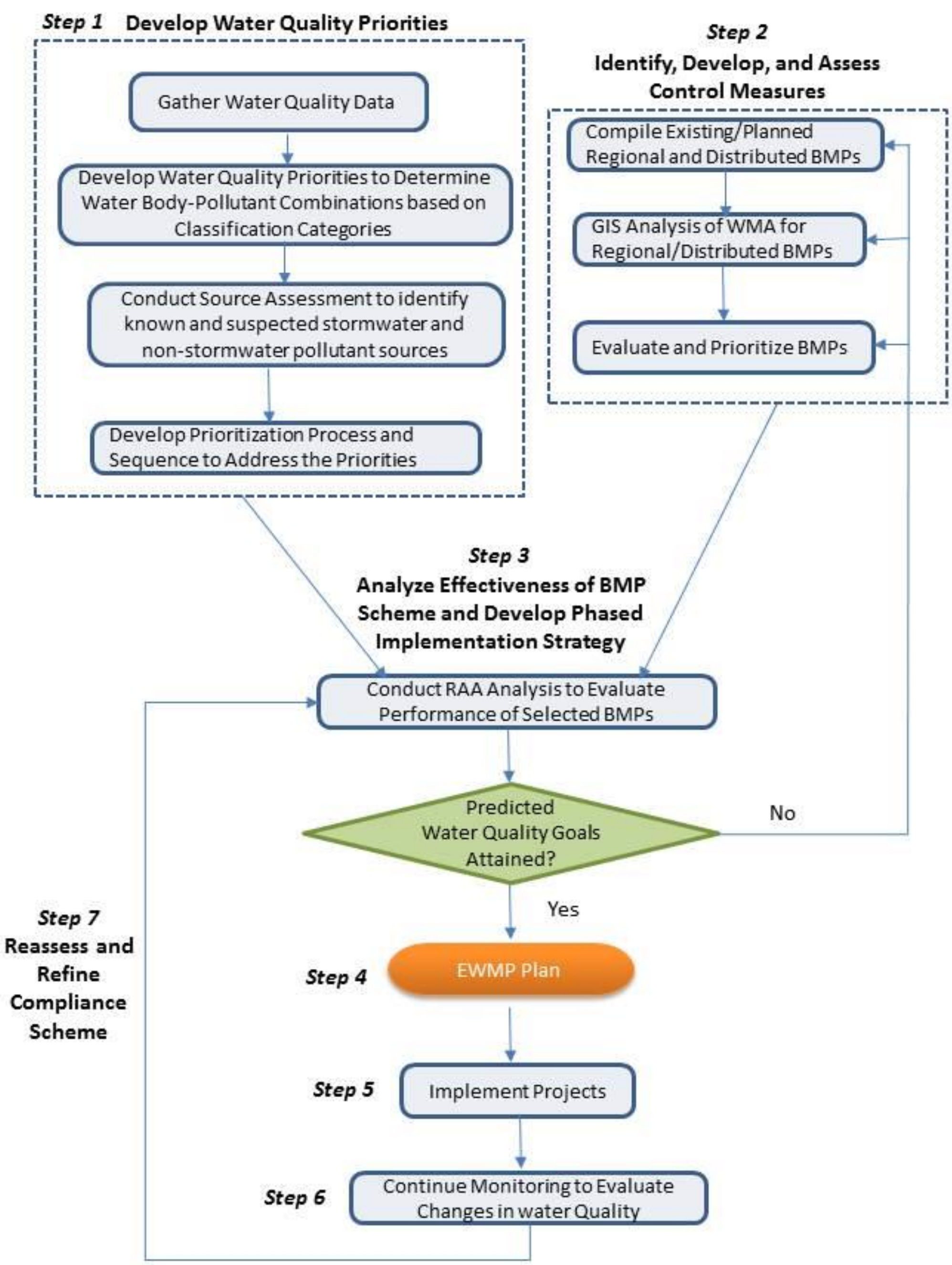


Figure 1-2 EWMP Development Process

1.4.2 Watershed Management Group and Stakeholder Process

The BCWMG, comprised of the jurisdictions identified in Section 1.1, has jointly and cooperatively agreed to execute the Work Plan contained herein with the goal of producing an EWMP Plan in accordance with the Permit requirements with stakeholder support and input. To achieve this objective, monthly meetings of the BCWMG have been held since the project's inception and will continue throughout the EWMP development process. In addition, a series of workshops are envisioned that will bring together other interested parties within the watershed to provide input and insight into the approach and findings of the Work Plan, particularly with respect to identifying potential multi-benefit regional projects. The Stakeholder Process is further described in Section 5.

1.5 EWMP Work Plan Overview

The Final EWMP Work Plan is presented in the following five sections:

Section 1 – Introduction: Provides the geographical scope, regulatory basis, development process and goals of the EWMP.

Section 2 – Water Quality Priorities: Presents the water quality characterization for the watershed, identifies WBPCs, and summarizes the source assessments conducted to date.

Section 3 – Watershed Control Measures: Provides descriptions of the suite of existing and potential structural and institutional pollution control measures that constitute the "tool box" for addressing the water quality priorities identified in Section 2. Most significantly, the process for identifying regional projects that constitute the defining characteristic of the EWMP is described.

Section 4 – Reasonable Assurance Analysis Approach: Provides a description of the modeling approach and RAA approach to demonstrate the projects identified in the EWMP will achieve the permit requirements.

Section 5 – EWMP Development: Provides a description of the EWMP framework, stakeholder engagement process and EWMP development schedule. It also includes a section on how the LARWCB and interested party comments on this work plan and the EWMP will be addressed.

Section 6 - References

Section 2
Water Quality Priorities

The identification of water quality priorities is an important first step in the EWMP process. The water quality priorities provide the basis for prioritizing implementation and monitoring activities within the EWMP and CIMP and selection and scheduling of BMPs in the RAA. The identification of water quality priorities is required in Section VI.C.5.a of the Permit as part of the development of an EWMP. The Permit defines three categories of WBPCs to support the development of priorities (Table 2-1). The Permit establishes a four-step process that leads to prioritization and sequencing of the water quality issues within each watershed, including:

- **Step 1:** Water quality characterization (VI.C.5.a.i, pg. 58) based on available monitoring data, TMDLs, 303(d) lists, stormwater annual reports, *etc*.,
- **Step 2:** Water body-pollutant classification (VI.C.5.a.ii, pg. 59), to identify water body-pollutant combinations that fall into three Permit defined categories,
- **Step 3:** Source assessment (VI.C.5.a.iii, pg. 59) for the water body-pollutant combinations in the three categories, and
- **Step 4:** Prioritization of the water body-pollutant combinations (VI.C.5.a.iv, pg. 60).

Table 2-1 Water Body-Pollutant Classification Categories (Permit Section IV.C.5.a.ii)

Category	Water Body-Pollutant Combinations (WBPCs)
1 Highest Priority	WBPCs for which TMDL Water Quality-Based Effluent Limits (WQBELs) and/or RWLs are established in Part VI.E and Attachment M of the MS4 Permit.
2 High Priority	WBPCs for which data indicate water quality impairment in the receiving water according to the State's Listing Policy, regardless of whether the pollutant is currently on the 303(d) List and for which the MS4 discharges may be causing or contributing.
3 Medium Priority	WBPCs for which there are insufficient data to indicate impairment in the receiving water according to the State's Listing Policy, but which exceed applicable RWLs contained in the MS4 Permit and for which MS4 discharges may be causing or contributing to the exceedance.

2.1 Water Quality Characterization (Step 1)

As noted in Section 1, the first step in developing an EWMP is to develop water quality priorities. These priorities were based on a comprehensive characterization of water quality impairments to develop a strategy that systematically addresses pollutant reduction in accordance with previous commitments, such as those established by TMDL compliance schedules, and implementation plans. To conduct the water quality characterization[1], data were obtained from numerous sources. A data request was submitted to the BCWMG to gather information necessary to meet the water quality characterization and source assessment requirements outlined in the Permit (pages 58 and 59). The data requested to support the water quality characterization included:

[1] Appendices 2.A and 2.B provide more detailed descriptions of the results of the characterization.

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

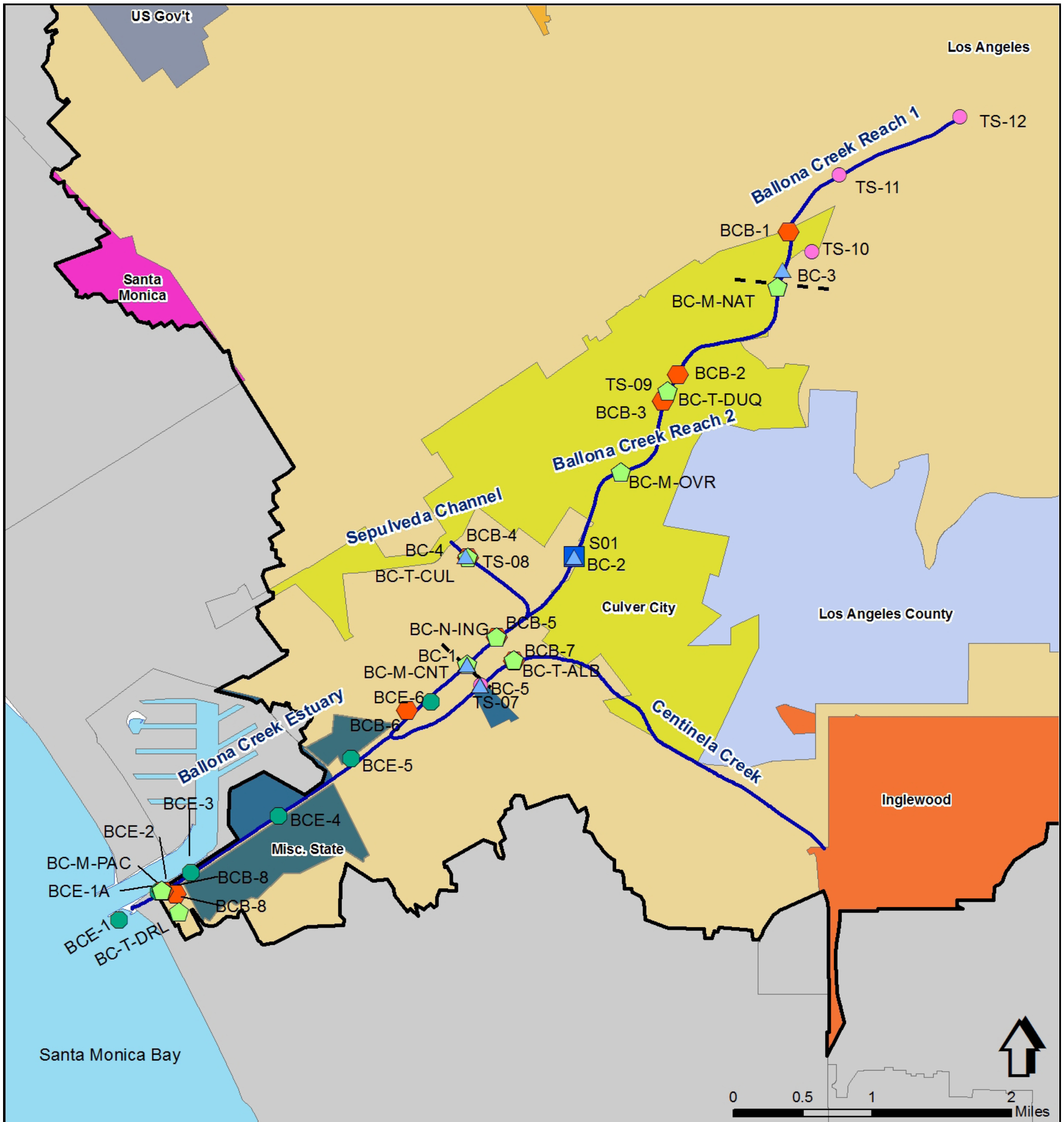
Monitoring data collected within the BCWMA were received from the following sources:

- Los Angeles Department of Public Works (LACDPW) provided long-term monitoring data from the Ballona Creek Mass Emission station S01 and temporary receiving water sites in Centinela Creek (TS-07), Sepulveda Channel (TS-08), Benedict Canyon (TS-09) and the following drains Adams Drain (TS-10), Fairfax Drain (TS-11), and Cochran Drain (TS-12),
- TMDL Coordinated Monitoring Program data funded by the BCWMG and provided by the City of Los Angeles for the Ballona Creek Metals, Toxics, and Bacteria TMDLs, and
- City of Los Angeles Status and Trends program.

Over 55,000 data records were compiled and reviewed as part of the data analysis. Figure 2-1 presents the site locations for the monitoring data received and used for the water quality characterization process.

2.1.1 Characterization of Receiving Water Quality

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include an evaluation of existing water quality conditions, including characterization of receiving water quality. Appendix 2.A presents additional details on the data analysis approach and results. Data were compiled to identify constituents exceeding applicable water quality objectives. Applicable water quality objectives were obtained from the California Toxics Rule (CTR), the Basin Plan, and relevant TMDLs. Applicable water quality objectives from the CTR and Basin Plan were selected based on the beneficial uses identified in the Basin Plan (summarized in Table 1-3).



Site ID	Program	Site ID	Program	Site ID	Program	Site ID	Program
BC-1	Metals and Toxics TMDLs	BCB-6	Bacteria TMDL	BCE-6	Toxics TMDL	S01	MS4 ME
BC-2	Metals and Toxics TMDLs	BCB-7	Bacteria TMDL	BC-M-CNT	Status & Trends	TS-07	MS4 Trib
BC-3	Metals and Toxics TMDLs	BCB-8	Bacteria TMDL	BC-M-ING	Status & Trends	TS-08	MS4 Trib
BC-4	Metals and Toxics TMDLs	BCB-9	Bacteria TMDL	BC-M-NAT	Status & Trends	TS-09	MS4 Trib
BC-5	Metals and Toxics TMDLs	BCE-1	Toxics TMDL	BC-M-OVR	Status & Trends	TS-10	MS4 Trib
BCB-1	Bacteria TMDL	BCE-1A	Toxics TMDL	BC-M-PAC	Status & Trends	TS-11	MS4 Trib
BCB-2	Bacteria TMDL	BCE-2	Toxics TMDL	BC-T-ALB	Status & Trends	TS-12	MS4 Trib
BCB-3	Bacteria TMDL	BCE-3	Toxics TMDL	BC-T-CUL	Status & Trends		
BCB-4	Bacteria TMDL	BCE-4	Toxics TMDL	BC-T-DRL	Status & Trends		
BCB-5	Bacteria TMDL	BCE-5	Toxics TMDL	BC-T-DUQ	Status & Trends		

Figure 2-1 Monitoring Site Locations for Data Utilized in the Water Quality Priorities Process

Generally, the water quality objectives utilized included those established for the protection of aquatic life, contact recreation and human health related to the consumption of organisms. Bed and suspended sediment quality data were compared to TMDL targets. Given the significant number of water quality constituents and corresponding water quality objectives the following steps were taken to identify WBPCs:

- The first step in the analysis was to eliminate lower priority constituents that were sampled for but were never detected in any water body within the EWMP area and therefore would not fall into one of the three Permit categories (see Table 2-1). A list of these constituents is presented in Appendix 2.A - Attachment 1.
- Next, constituents that were detected, but the sample results never exceeded a corresponding water quality objective and therefore would not fall into one of the three Permit categories were identified. A list of these constituents is presented in Appendix 2.A – Attachment 2.
- All other constituents (*i.e.*, all constituents detected and with sample results that had at least one result greater than an applicable water quality objective) were subject to further analysis. A list of these constituents is presented in Appendix 2.A – Attachment 3.

2.1.2 Characterization of Discharge Quality

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include a characterization of stormwater and non-stormwater discharges from the MS4. A characterization was conducted on stormwater and non-stormwater discharges from the MS4 associated with constituents identified in a TMDL, a 303(d) listing, or through the receiving water data analysis described above. The following sources of discharge characterization data were reviewed and are summarized in Appendix 2.B:

- TMDL Staff Reports for TMDLs identified in Table 1-4.
- Data collected during a June 2012 bacteria snapshot event conducted along Ballona Creek and Sepulveda Channel to document the locations and bacteriological water quality of dry weather discharges.
- Data collected as part of the 2007 Southern California Coastal Water Research Project (SCCWRP) Technical Report 510 titled "Sources, patterns and mechanisms of stormwater pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA."
- Land use data collected as part of previous MS4 Permit monitoring and presented in the 2000 report titled "Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report."

2.2 Water Body Pollutant Classification (Step 2)

Based on available information and data analysis, WBPCs were classified into one of the three Permit categories described in Table 2-1. To further support development of the EWMP, the three Permit categories were further subdivided into subcategories (described in Table 2-2) and each WBPC was assigned to an appropriate subcategory. Additionally, pollutants were identified as belonging to a specific "class." As stated in the Permit (pg. 49, footnote 21), pollutants are considered to belong in the same 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. The "classes" are preliminary in nature and may be refined as part of EWMP development.

The following classes were identified:

- Metals,
- Trash,
- Bacteria,
- Sediment,
- Historical Organics (HO) – inclusive of historically-used pesticides,
- Current Organics (CO) – inclusive of current use pesticides and other organics such as PAHs, and
- To be determined – used for conditions (pH and dissolved oxygen) that are not pollutants, *per se*, or constituents where the linkage to another type of constituent will be further investigated during EWMP development.

Table 2-3 presents the BCWMG WBPCs by subcategory. Summary tables presenting the data analysis to support the placement of WBPCs into the various subcategories are presented in Attachment 3 of Appendix 2.A.

2.3 Source Assessment (Step 3)

Following the water body-pollutant classification, the next step in the prioritization process is to conduct a source assessment. The Permit requires that a source assessment be conducted to identify potential sources within the watershed for the WBPCs in Categories 1-3, utilizing existing information.

The intent of the source assessment is to identify potential sources within the watershed for the WBPCs in Categories 1-3 and to support prioritization and sequencing of management actions. Prioritization of the pollutants and sequencing of BMP installation and management actions will be part of the EWMP development process, described in Section 5. Watershed modeling conducted as part of the RAA during the EWMP development process may shed additional light on potential pollutant sources that will further inform the resultant EWMP Plan. Pollutant exceedances may come from point or non-point sources, described below. Often, however, non-point source discharges may flow to the MS4 and thus become associated with the MS4 and subject to the MS4 Permit requirements.

2.3.1 Permit Requirements

The specific requirements in the Permit for the source assessment are as follows (per section VI.C.5.a.iii, page 59):

"(1) Permittees shall identify known and suspected stormwater and non-stormwater pollutant sources in discharges to the MS4 and from the MS4 to receiving waters and any other stressors related to MS4 discharges causing or contributing to the water quality priorities. The identification of known and suspected sources of the highest water quality priorities shall consider the following:

(a) Review of available data, including but not limited to:

(i) Findings from the Permittees' Illicit Connections and Illicit Discharge Elimination Programs;

(ii) Findings from the Permittees' Industrial/Commercial Facilities Programs;

(iii) Findings from the Permittees' Development Construction Programs;

(iv) Findings from the Permittees' Public Agency Activities Programs;

(v) TMDL source investigations;

(vi) Watershed model results;

(vii) Findings from the Permittees' monitoring programs, including but not limited to TMDL compliance monitoring and receiving water monitoring; and

(viii) Any other pertinent data, information, or studies related to pollutant sources and conditions that contribute to the highest water quality priorities.

(b) Locations of the Permittees' MS4s, including, at a minimum, all MS4 major outfalls and major structural controls for stormwater and non-stormwater that discharge to receiving waters.

(c) Other known and suspected sources of pollutants in non-stormwater or stormwater discharges from the MS4 to receiving waters within the watershed."

The findings from items *VI.C.5.a.iii (1)(a)(i)-(vii)* and item *VI.C.5.a.iii (1)(c)* that are pertinent to the Category 1, 2 and 3 pollutants identified in Section 2.2 of this Final Work Plan are summarized below.

Item *VI.C.5.a.iii (1)(b)* is provided in the discussion of the MS4 database requirements of Part VII.A of Attachment D (Monitoring and Reporting Program) of the Permit and addressed in the CIMP.

2.3.2 Point Sources

Point sources are discrete conveyances that can carry pollutants to surface waters. Discharges from point sources are regulated by both CWA NPDES permits and California's Porter-Cologne Water Quality Control Act Waste Discharge Requirements (WDRs). Combined NPDES/WDR permits are issued by the LARWQCB for discharges to surface waters.

Urban runoff to Ballona Creek and Estuary is regulated as a point source discharge under two stormwater permits that cover MS4 discharges. The first is the MS4 Permit applicable to the Permittees developing the EWMP. The second is a separate statewide stormwater permit issued to the California Department of Transportation (Caltrans) (Order No. 2012-0011-DWQ, NPDES No. CAS000003). The other NPDES permits in the watershed include the general construction stormwater permits, general industrial stormwater permits, minor NPDES permits, and general NPDES permits, as listed in Table 2-4. A broad assessment of the relative potential for pollutant contribution and runoff condition (wet weather or dry weather) of the discharges typically associated with each of the permit types is also provided in Table 2-4.

Appendix 2.C contains detailed descriptions of WBPCs and their common sources, which will provide the basis for source assessment activities in the Ballona Creek watershed.

Table 2-2 Details for Water Body-Pollutant Classification 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 an LARWQCB adopted Implementation Plan.	
	Category 1D: WBPCs with past due or current Permit term TMDL deadlines but have there have been no exceedances in the 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.
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 EWMP compliance mechanisms.
	Category 2B: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements that are not a "pollutant"[2] (*e.g.*, 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 there have been no exceedances in the past 5 years.	WBPCs where specific actions for implementation may end up not being identified because recent exceedances have not been observed (and thus specific BMPs may not be necessary.) Pollutants that are in a similar class[1] as those with TMDLs are identified. Either routine monitoring or special studies identified in the CIMP should ensure these WBPCs are addressed to support re-prioritization in the future.
3	Category 3A: All other WBPCs that have exceeded 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] (*e.g.*, 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 3C: All other WBPCs that have exceeded in the past ten years, but not in past five years.	Pollutants that are in a similar class[1] as those with TMDLs are identified.
	Category 3D: WBPCs identified by the BCWMG.	

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, footnote 21).
2. While pollutants may be contributing to the impairment, it currently is not possible to identify the specific pollutant/stressor.

Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories

Class[1]	Constituents	Ballona Creek				Centinela Creek	Sepulveda Channel	Benedict Channel[2]	Santa Monica Bay
		Estuary	Wetlands	Reach 1	Reach 2				
Category 1A: WBPCs with past due or current Permit term TMDL deadlines with exceedances in the past 5 years. (I = Interim and F = Final Limits)									
Trash	Trash	I/F	I/F	I/F	I/F	I/F	I/F	--	I
Bacteria	Total Coliform, Fecal Coliform, Enterococcus	F (Dry)	--	--	--	--	--	--	F (Dry)
	E. coli	--	--	F (Dry)	F (Dry)	F (Dry)	F (Dry)	F (Dry)	--
Metals	Copper, Lead, Zinc, Selenium[3]	--	--	I (Wet & Dry)/F (Dry)				--	--
Metals	Sediment: Cadmium, Copper, Lead, Zinc, Silver	I	--	--	--	--	--	--	--
HO	Sediment: PAHs[3], Chlordane, DDT, PCBs	I	--	--	--	--	--	--	--
Category 1B: WBPCs with TMDL deadlines beyond the Permit term with exceedances in the past 5 years. (F = Final Limits)									
Trash	Trash	--	--	--	--	--	--	--	F
Metals	Copper, Lead, Zinc, Selenium[3]	--		F (Wet)				--	--
Metals	Sediment: Cadmium, Copper, Lead, Zinc, Silver	F	--	--	--	--	--	--	--
HO	Sediment: PAHs[3], Chlordane, DDT, PCBs	F	--	--	--	--	--	--	--
Bacteria	Total Coliform, Fecal Coliform, Enterococcus	F (Wet)	--	--	--	--	--	--	F (Wet)
	E. coli	--	--	F (Wet)	F (Wet)	F (Wet)	F (Wet)	F (Wet)	--
Category 1C: WBPCs addressed in USEPA TMDL without an LARWQCB Adopted Implementation Plan. (WLA = Wasteload Allocation in EPA TMDL)									
HO	DDT (sediment)	--	--	--	--	--	--	--	WLA
	PCBs (sediment)	--	--	--	--	--	--	--	WLA
Sediment	Sediment	--	WLA	--	--	--	--	--	--
Category 1D: WBPCs with past due or current Permit term TMDL deadlines but have not exceeded in past 5 years.									
	None	--	--	--	--	--	--	--	--
Category 2A: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements with exceedances in the past 5 years.									
Bacteria	Fecal Coliform (Shellfish Harvesting Advisory)	303(d)	--	--	--	--	--		--
Metals	Cyanide	--	--	--	Delist	--	--	--	--

Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories

Class[1]	Constituents	Ballona Creek				Centinela Creek	Sepulveda Channel	Benedict Channel[2]	Santa Monica Bay
		Estuary	Wetlands	Reach 1	Reach 2				
Metals	Copper (dissolved and total)	Dry	--	--	--	--	--	--	--
Metals	Mercury (total)	--	--	--	Dry	--	--	--	--
HO	4,4'- Dichlorodiphenyldichloroethylene (4,4'-DDE)	--	--	--	--	Wet	--	--	--
CO	Benzo(a)anthracene	--	--	--	Wet	--	--	--	--
CO	Dibenzo(a,h)anthracene	Dry	--	--	--	--	--	--	--
CO	Indeno(1,2,3-cd)pyrene	Dry	--	--	--	--	--	--	--
Category 2B: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements that are not a "pollutant"[4] (*i.e.*, toxicity).									
TBD	pH	--	--	--	Dry	--	Dry	--	--
Category 2C: 303(d) Listed WBPCs or WBPCs that meet 303(d) Listing requirements but have not exceeded in past 5 years.									
Nutrients	Ammonia	--	--	--	--	--	Dry (Delist)	--	--
Metals	Copper (dissolved and total)	Wet (NS)	--	--	--	--	--	--	--
Metals	Lead (dissolved and total)	Dry	--	--	--	--	--	--	--
Metals	Mercury Total	Wet (NS)/Dry (NS)	--	Wet (NS)/Dry (NS)	Wet	--	--	--	--
Metals	Nickel (dissolved and total)	Dry (NS)	--	--	--	--	--	--	--
Metals	Silver (dissolved and total)	--	--	Wet	--	--	--	--	--
Metals	Zinc (dissolved and total)	Wet (NS)	--	--	--	--	--	--	--
Category 3A: All other WBPCs with exceedances in the past 5 years.									
Nutrients	Ammonia-N	--	--	--	Dry	--	--	--	--
TBD	Cyanide (total)	--	--	--	Wet	--	--	--	--
Metals	Silver (total)	--	--	--	--	Wet	--	--	--
HO	4,4'-DDE	--	--	--	Wet	--	--	--	--
HO	4,4'-DDT	--	--	--	--	Wet	--	--	--
CO	3,4 Benzofluoranthene	--	--	--	Wet	--	--	--	--

Table 2-3 Summary of Ballona Creek Water Body-Pollutant Categories

Class[1]	Constituents	Ballona Creek				Centinela Creek	Sepulveda Channel	Benedict Channel[2]	Santa Monica Bay
		Estuary	Wetlands	Reach 1	Reach 2				
HO	alpha-chlordane	--	--	--	Wet	--	--	--	--
HO	gamma-chlordane	--	--	--	Wet	--	--	--	--
CO	Benzo(a)anthracene	--	--	--	--	Wet	--	--	--
CO	Benzo(a)pyrene	--	--	--	Wet	--	--	--	--
CO	Benzo(k)fluoranthene	--	--	--	--	Wet	--	--	--
CO	Bis(2-Ethylhexyl) phthalate	--	--	--	Wet	--	--	--	--
CO	Chrysene	--	--	--	Wet	Wet	--	--	--
CO	Indeno(1,2,3-cd)pyrene	--	--	--	Wet	Wet	--	--	--
Category 3B: All other WBPCs that are not a "pollutant"[4] (*i.e.*, toxicity). (D = dry weather exceedances, W = wet weather exceedances)									
TBD	Dissolved Oxygen	--	--	--	Wet	--	--	--	--
TBD	pH	--	--	--	Wet	Wet/Dry	--	--	--
Category 3C: All other WBPCs that have exceeded in the past ten years, but not in past five years.									
CO	Bis(2-Ethylhexyl) phthalate	--	--	--	Dry	Wet (NS)	Wet (NS)	--	--
CO	Diazinon	--	--	--	Wet	--	Wet (NS)	--	--
Metals	Cadmium (total)	--	--	Wet	Wet	Wet	--	--	--
Metals	Cyanide (total)	--	--	--	Dry	--	Wet (NS)	--	--
Metals	Mercury (total)	--	--	--	--	--	--	--	--
Metals	Silver (dissolved and total)	Wet (NS)	--	--	Wet	--	--	--	--
Metals	Zinc (total)	Dry (NS)	--	--	--	--	--	--	--

[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, footnote 21).
[2]Note that although Benedict Canyon Channel is identified in TMDLs as a tributary to Ballona Creek, it is a closed channel that daylights where the channel meets Ballona Creek and is not identified in the Basin Plan as a waterbody in the watershed. As such, it is not considered a tributary for the purposes other than addressing the bacteria TMDL for the watershed.
[3]The BC Toxics and Metals TMDLs were amended on December 5, 2013 and WLAs associated with these constituents were removed. Associated WQBELs would be expected to be removed when the Permit is updated to incorporate these two TMDLs once they become effective.
[4]While pollutants may be contributing to the impairment, it currently is not possible to identify the specific pollutant/stressor.
Note that unless explicitly stated as sediment, constituents are associated with the water column.
I/F = Denotes where the Permit includes interim (I) and/or final (F) effluent and/or RWLs.
NS = Not sampled
303 = WBPC on the 2010 303(d) List where the listing was confirmed during data analysis.
Delist = WBPC on the 2010 303(d) List that could now be delisted.
HO = Historical Organics – inclusive of historical pesticides.
CO = Current Organics – inclusive of current use pesticides and other organics such as PAHs.
TBD = To be determined – used for conditions (pH and dissolved oxygen) that are not pollutants, per se, or constituents where the linkage to another type of constituent will be further investigated during EWMP development.

Table 2-4 NPDES Permits in the Ballona Creek Watershed

Type of NPDES Permit	Number of Permits	Potential for Pollutant Contribution
Los Angeles County Municipal Stormwater	1	High (wet/dry weather)
Caltrans Stormwater	1	High (wet weather)
General Construction Stormwater	17	High (wet weather)
Industrial Stormwater	68	High (wet weather)
Construction Stormwater	47	Medium (wet weather)
Individual NPDES Permits (Minor)	7	Medium (wet/dry weather)
Total	**141**	

(LACDPW, 2012a)

2.3.3 Non-Point Sources

Pollutants from non-point sources are conveyed to surface waters in a diffuse manner, *i.e.*, not directly from point source conveyances. However, when contaminants from such non-point sources reach the MS4 system, they become regulated through the MS4 point source NPDES permits. In the highly urbanized Ballona Creek watershed, there is not necessarily a clear regulatory distinction between point and non-point sources.

Non-point sources in the Ballona Creek watershed include:

- Runoff from the National and State forests outside of the MS4s into the headwaters of tributaries, and
- Sources that occur within the channels of Ballona Creek and tributaries ("in-channel sources") such as:
  - Urban runoff,
  - Groundwater discharges,
  - Pet Waste,
  - Sanitary sewer leaks/spills,
  - Illicit/illegal discharges,
  - Wildlife and birds, and
  - Suspension and/or regrowth of sediment-associated pollutants.

Targeted special studies and planned stormwater program elements, such as an IC/ID program, to identify these sources of pollution within the MS4 drainage area will also be developed and incorporated in the EWMP.

2.4 Approach to Prioritization (Step 4)

The Permit outlines a prioritization process that defines how pollutants in the various categories will be considered in scheduling during the EWMP development process. The factors to consider in the scheduling include the following based on the compliance pathways outlined in the Permit:

- TMDLs with past due interim and/or final limits and those with interim and/or final limits within the Permit term (schedule according to TMDL schedule),
- TMDLs with interim and/or final limits outside the Permit term (schedule according to TMDL schedule), and
- Other receiving water exceedances:
  - Pollutants in the same class as TMDL (evaluate ability to consider on same time frame as TMDL),
  - Pollutants on 303(d) list or in same class as 303(d) listings (develop schedule to address as soon as possible with milestones),
  - Pollutants with exceedances that are not in same class as 303(d) listing (conduct monitoring under CIMP to confirm exceedances and if confirmed develop schedule with milestones), and
  - Pollutants without exceedances in last five years (not prioritized for BMPs, but included in monitoring).

Evaluating whether or not a pollutant is in the same class[2] as either a TMDL or a 303(d)-listed pollutant is a critical decision for prioritization and scheduling.

As part of EWMP development and the RAA, prioritizing and sequencing of BMPs will consider the aforementioned factors, including linking pollutants within the same class.

[2] 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, footnote 21).

Section 3
Watershed Control Measures

The EWMP provides the opportunity for Permittees to customize their stormwater programs to achieve compliance with applicable RWLs and WQBELs through implementation of stormwater best management practices (BMPs) or control measures.

BMPs vary in function and type, with each BMP providing unique design characteristics and benefits from implementation. The overarching goal of BMPs in the EWMP is to reduce the impact of stormwater and non-stormwater on receiving water quality and address the Water Quality Priorities. The development of the EWMP will involve the evaluation and selection of multiple BMP types. This section describes proposed processes for evaluating and identifying BMPs for inclusion in the EWMP. The main categories of BMPs outlined herein include structural, either regional or distributed scale, and institutional, as follows:

- Regional Structural BMPs - Constructed structural practices intended to treat runoff from a contributing area of multiple parcels (*e.g.*, facilities typically serving a contributing area on the order of 10s or 100s of acres or larger).
- Distributed Structural BMPs - Constructed structural practices intended to treat runoff close to the source and typically implemented at a single- or few-parcel level (*e.g.*, facilities typically serving a contributing area less than one acre).
- Institutional BMPs - Policies, actions, and activities intended to prevent pollutants from entering stormwater runoff thus eliminating the source of the pollutants. These BMPs are not constructed, but may involve costs such signage or spill kits.

The development of the EWMP will involve the evaluation and selection of multiple BMP types, as described in the following sections. Section 3.1 describes structural BMPs and the process for identifying and selecting Regional BMPs. Section 3.2 describes institutional BMPs and potential approaches to customization.

3.1 Structural BMPs

Structural BMPs will likely be an important component of the EWMP, and information on existing and planned BMPs will support efforts to select among the many potential BMPs. This subsection describes nomenclature and categories used to compile BMP information and support the BMP planning process.

3.1.1 Sub-Categories of Structural BMPs

Regional and distributed BMPs are separated into *subcategories* as shown in Table 3-1. These categories are used herein to compile and describe information on existing, planned, and potential BMPs. The nomenclature will be important for engaging participating agencies as the EWMP is developed. Each of these subcategories is described in more detail with the *BMP Fact Sheets* included in Appendix 3.A.

To assist with the process of compiling and describing existing, planned, and potential BMPs, the *BMP functions* that drive BMP performance are presented in each BMP Fact Sheet.

The three major BMP functions for *structural BMPs* are infiltration, water quality treatment, and storage, as follows:

- Infiltration - Runoff is directed to percolate into the underlying soils. Volume reduction and groundwater recharge occur in infiltration practices.
- Water Quality (WQ) Treatment - Pollutants are removed through various unit processes, including filtration, settling, sedimentation, sorption, straining, and biological or chemical transformations.
- Storage - Runoff is captured, stored (detained), and slowly released into downstream waters. Storage can reduce the peak flow rate from a site, but does not directly reduce runoff volume.

Table 3-1 Summary of Structural BMP Categories and Major Functions

Category	Subcategory	Example BMP Types
Regional[1]	Infiltration	Surface infiltration basin, subsurface infiltration gallery
	Detention	Surface detention basin, subsurface detention gallery
	Constructed Wetland	Constructed wetland, flow-through/linear wetland
	Treatment Facility	Facilities designed to treat runoff from and return it to the receiving water
	Low Flow Diversion	Facilities designed divert dry weather flows to the sanitary sewer
Distributed	Site-Scale Detention	Dry detention basin, wet detention pond, detention chambers, etc.
	Green Infrastructure	Bioretention and biofiltration (vegetated practices with a soil filter media, and the latter with an underdrain)
		Permeable pavement
		Green streets (often an aggregate of bioretention/biofiltration and/or permeable pavement)
		Infiltration BMPs (non-vegetated infiltration trenches, dry wells, rock wells, etc.)
		Bioswales (vegetative filter strips and vegetated swales)
		Rainfall harvest (green roofs, cisterns, rain barrels)
	Flow-Through Treatment BMP	Media/cartridge filters, high-flow biotreatment filters, etc.
	Source Control Structural BMPs	Catch basin inserts, screens, hydrodynamic separators, trash enclosures, etc.

1. The term "regional BMP" does not necessarily indicate the project can capture the 85th percentile storm, as used in the Permit. The term "Regional EWMP projects" is recommended for those regional BMPs that are able (or expected to be able) to capture the 85th percentile storm.

3.1.2 Structural BMP Selection

Structural BMPs will play an integral role in meeting MS4 Permit objectives. Development of the EWMP will involve a process by the BCWMG to develop networks of structural BMPs (Regional EWMP projects, regional BMPs, and distributed BMPs) that, when combined with institutional BMPs (including the effect of Low Impact Development [LID] ordinances), have reasonable assurance of addressing Water Quality Priorities (see Section 4 for a description of the RAA). The BCWMG will assess the effectiveness of existing structural BMPs and evaluate other regional or distributed BMP projects contained in existing watershed plans and identified as new/additional opportunities in the EWMP development process.

The process for selecting structural BMPs to be included in the EWMP will follow these general steps:

- Step 1. Compilation of regional and distributed BMPs from existing planning documents,
- Step 2. Identification of additional regional BMPs (beyond those identified in planning documents), utilizing resources such as a geographic information system (GIS) and stakeholder input,
- Step 3. Evaluation and ranking of all structural BMPs identified in Steps 1 and 2 into appropriate prioritization categories, including:
  - Regional EWMP Projects that capture and treat the 85th percentile storm event volume.
  - Regional BMPs to be included in the EWMP that provide significant pollutant load reductions.
  - Other Potential Regional BMPs which are of interest for possible future implementation, but are not ready to be included in the EWMP.
  - Other Potential Regional BMPs which need more study and re-evaluation before they can be included as projects of interest.
- Step 4. Identification and evaluation of additional distributed structural BMPs to provide needed water quality improvement in SMSs where no regional BMPs are prioritized for inclusion in the EWMP, and
- Step 5. Site-specific feasibility assessments for structural BMP projects prioritized for inclusion in the EWMP.

The prioritization of projects will use the output from the RAA as the primary basis for determining performance toward achieving the goals of the EWMP. The RAA provides a detailed estimation of water quality improvements as a result of implementing a series of watershed control measures; however, it does not provide site-specific information about project locations. Therefore, the final step prior to selection of structural BMPS for inclusion in the EWMP will involve site-specific feasibility assessments. Figure 3-1 provides a flow chart to illustrate the process being followed by the BCWMG to develop a set of structural BMPs that, when combined iwht instituational BMPs, will meet the objectives of the MS4 Permit. Figure 3-2 summarizes the key milestones in the development of the structural BMP for inclusion in the EWMP.

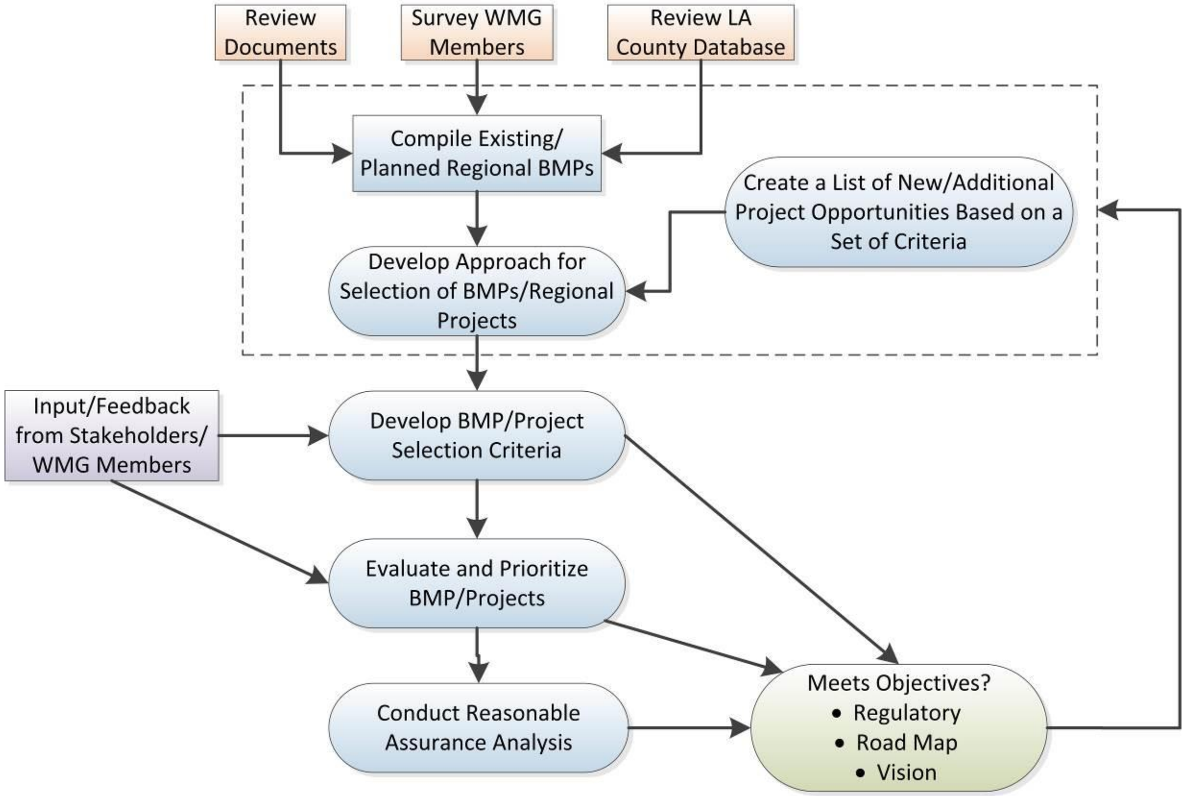


Figure 3-1 Flow Chart for Selecting Structural BMPs for the Ballona Creek EWMP

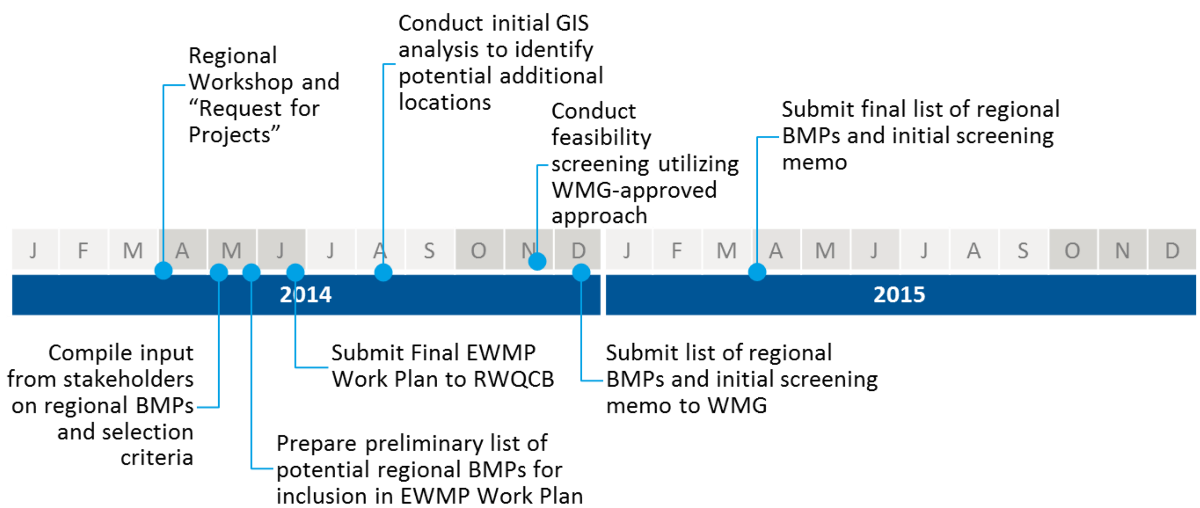


Figure 3-2 Summaries of Key Milestones in the Identification and Selection of Regional BMPs

3.1.2.1 Existing Regional BMPs

Within the Ballona Creek WMA, there are existing structural BMPs currently operating that are providing reductions to specific pollutants of concern and are presumed to be improving downstream water quality. Most of these BMPs were selected and installed by developers as part of a Standard Urban Stormwater Mitigation Plan (SUSMP) to provide required runoff capture and treatment for new development or signficant redevelopment projects. Prior to the 2012 NPDES Permit update (Order No. R4-2012-0175), the selection of BMPs to be included in project SUSMPs involved a qualitative assessment of the effectiveness of different BMPs for the pollutants of concern. More recent projects have been subject to more stringent BMP selection criteria, whereby BMP selection must follow a hierarchy of infiltration, then harvest and use, then biological treatment and release, and then other flow through treatment alternatives.

In addition to development-driven BMPs, the stormwater programs have constructed several publically-owned regional structural BMPs to reduce pollutants of concern to a receiving water body and to comply with TMDLs for WBPCs.

A key step in the development of the RAA for the EWMP will be to consider the effectiveness of existing regional structural BMPs for the full range of pollutants and flow conditions that must be addressed in the downstream receiving waterbody. Accordingly, modifications to these existing facilities will be considered in the EWMP if these facilities currently are shown to be ineffective for all downstream WBPCs or flow conditions. The EWMP will identify and consider such modifications to all publically owned and a subset (those serving at least ten acres) of privately owned regional structural BMPs.

3.1.2.2 Planned Regional BMPs

Potential Regional BMPs have been identified in a number of watershed management or TMDL implementation plans developed by public agencies or organizations in the watershed. While not yet implemented, these potential regional BMPs represent projects that could be incorporated into the EWMP. An example BMP identified to be implemented in the Ballona Creek WMA as a path toward compliance with individual TMDLs for specific WBPCs is the enhancement of the North Outfall Treatment Facility (NOTF), which will provide disinfection of dry weather flows in Ballona Creek Reach 2. Modifications to the planned facilities will be considered in the EWMP to ensure that each potential project can be effective for all downstream WBPCs and flow conditions. These watershed plans identified many potentially feasible sites where retrofits to include regional structural BMPs could be incorporated into the existing landscape (Appendix 3.B).

3.1.2.3 New/Additional Regional BMPs to be Developed in this EWMP

BCWMG members provided input on the development of an approach to identify new/additional regional BMPs for inclusion in the EWMP, considering several existing and completed regional efforts to identify and evaluate regional BMPs including the call for projects used in the LA IRWMP process, the 2013 LA IRWMP OPTI database, and other regional project development processes such as the Southern California Stormwater Committee (SCSC) Stormwater Capture Master Plan, Los Angeles Department of Water and Power (LADWP) Stormwater Capture Master Plan, and the Green Solutions Project (a GIS-based analysis developed by Community Conservation Solutions). Based on this input this approach will include three key components:

1) **Stakeholder Engagement -** The following process for identifying additional regional BMPs through stakeholder engagement has been developed in consultation with the BCWMG:

a. A formal "Request for Projects" to BCWMG members and other watershed stakeholders in April 2014 to identify additional potential regional BMPs for inclusion in the final EWMP.

b. A regional workshop in mid-2014 which invites a broad cross section of stakeholders from throughout the region to provide input and ideas for additional regional BMPs.

c. A dedicated BCWMG meeting in late March 2014 which continues to invite input and ideas for additional regional BMPs.

d. One-one-one meetings with key stakeholders to discuss additional potential regional BMPs.

2) **GIS-Based Approach for Identifying Additional Regional BMPs -** The development of a GIS-based approach is a useful tool for identifying additional Regional BMP opportunities. BCWMG members have requested that the GIS process be operable by city staff, and not require consultant support on an ongoing basis.

   a. Figure 3-3 below represents a suggested GIS-based approach for identifying additional regional BMPs. The approach builds on the preliminary set of regional BMPs identified in the "Request for Projects", and a preliminary output from the Watershed Management Modeling System (WMMS) that estimates per-sub watershed volumes that correspond to the 85th percentile storm. This initial output from the WMMS model will provide useful information about the areas of opportunity to capture runoff from critical areas.

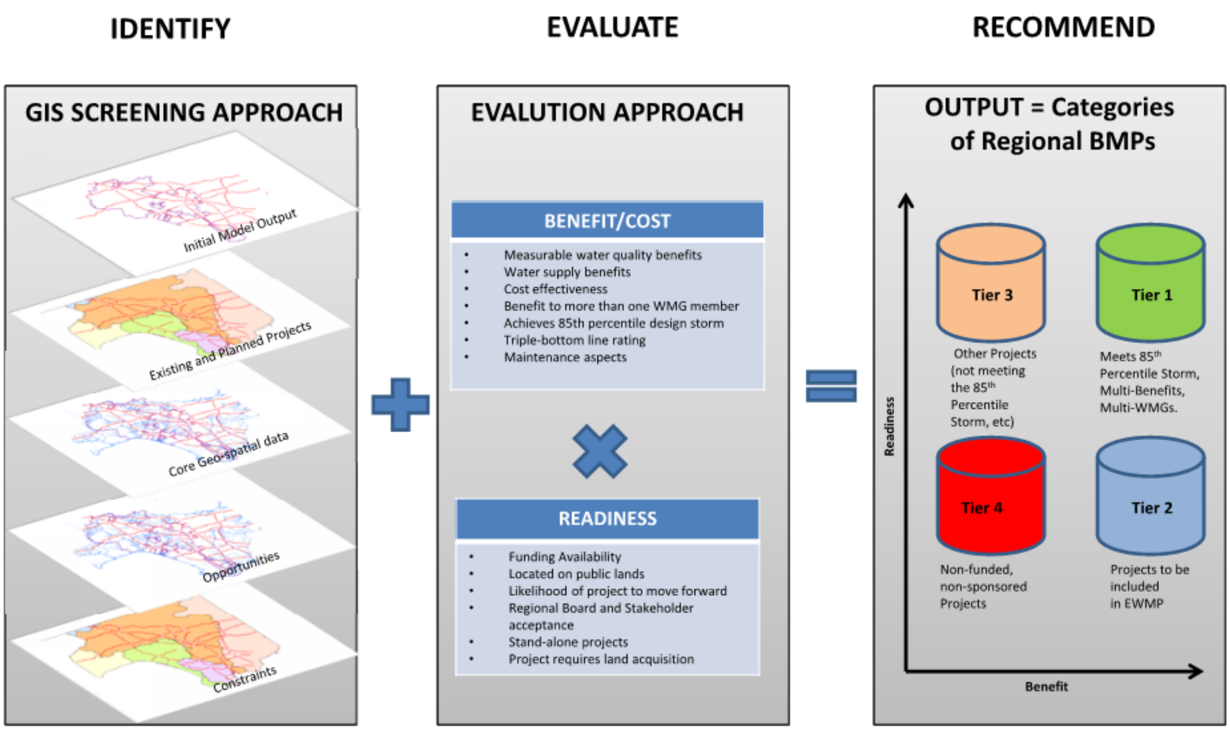


Figure 3-3 Suggested GIS-Based Approach for Identifying Additional Regional BMPs

b. Potential regional BMP projects identified through the GIS-based approach will be screened based on a number of criteria, including:

i. Topography

ii. Hydrologic features

iii. Land use

iv. Transit infrastructure

v. Parcel data/ownership

vi. Existing storm drain infrastructure

vii. Storm drain invert depth

Key considerations of both opportunities and constraints that will be used in the final selection of regional BMPs are presented in Table 3-2.

Table 3-2 Opportunities and Constraints for Structural BMP Implementation

List of Opportunities	List of Constraints
▪ Water supply benefits ▪ Water quality benefits ▪ Multiple benefits (includes projects that would (a) provide more than one type of benefit, *e.g.*, in addition to stormwater runoff and pollutant load reduction, aesthetic enhancements, habitat restoration, etc.; or (b) complement another project to result in combined/synergistic benefits.) ▪ Recreation/open space benefits ▪ Located on public lands ▪ 85th percentile storm criteria ▪ Funding is committed ▪ Benefit – cost ratio (ROI) ▪ Benefits to more than one BCWMG member ▪ Project sponsor is BCWMG member ▪ Project readiness ▪ Stand-alone projects, *i.e.*, those projects that do not require significant infrastructure development to implement ▪ Likelihood of project to move forward ▪ Project sponsor is committed ▪ Flood control benefits or address historical flooding issues ▪ LARWQCB acceptance ▪ Stakeholder acceptance ▪ Proximity to pollutant sources or impaired waters ▪ Adjacent to existing storm drain	▪ Soil contamination ▪ Historical landmarks ▪ Brownfields ▪ High groundwater ▪ Project requires land acquisition ▪ Cost Effectiveness ▪ Proximity to pollutant sources or impaired waters ▪ Located on private land ▪ Liquefaction zones

3) Evaluation and ranking of all regional BMPs into appropriate prioritization categories. This step will use the results of the RAA, described in Section 4 of this EWMP Work Plan, to finalize the most effective projects for inclusion in the EWMP to meet water quality objectives in receiving waterbodies. Appendix 3.C provides summary statistics of pollutant removal effectiveness of various BMPs that may be selected for implementation at a potential location. These statistics provide a basis for the simulation of load reduction in the RAA. One key part of the BMP evaluation step will be to conduct a site-specific assessment of each prioritized regional BMP opportunity to ensure its feasibility for implementation as specified in the RAA. If the project cannot be constructed as modeled, then the RAA will be updated with a modified project. If the project is found to have a fatal flaw, then the RAA will be updated with additional lower ranking project(s), including potential new distributed BMP opportunities such as green street retrofits, to that equal or better water quality improvement may be obtained.

3.2 Institutional BMPs including MCMs

Institutional BMPs are non-constructed control measures that limit the amount of stormwater runoff or pollutants that are transported within the MS4 area. Most institutional BMPs are implemented to meet MCM requirements in the MS4 Permit.

The LA MS4 Permit was recently updated in 2012 and changes were made to the MCMs that must be implemented. The BCWMG has assessed these changes in Permit requirements. One key change was to allow for customized actions within each category of control measures as set forth in an approved EWMP. Thus, Permittees can evaluate the MCMs, identify potential customization that will address water quality priorities, and provide justification for customization of any MCM that is determined to not be applicable to the Permittee (with the exception of MCMs in the Planning and Land Development Program, which may not be customized). Customization may include replacement of an MCM for a more effective measure, reduced implementation of an MCM, augmented implementation of the MCM, focusing the MCM on the water quality priority, or elimination of a MCM.

3.2.1 Summary of Existing MCMs/Institutional BMPs

The MS4 Permit categorizes institution BMPs and MCMs into the following five program categories:

- Development Construction Program,
- Industrial/Commercial Facilities Program,
- IC/ID Detection and Elimination Program,
- Public Agency Activities Program, and
- Public Information and Participation Program.

Specific institutional BMPs currently implemented by the BCWMG member jurisdictions as part of these stormwater program categories are reported in the Los Angeles County MS4 Permit Unified Annual Report[3].

[3] Los Angeles County provides access to Permittee Annual Reports at the following website: http://ladpw.org/wmd/NPDESRSA/AnnualReport/

3.2.2 Potential EWMP Approach to Modifying MCMs/Institutional BMPs

As part of the implementation of the Work Plan, the BCWMG agencies may develop customized plans for MCM implementation. If one or more MCMs are customized, the approach and results of customization will be presented in the EWMP along with an overview of the remaining MCMs. The following subsections describe generalized steps for conducting the MCM customization process. Some of these steps have been completed and provide the basis for later steps in the process that may or may not be undertaken. Permittees may choose to forgo MCM customization during the initial EWMP development process and customize MCMs during subsequent revisions to the EWMP conducted as part of the regularly scheduled adaptive management process.

3.2.2.1 Step 1 Summarize the Current MCM Implementation

The existing MCM implementation was summarized to allow for a comparison of the implementation of current control measures to the MCMs specified in the Permit. The 2010-2011 and 2011-2012 Annual Reports were used as the basis for the summary.

3.2.2.2 Step 2 Compare Current MCM Implementation to 2012 Permit

The summary of current MCM implementation provided a basis for a comparison of control measure implementation from the 2001 Permit requirements against the 2012 Permit, thus allowing for a general assessment of the potential gaps in the current program with the required MCMs. In general, the 2001 Permit and 2012 Permit requirements are worded differently and contain different specific requirements that cannot easily be compared.

3.2.2.3 Step 3 Develop a List of MCMs that are Candidates for Customization

Step 3 is intended to develop a list of the MCMs that may be evaluated for customization for those BCWMG agencies that choose to do so. The EWMP will include an assessment of the water quality priorities that MCMs address based on the classes of the various WBPCs identified in Section 2. Resources such as the California Stormwater Quality Association (CASQA) BMP Handbooks provided information that relate control measures to the targeted constituents and information on sources of the pollutant (such as TMDLs) were utilized to complete the assessment. In some cases, an MCM only indirectly addresses a water quality priority. For example, a Public Outreach control measure may directly address a water quality priority if that pollutant is the focus of an outreach message, or the message may broadly address pollution prevention without targeting a specific pollutant. Conversely, some MCMs may be customized to provide “true source control”, such as is achieved by product replacement programs (*e.g.*, support for legislation to reduce allowable copper content in brake pads).

Once the candidates for customization are identified, the EWMP will evaluate the potential effectiveness of MCMs. This evaluation will use qualitative rankings of high, medium, or low effectiveness. The basis for these qualitative rankings will be from readily available resources including CASQA BMP Handbooks, effectiveness assessment guidance, stormwater program implementation experience, and published scientific studies.

3.2.2.4 Step 4 Evaluate Existing Information and Data and Develop Justifications for MCM Customization

MCMs that are candidates for customization may be either modified to be more effective/efficient or to provide greater water quality benefits. Examples of evaluations that could be conducted to identify more effective/efficient approaches to MCM implementation include:

- Public Outreach material can be evaluated on whether it addresses a water quality priority. If public outreach is found to be ineffective (Step 3), then the material is general (broadly addresses pollution prevention without targeting a specific pollutant), it could be modified to focus on a water quality priority (*e.g.*, pesticides).
- Industrial inspection checklists can be evaluated to ensure consistency with water quality priorities.
- Industrial and commercial inspection frequencies can be evaluated to better target identified sources of water quality priorities.
- Permittees can evaluate whether changes in equipment, for example, from mechanical broom to vacuum assisted street sweepers may provide a meaningful improvement in the reduction of water quality priority pollutants.

> Example Assessment and Justification
>
> A stormwater program's Illicit Discharges Program Element contains multiple control measures to detect and eliminate illicit discharges (IDs) and illicit connections (ICs), including dry weather field screening. Program staff recognized that dry weather field screening was a resource-intensive effort, but was not effective in identifying any consistent or definitive sources of IDs. Over multiple years of outfall screening, only a small percentage of screened outfalls exceeded action levels for only one parameter, and a definitive source was not identified. Program staff provided justification for discontinuing field screening and refocusing efforts on other more cost-effective mechanisms for detection and elimination of IDs (*e.g.*, public reporting and field crew inspections during regular maintenance activities). Bottom Line: This control measure was a good candidate for elimination since it was resource intensive with poor performance, and there were redundant program elements that were effective.

If there are no reasonable opportunities to modify MCMs to improve effectiveness/efficiency or to focus on a water quality priority, the MCM could be considered for reduced implementation or elimination. Note that the Permit (Part VI.C.5.b) directs Permittees to "provide justification for elimination of any MCM that is determined not to be applicable to the Permittee." Thus any reduction/elimination must be supported by sufficient information. A hypothetical example is described om the box above.[4]

The following outlines the procedures that may be followed by the Permittees to determine if there is justification to reduce/eliminate an MCM. At a minimum, there are two potential rationales for reduced implementation or elimination:

- <u>MCMs that are not expected to address a water quality priority:</u> For those MCMs that do not address, at least in part, a water quality priority, potential opportunities to focus the MCM on one or more water quality priorities may be considered and identified. If there are no reasonable opportunities to modify MCMs to focus on a water quality priority, the MCM may be considered for reduced implementation or elimination. It is expected that MCMs that address, at least in part,

[4]Note that this example is completely hypothetical and no cities have identified IDIC as an MCM they plan to modify.

a water quality priority will continue to be implemented. However, customization may still be desirable to make the MCM more effective.

- MCMs that address a water quality priority, but are not an effective or efficient use of program resources: An assessment of the effectiveness of the MCM will be conducted to determine if the MCM makes effective and efficient use of program resources. Similar to the customization discussion for water quality priorities, reasonable opportunities should be explored to modify MCMs to make them more effective. Assessing the effectiveness of a MCM may require combining information from a variety of measurement tools, depending on what data are collected (*e.g.*, survey results in response to number of items turned in or changes in sales of certain products). If the effectiveness evaluation shows that a MCM is not effective or the costs are high compared to other MCMs that address the same water quality priorities, the Permittee may determine if the implementation strategy can be modified to be more effective, or if there are alternative measure(s) that may work better. Three potential tools for assessing effectiveness, in addition to the information that has been summarized in the annual reports, are described below. The appropriate evaluation method will depend on the type of MCM and the data collected.

The CASQA *Municipal Stormwater Program Effectiveness Assessment Guidance* (May 2007) (Guidance Document) provides a framework for evaluating the effectiveness of a stormwater program and/or the stormwater program elements. It includes multiple outcome levels that reflect a gradient from activity-based to water-quality based outcomes. The Guidance Document identifies the following outcome levels to help categorize and describe the results of the program implementation:

- Outcome Level 6 – Receiving Water Quality,
- Outcome Level 5 – Runoff Quality,
- Outcome Level 4 – Sources and Loads,
- Outcome Level 3 – Behavior,
- Outcome Level 2 – Awareness, and
- Outcome Level 1 – Implementation.

At this time, water-quality based outcomes (Outcome Levels 4-6) will likely be tenuous for most control measures or unable to be determined, so it is recommended that the evaluations of effectiveness focus on activity-based outcomes (Outcome Levels 1-3). CASQA is expected to release an updated version of its effectiveness assessment guidance manual in early to mid-2014. The updated guidance is expected to advance the concept and tools of effectiveness assessments for stormwater Program Managers. Once available, the tools from the new guidance can be utilized to support the evaluation of the MCM effectiveness.

Another approach to evaluating the effectiveness of source control programs, (WERF and ASCE 2012), is to estimate the potential load reduction associated with an MCM. This is accomplished by determining a participation rate for the target audience (*e.g.*, business outreach is performed at 90 percent of facilities) and a loading factor (*e.g.*, 50 percent of the pollutant load is reduced if there is 100 percent participation). The participation and loading factors are multiplied to estimate effectiveness with respect to reduction in loading of a pollutant that is released to the environment (*e.g.*, 45 percent effectiveness for the above examples). This strategy typically requires several assumptions to be made and will be easiest to employ with MCMs that target specific pollutants. Similarly, a non-static approach that utilizes buildup/washoff approaches could be utilized.

A cost analysis can be used to determine if a MCM is an efficient use of program resources. A cost analysis helps evaluate the resources necessary to implement the MCM as compared to its effectiveness. The overall cost should take into account the time requirements of staff and the direct costs of any materials needed.

3.2.3 Other Institutional BMPs Under Consideration for EWMP

There may be other institutional BMPs that are not considered as MCMs in the MS4 Permit, but that could provide significant water quality improvements for one or more WBPCs. The BCWMG will consider alternative institutional BMPs for inclusion in the EWMP. These BMPs could replace existing MCMs in the MS4 Permit that are reduced or eliminated, or could serve to reduce the need placed on structural BMPs to meet water quality objectives. Several additional institutional BMPs proposed within several existing Ballona Creek WMA plans, include but are not limited to the following:

- Water-use efficiency BMPs for dry weather runoff reduction,
- Support for new legislation to reduce allowable copper content in brake pads, and
- Rebates or other incentive programs for property owners to install rain barrels or disconnect downspouts.

Section 4
Reasonable Assurance Analysis Approach

4.1 Introduction

A key element of each EWMP is the RAA, which is used to demonstrate "that the activities and control measures…will achieve applicable WQBELs and/or RWLs with compliance deadlines during the Permit term" (Section C.5.b.iv.(5), page 63). The purpose of this section of the Work Plan is to describe the process to be used to conduct the RAA for the Ballona Creek EWMP. While the Permit prescribes the RAA as a quantitative demonstration that control measures (BMPs) will be effective, the RAA also provides an opportunity to utilize a modeling process to identify and prioritize potential control measures. In other words, the RAA approach for the Ballona Creek watershed will result in not only demonstrating the cumulative effectiveness of BMPs to be implemented, it will also support BMP *selection*. Additionally, the RAA considers the applicable compliance dates and milestones for attainment of the WQBELs and RWLs, and therefore supports BMP scheduling.

The modeling component of the RAA effort will begin in summer 2014, and the methodology described herein will likely evolve over the course of EWMP development. Also, the proposed RAA methodology is generally consistent with the RAA Guidelines document from the LARWQCB.

4.2 Modeling System to be used for the RAA

The Watershed Management Modeling System (WMMS) will be used to support the RAA. WMMS is identified in the Permit as a potential tool to conduct the RAA. The LACFCD, through a joint effort with USEPA, developed WMMS specifically to support informed decisions associated with managing stormwater. The ultimate goal of WMMS is to identify cost-effective water quality improvement projects through an integrated, watershed-based approach. The WMMS encompasses Los Angeles County's coastal watersheds of approximately 3,100 square miles, representing 2,655 subwatersheds (Figure 4-1)**.** As described in the following subsections, WMMS is a modeling system that incorporates three tools: (1) a watershed model for prediction of long-term hydrology and pollutant loading (LSPC – Loading Simulation Program C++), (2) a BMP model (SUSTAIN – **S**ystem for **U**rban **S**tormwater **T**reatment **A**nalysis and **IN**tegration), and (3) a BMP optimization tool to support regional, cost-effective planning efforts (NIMS). A total of 115 subwatersheds in the Ballona Creek watershed are represented by WMMS (Figure 4-2). To support evaluation of regional BMPs, these subwatersheds *will be further grouped* by "pour point" to receiving waters.

Figure 4-1 WMMS Model Domain, Representative Land Uses, and Slopes by Subwatershed

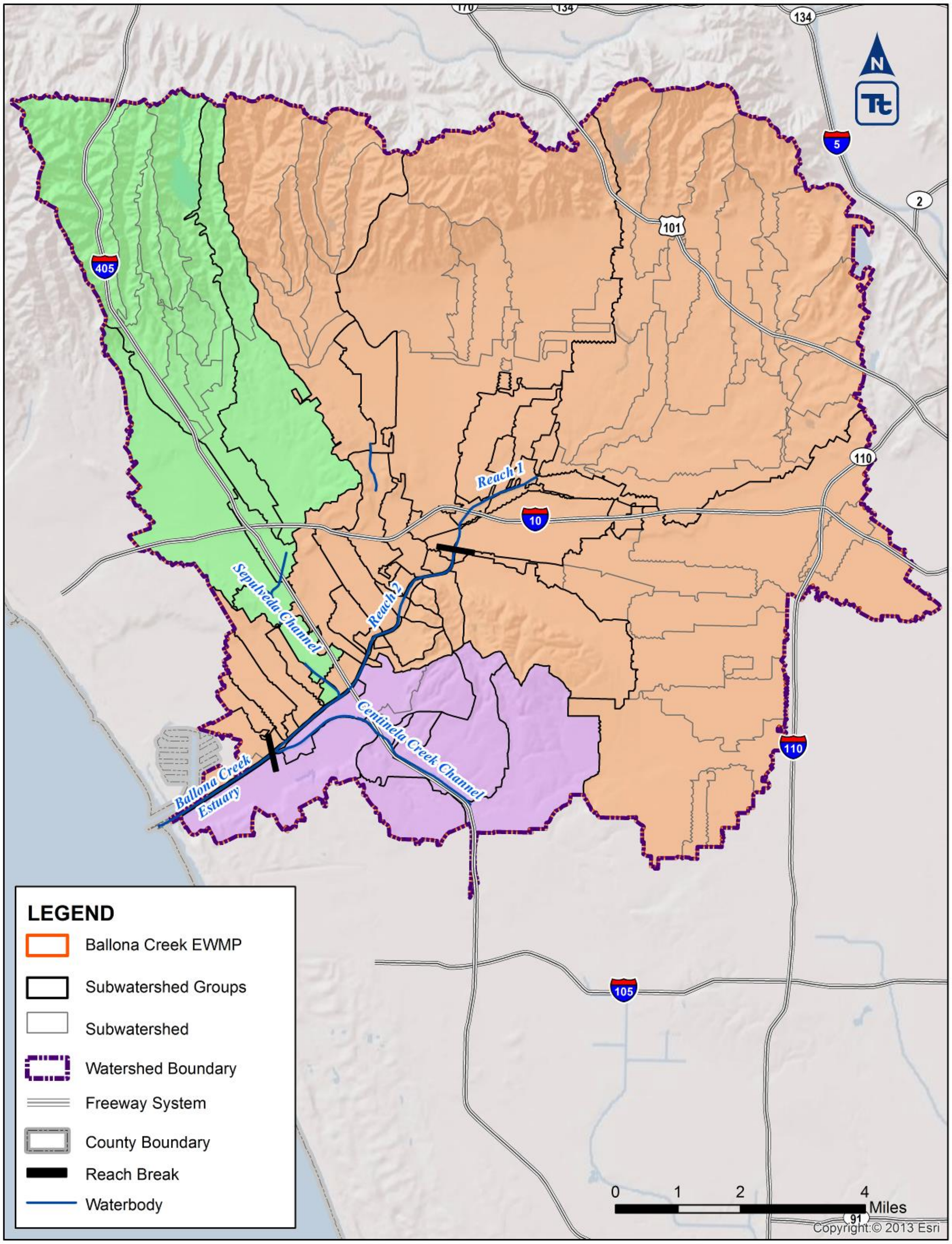


Figure 4-2 Ballona Creek Watershed and the 115 Subwatersheds in WMMS

WMMS is available for public download from LACFCD. The version of WMMS to be used for the Ballona Creek RAA has been customized through enhancements and modifications in several ways, including the following:

- Updates to meteorological records to represent the last ten years and to allow for simulation of the design storm,
- Calibration adjustments to incorporate the most recent ten years of water quality data collected at the nearby Ballona Creek mass emission station,
- Enhancements to LSPC to allow for simulation of non-structural BMPs,
- Enhancements to SUSTAIN to allow for representation of an expanded/modified BMP network,
- Application of a second-tier of BMP optimization using SUSTAIN, which replaces the NIMS component of WMMS,
- Optimization of BMP effectiveness for removal of bacterial pollutant (rather than metals only), and
- Updates to GIS layers, as available.

4.2.1 Watershed Model - LSPC

The watershed model included within WMMS is the Loading Simulation Program C++ (LSPC) (Shen *et al.*, 2004; Tetra Tech and USEPA 2002; USEPA 2003). 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 PC-based Windows 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. Another advantage of LSPC is that there is no inherent limit to the size and resolution of the model than can be developed, making it an attractive option for modeling the Los Angeles region watersheds. 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.

The WMMS development effort culminated in a comprehensive watershed model of the entire Los Angeles County area that includes the unique hydrology and hydraulics of the system and characterization of water quality loading, fate, and transport for all the key TMDL constituents (Tetra Tech 2010a, 2010b). The 115 subwatersheds in the Ballona Creek watershed as represented by WMMS are shown in Figure 4-2. Since the original development of the WMMS LSPC model, Los Angeles County personnel have independently updated the model with meteorological data through 2012, and refined the physical representation of the spreading grounds with higher resolution information.

4.2.2 Small-Scale BMP Model – SUSTAIN

The **S**ystem for **U**rban **S**tormwater **T**reatment and **A**nalysis **IN**tegration (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 resource goals (USEPA, 2009). It was specifically developed as a decision-support system for selection and placement of BMPs at strategic locations in urban watersheds. It includes a process-based continuous simulation BMP module for representing flow and pollutant transport routing through various types of structural BMPs. Users are given the option to select from various algorithms for certain processes (*e.g.*, flow-routing, infiltration, etc.) depending on available data, consistency with coupled modeling assumptions, and the level of detail required. Figure 4-3 shows images from the SUSTAIN model user interface and documentation depicting some of the available BMP simulation options in a watershed context.

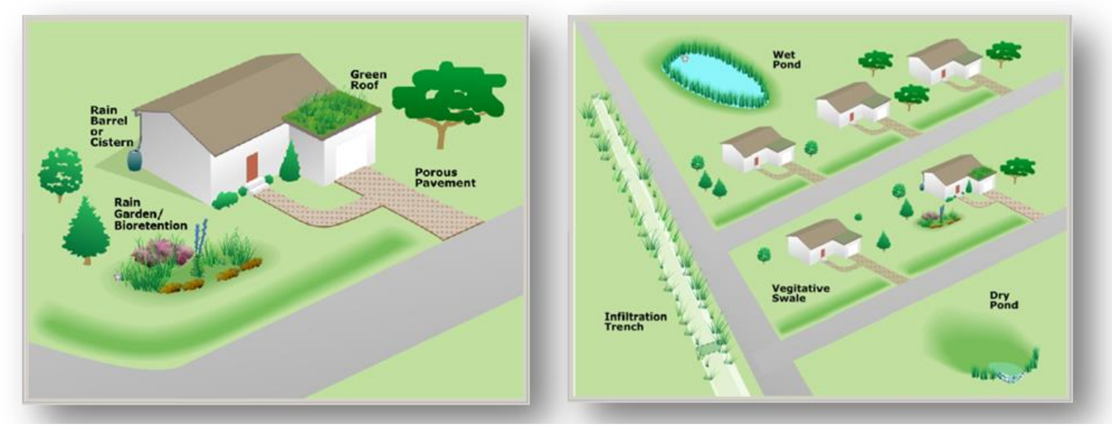


Figure 4-3 SUSTAIN Model Interface Illustrating Some Available BMPs in Watershed Settings

SUSTAIN extends the capabilities and functionality of traditionally available models by providing integrated analysis of water quantity, quality, and *cost factors*. The SUSTAIN model in WMMS includes a cost database comprised of typical BMP component cost data from a number of published sources including BMPs constructed and maintained in LA County. SUSTAIN considers certain BMP properties as "decision variables," meaning that they are permitted to change within a given range during model simulation to support BMP selection and placement optimization. As BMP size changes, so do cost and performance. SUSTAIN runs iteratively to generate a cost-effectiveness curve comprised of optimized BMP combinations within the modeled study area (*e.g.,* the model evaluates the optimal width and depth of certain BMPs to determine the most cost-effective configurations for planning purposes).

4.2.3 Large-Scale BMP Optimization Tool – NIMS

WMMS was specifically designed to dynamically evaluate effectiveness of BMPs implemented in subwatersheds for meeting downstream RWLs while maximizing cost-benefit. The structural BMP strategies included in WMMS primarily focus on (1) distributed green infrastructure BMPs and (2) large regional BMPs. With the number of alternative combinations of BMPs possible in a watershed, the ability to evaluate and compare the benefits and costs of each scenario (representing a combination of multiple BMPs) is highly desirable. As such, WMMS employs optimization based on an algorithm named Nonlinearity-Interval Mapping Scheme (NIMS) to navigate through the many potential scenarios of BMP strategies and identify the strategies that are the most cost-effective (Zou *et al.* 2010). While SUSTAIN performs optimization at the subwatershed-scale, NIMS optimizes at the watershed-scale, supporting identification of the subwatersheds that should be targeted to most cost effectively achieve pollutant reduction goals The RAA will employ a similar watershed-scale optimization approach as NIMS, except SUSTAIN will be leveraged because optimization at the jurisdictional level (rather than watershed-wide) is not readily achieved with NIMS. This optimization approach with SUSTAIN is referred to as "two-tiered", meaning both subwatershed-scale and watershed-scale optimization is being conducted (see Figure 4-2 for the 115 subwatersheds in the Ballona Creek Watershed).

4.3 Overview of the RAA Process and Elements

The proposed RAA approach is a predictive quantitative process that includes the following components (see Figure 4-4 and the more detailed descriptions in the following subsections):

1. **Incorporates Water Quality Priorities and identifies Numerical Goals to address them** (Step 1): the Water Quality Priorities identified in Section 2 and corresponding Numeric Goals (*i.e.*, TMDL targets, WQBELs, and RWLs) represent RAA drivers,. The estimated baseline/existing loading provides a reference point of comparison for measuring BMP performance and cost-effectiveness (*i.e.*, the difference (Δ) between the current loading and predicted loading after BMPs are implemented, and the cost ($) of those BMPs).

2. **Identifies opportunities for BMP implementation in the watershed** (Step 2): the RAA inherently includes an exploratory element for evaluating BMP opportunities. The opportunities include BMPs under construction (committed BMPs), BMPs in planning documents (proposed BMPs), and additional BMPs identified through the iterative modeling process (potential BMPs).

3. **Evaluates effectiveness of potential BMPs on receiving water quality and jurisdictional loading** (Step 3): EWMPs are ultimately developed as "recipes for compliance" for each jurisdiction, but compliance is also assessed in the receiving waters. As such, assessment of the effectiveness of BMP scenarios requires consideration of averaging/simulation periods and determination of points where load reductions will be assessed.

4. **Identifies the combination of BMPs expected to attain Numeric Goals** (Step 4): the RAA will be an iterative process that evaluates different combinations of BMPs and quantifies their effectiveness. It is through the iterative modeling process that certain BMPs will be prioritized for inclusion in the EWMP.

   Supports scheduling to implement the BMPs over a timeline that addresses milestones cost-effectively (Step 5): BMPs that offer the greatest immediate benefit for the lowest cost would be among those first identified and included in the early implementation phases. Furthermore, the pace at which BMPs are implemented will be dictated by applicable TMDL and EWMP milestones.

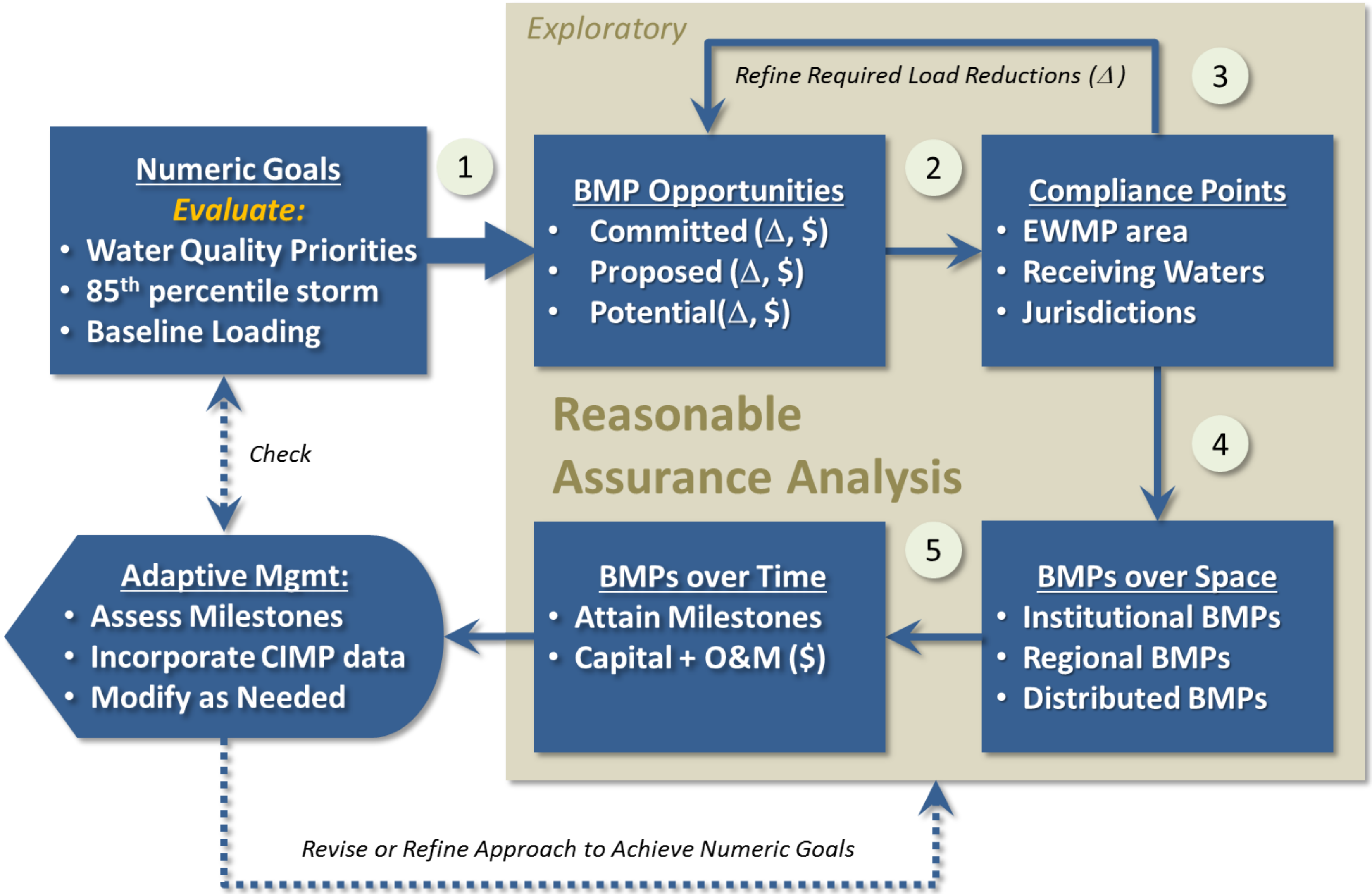


Figure 4-4 Conceptual Diagram of RAA Components

4.3.1 Establishing Numeric Goals to Address Water Quality Priorities (Step 1)

The Water Quality Priorities (WQ Priorities) are the primary driver of the EWMP and its BMPs. The Permit provides two types of Numeric Goals for addressing WQ Priorities (see Figure 4-5):

- Retain the standard runoff volume from the 85th percentile, 24-hour storm, and
- Achieve the necessary *pollutant load* reductions to attain RWLs or WQBELs.

At this time, the difference in these two compliance paths (in terms of number and types of BMPs) is unknown. As such, early in the RAA process, both types of Numeric Goals will be evaluated. If the Numeric Goal based on the 85th percentile storm is similar to the pollutant-based Numeric Goal, then the volume-based goal may be selected because [1] it offers increase compliance coverage (also applies to final TMDL limits) and [2] it represents a more comprehensive approach to addressing all Water Quality Priorities while also promoting increased sustainability of local water supplies.

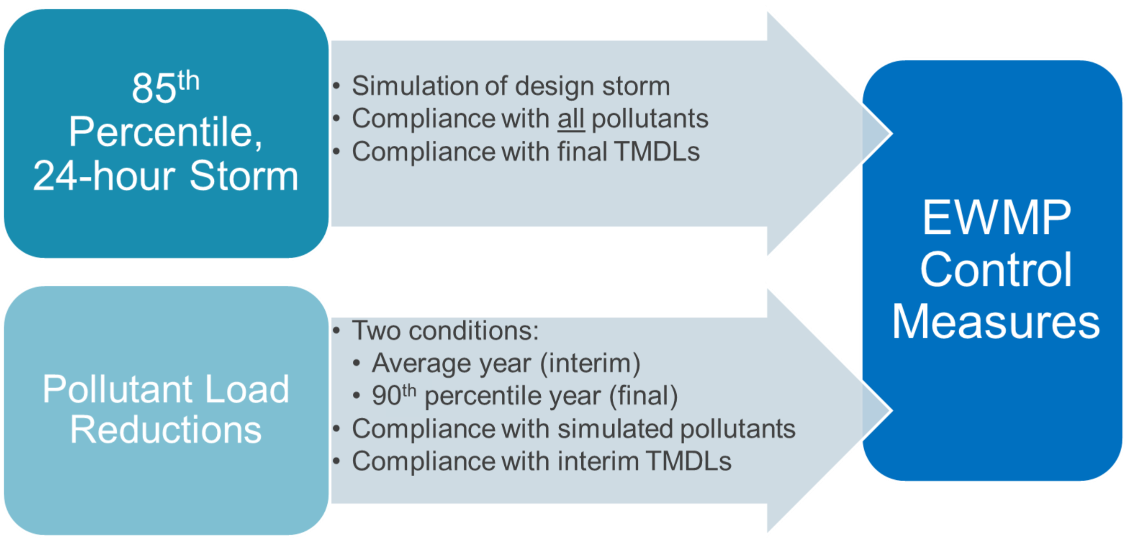


Figure 4-5 Two Types of Numeric Goals and EWMP Compliance Paths

4.3.1.1 Numeric Goals based on 85th Percentile, 24-hour Storm Volume

The volume associated with the 85th percentile, 24-hour storm varies by subwatershed. Each of the 115 subwatersheds in the Ballona Creek watershed will have a unique volume, due to varying rainfall amounts and land characteristics (imperviousness, soils, slope, *etc*.). Shown in Figure 4-6 are the rainfall depths associated with the 85th percentile, 24-hour storm. These rainfall amounts will be used as boundary conditions in the LSPC watershed model, in order to predict the associated runoff volumes for each of the 115 subwatersheds in the Ballona Creek River watershed. These runoff volumes could potentially be attained with distributed BMPs (both retrofits and BMP implemented through LID ordinances) as well as Regional EWMP Projects.

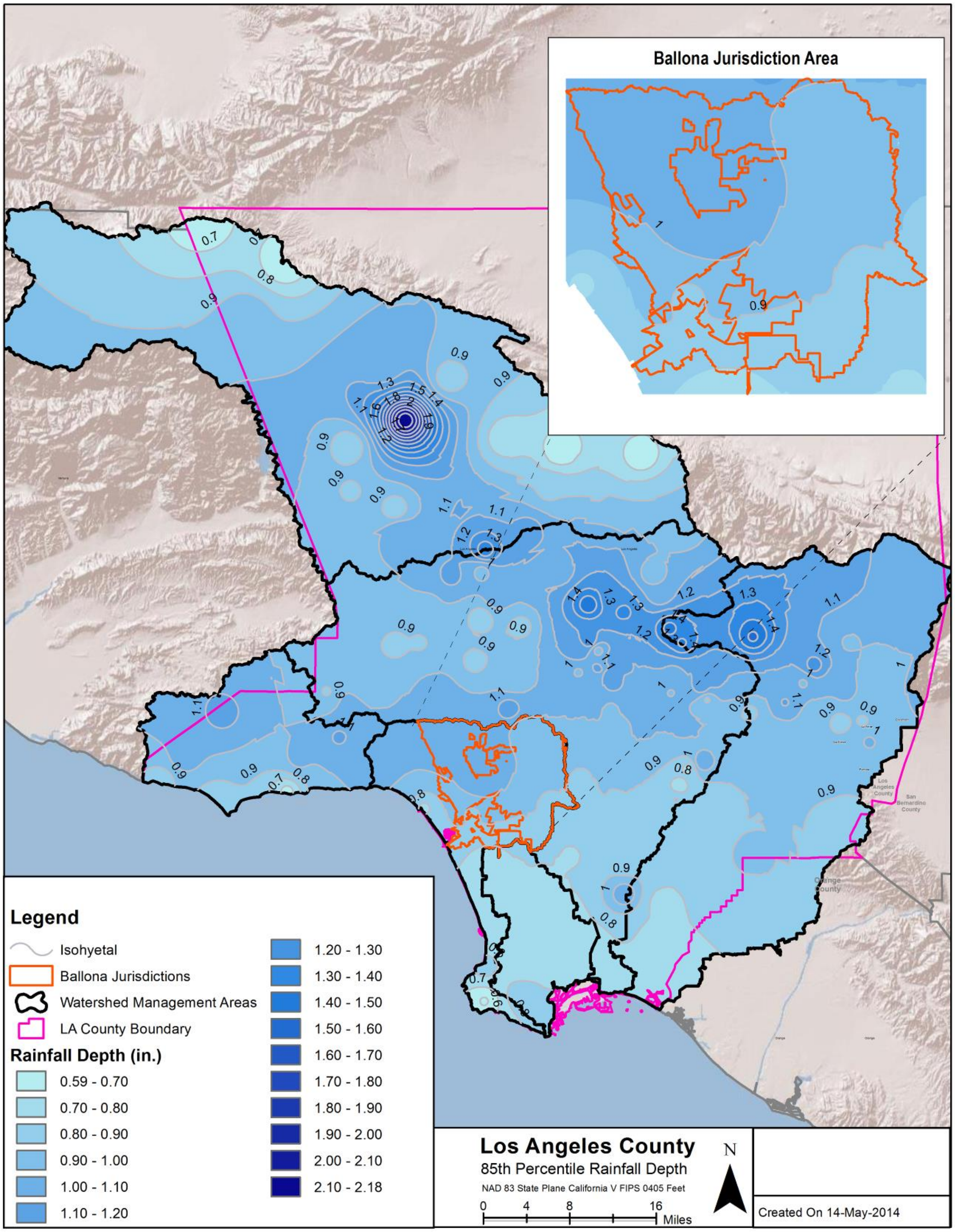


Figure 4-6 Rainfall Depths Associated with the 85th Percentile, 24-Hour Storm

4.3.1.2 Numeric Goals based on Pollutant Load Reductions

The numeric goals based on pollutant load reductions are derived from WQBELs and RWLs. The required pollutant load reduction is the difference between current/baseline loading and the loading predicted to attain the WQBELs and RWLs. The baseline loading will be calculated for most WQ Priority pollutants by simulating the hydrology and water quality that occurred during average conditions and critical conditions, per the RAA Guidelines from the LARWQCB. At this time, it is anticipated the 90th percentile wet year will serve as a "default" critical condition for many pollutants, though several critical conditions may be evaluated. One possible exception is the Ballona Creek Toxics TMDL, which uses the average year as the critical condition.

The load-based Numeric Goals will assume each jurisdiction is held to the same percent load reduction for the critical pollutant associated with the compliance point of concern. With each jurisdiction held equitably to the same load reduction percentage, this ensures (1) the overall net load reduction for the entire watershed is consistent with the required TMDL reduction, and (2) that each contributing jurisdiction does an equal amount of effort to achieve this goal relative to the loads emanating from their jurisdiction. The result is that jurisdictions with higher existing loads also have more loads to reduce in order to achieve the same percent reduction as jurisdictions with lower existing loads.

The EWMP will prescribe responsibilities for each MS4 Permittee and thus a GIS analysis will be performed to support determination of the BMP planning areas for the EWMP. Caltrans facilities and parcels with facilities subject to general or individual industrial NPDES permits will be extracted prior to determination of baseline MS4 loading. Other parcels outside of the MS4 jurisdictions will also be excluded, including state and federally-owned land.

Many of the pollutants included in the WQ Priorities for the Ballona Creek EWMP are listed in Table 4-1, along with the approach for modeling them for the RAA. The LSPC watershed model in WMMS includes modules for modeling sediment, metals, bacteria, and nutrients (not all pollutants can be modeled cost-effectively). Pollutants in the WQ Priorities that do not fall directly in these classes will be indirectly modeled by associating them with a surrogate pollutant to which they are typically associated within the environment, as shown in Table 4-1. For example, certain toxic and legacy pollutants are typically associated with sediment, and therefore sediment reductions will be associated with toxics/legacy pollutant reductions.

The RAA will include many pollutants, yet it is likely that one or two pollutants are "limiting," meaning that achieving the Numeric Goal applicable to those pollutants (through BMP implementation) will result in other pollutant also meeting their Numeric Goals. An analysis will be performed to determine which of the pollutants in Table 4-1 are limiting.

Table 4-1 Approach for Modeling a Subset of Water Quality Priority Pollutants

Pollutant Type	Pollutant	Modeled LSPC Pollutant Category ● Directly Modeled ○ Indirectly Modeled			
		Sediment	Metals	Nutrients	Bacteria
Metals	Copper		●		
	Lead		●		
	Zinc		●		
	Selenium		○		
	Cadmium		○		
	Silver		○		
Bacteria	Fecal Coliform				●
	Total Coliform				○
	E. coli				○
	Enterococcus				○
Historical Organics	Chlordane	○			
	DDT	○			
	PAH	○			
	PCBs	○			
Trash	Trash	n/a			
Nutrients[1]	Ammonia			○	
Sediment	Sediment	●			
-	Cyanide	○			

1. Ammonia portion estimated as a portion of Total Nitrogen (Directly Modeled)
n/a. Trash will not be modeled. The trash capture and quantification approach of the Trash TMDL will be used.

4.3.2 Identifying Opportunities for BMP Implementation (Step 2)

Opportunities for BMP implementation are driven by locations where BMPs are feasible/desirable. This step in the RAA process includes the following analyses:

- **Distributed BMPs**: the RAA process includes a desktop GIS analysis to identify roads, public parcels and rights-of-way (see Figure 4-7). Then, screening criteria such as slope and soil contamination are used to exclude areas where BMP implementation is less feasible. The potential capacity available for distributed BMPs will be determined for each of the 115 subwatersheds (one capacity per subwatershed), based on the GIS screening. For example, the capacity available for green streets will be assessed based on the estimated length and width of roads in each subwatershed that met the screening criteria. Note that distributed BMPs on private parcels, as implemented through the LID ordinances, will be incorporated separately through redevelopment projections.

- **Regional BMPs**: the process for identifying Regional EWMP Projects and regional BMPs is described in Section 3.1. The WMMS model will be used iteratively to assess the effect of potential Regional EWMP Projects, and evaluate which, if any, additional BMPs are needed.

Overall, the results of the BMP screening determine the capacity available on public parcels and rights-of-way for BMP deployment, and ultimately the amount of private land acquisition required (if any) to provide additional BMP capacity to meet the Numeric Goals.

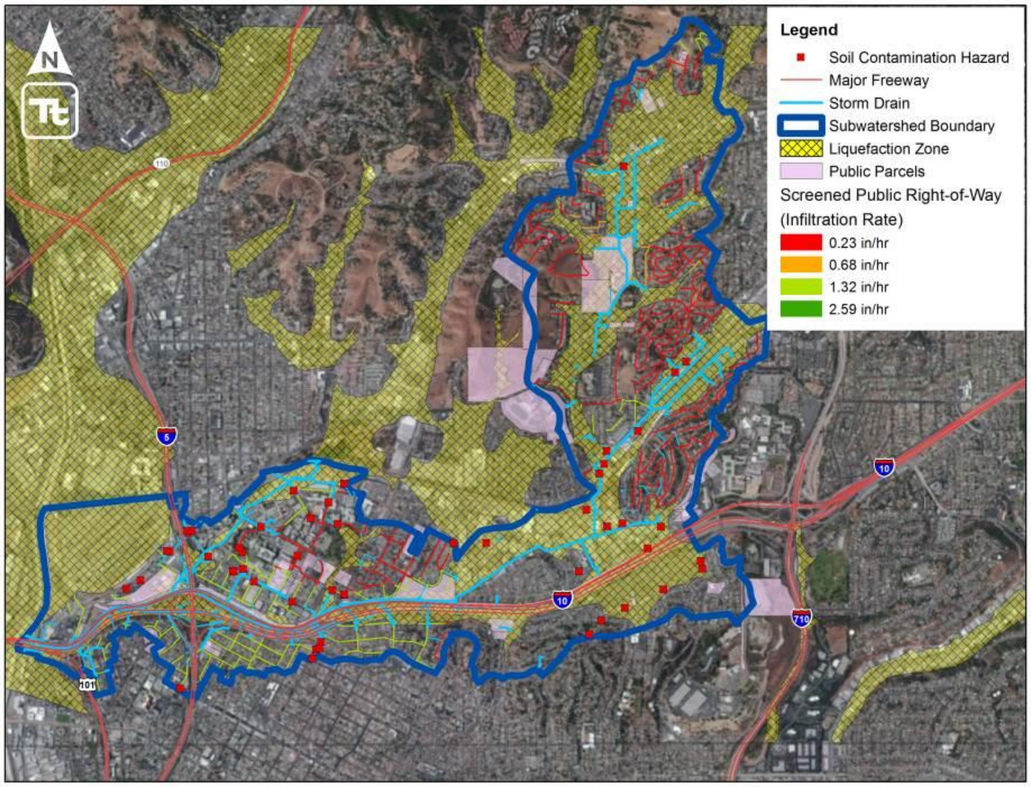


Figure 4-7 Example of GIS Data used to Screen for Regional and Distributed BMP Opportunities

4.3.3 Evaluating Effectiveness of Potential BMPs (Step 3)

BMP performance varies according to multiple factors including BMP type, location, size to drainage area ratio, contributing area imperviousness, etc. WMMS will be used to explore scenarios for BMPs to be included in the EWMP, including the following:

- **Institutional BMPs**: using the LSPC watershed model, the potential effectiveness of new or enhanced institutional BMPs including enhanced street sweeping, enhanced irrigation control (elimination of non-stormwater discharges through programmatic efforts), and brake pad replacement will be quantified. In addition, a small percent will be assumed to apply to all other "non-modeled" institutional BMP enhancements (*e.g.*, enhanced public outreach/education). Note that only enhancements will be modeled as it is assumed the effect on water quality of current level of institutional BMP implementation is captured in the water quality data utilized to establish baseline loading.

- **Distributed BMPs**: using the SUSTAIN BMP model, the potential effectiveness of distributed BMPs on volume reduction and pollutant loading from each of the 115 subwatersheds in the Ballona Creek watershed will be assessed.

- **Regional BMPs:** using the LSPC watershed model, the potential effectiveness of Regional EWMP Projects identified through the regional BMP selection process will be quantified (see Section 3.1). A generalized approach to incorporating Regional EWMP Projects into the RAA process is shown in Figure 4-8.

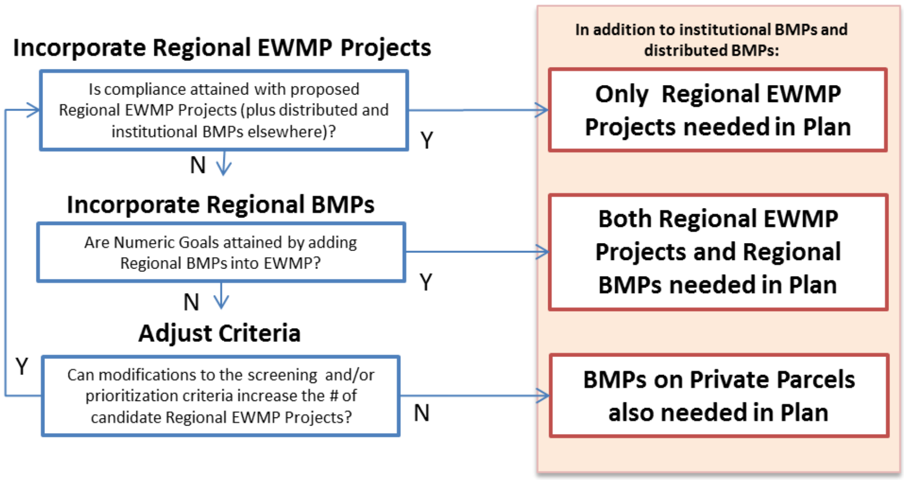


Figure 4-8 Generalized Process for Incorporating Regional EWMP Projects into the RAA

An illustration of using WMMS to identify required BMP capacities at the watershed-scale is shown in Figure 4-9. The figure shows the interaction between compliance points, distributed BMP capacities, and decisions on regional BMPs. The shading of the subwatersheds shows the capacity of distributed BMPs necessary to meet the Numeric Goals (darker blue indicates more BMP capacity to be implemented to meet Numeric Goals).

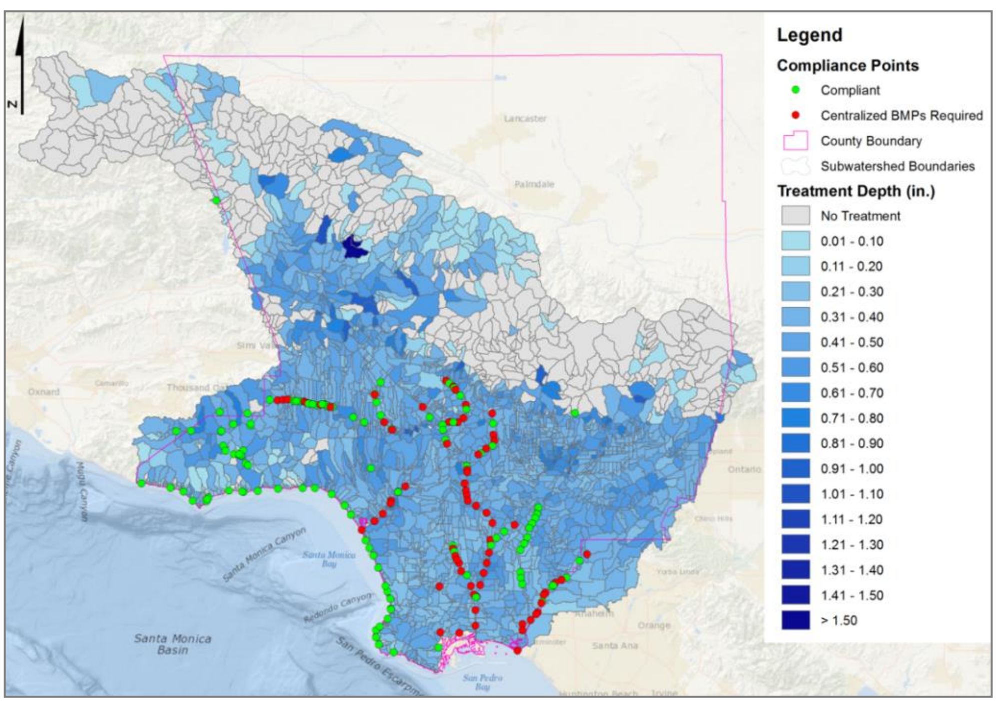


Figure 4-9 Hypothetical Example of WMMS Output Showing BMP Capacities by Subwatershed and Linkage to Receiving Water Conditions

The dots indicate whether RWLs are attained (green is attainment, red is non-attainment). In cases, where red dots are shown, the output indicates that additional BMPs are required upstream to attain RWLs.

The process for determining the necessary *cumulative* BMP capacity for both distributed and regional BMPs in each of the 115 subwatersheds in the Ballona Creek watershed depends on the type of Numeric Goal being addressed. As shown in Figure 4-10, the volume-based (85th percentile storm) approach, necessary BMP capacity is determined through a design storm analysis. For the load-based (pollutant reduction), the analysis is more intensive and will utilize in-stream receiving water assessment points to guide optimization of load-reduction BMPs. Attainment of load-based Numeric Goals will be evaluated based on [1] analysis of the subwatershed loadings and opportunities and [2] linkage to receiving water conditions through simulation of the representative year. The BMP treatment capacities determined to be needed will drive the number and type of BMPs selected for inclusion in the EWMP, as described in the next subsection. A key factor for selecting those BMPs is the preferences among the different BMP types.

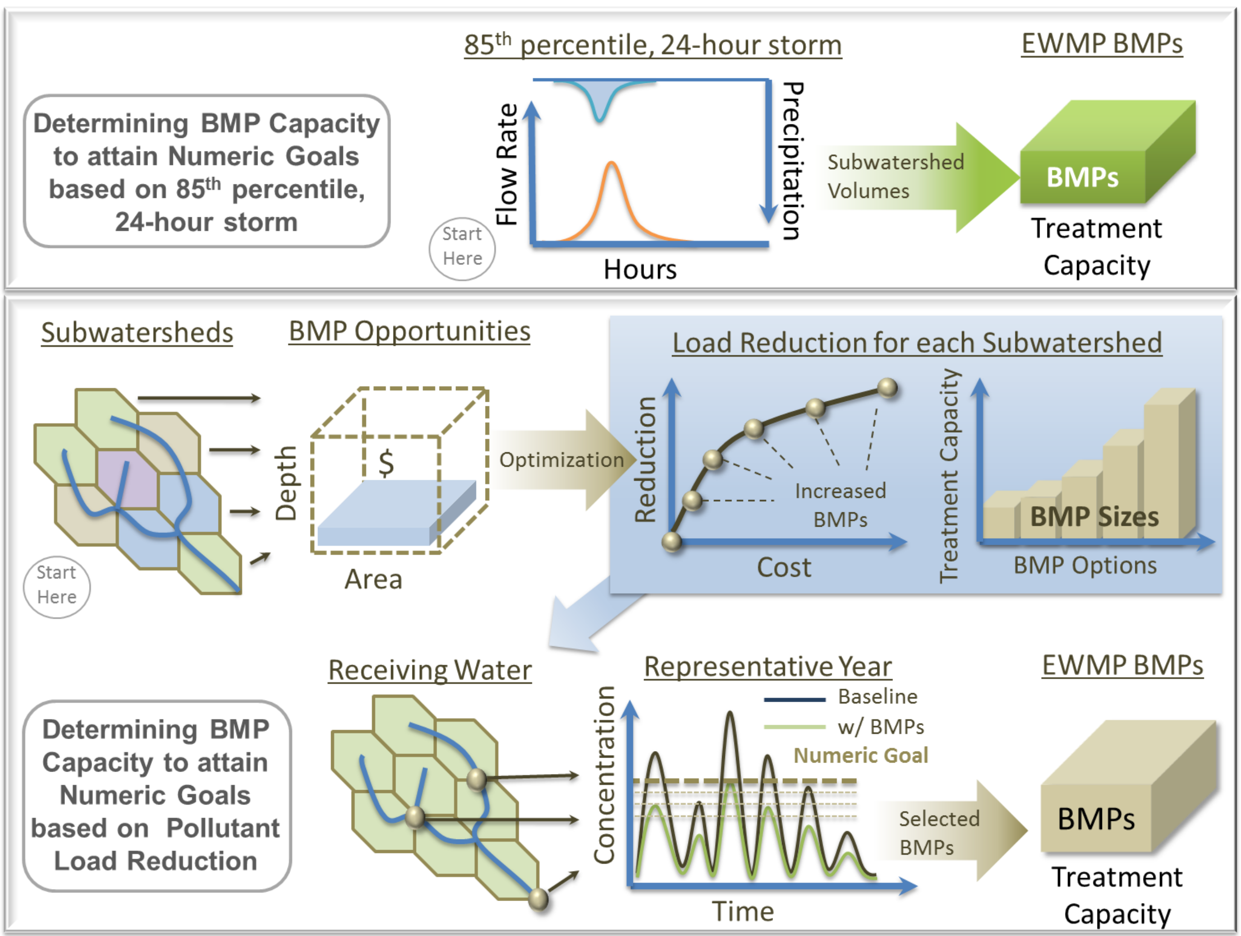


Figure 4-10 Illustration of the Process for Determining Required BMP Capacities for the RWMP using Volume-Based (Top Panel) and Load-Based (Bottom Panel) Numeric Goals

In general, the BMP preferences for the RAA, based on cost effectiveness, are shown in Figure 4-11. Notice the diminishing returns of load reduction associated with each additional BMP effort moving up the curve. These default preferences will be modified on a jurisdiction-by-jurisdiction basis, using a BMP Preferences Survey that has been distributed to the Ballona Creek WMA Group members. Some BCWMA Group members may choose to implement a BMP type, while others choose to not (regardless of the generalized approach below). As shown in Figure 4-11, the generalized approach to BMP preferences includes the following:

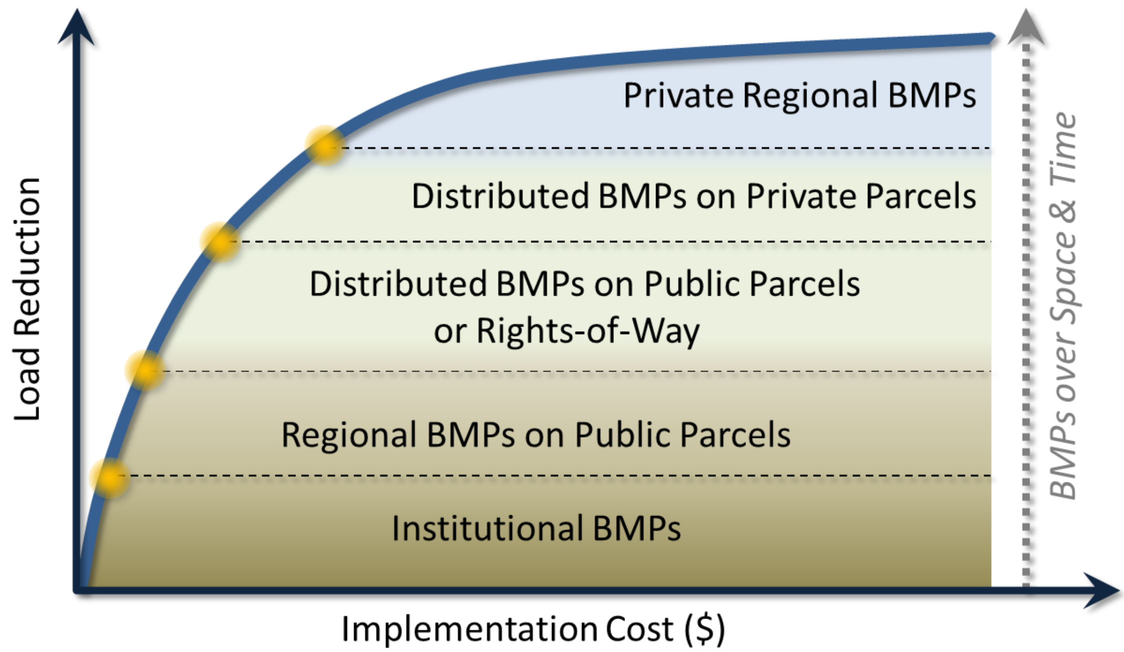


Figure 4-11 Generalized Preferences for BMP Types to be Incorporated into the RAA and EWMP

- **Minimum control measures and other institutional BMPs** (such as street sweeping) are often preferred because they can reduce flows and/or pollutants with little capital cost. Enhancement of institutional BMPs can provide an immediate load reduction at a relatively low cost. However, implementation of institutional BMPs often requires coordination with multiple departments with a municipality/agency.
- The preference of distributed versus regional BMPs is determined on a case-by-case basis.

Regional BMPs located on public parcels are often preferred because (1) there are little to no land acquisition costs (although there are institutional issues to overcome in a multijurisdictional setting), (2) publicly-owned land has fewer ingress/egress barriers for maintenance, and (3) regional facilities offer economies-of-scale in terms of treated drainage area. However, while they may have the lowest cost per pollutant load reduced, regional BMPs are also generally the most expensive *individual* projects. Finally, the regional BMPs that qualify as Regional EWMP Projects provide additional compliance coverage.

Distributed BMPs may be preferred because (1) they can often be implemented in the rights-of-way, (2) they often have multiple benefits including green infrastructure (*e.g.*, green streets) improving aesthetics and enhancing property values and (3) the costs for *individual* projects are less than regional BMPs. Also many distributed BMPs will be implemented over time by private land owners, as required by LID ordinances. However, distributed BMPs may be limited in their ability to achieve the necessary volume/load reductions identified by the RAA. Also, it may take more time to treat the volume that regional BMPs can treat, because so many *individual* projects must be completed and the multitude of projects increases maintenance requirements.

There will likely be locations where the BMP capacity on public parcels is insufficient to attain the Numeric Goals, and BMP sites on private land will need to be incorporated into the EWMP. BMPs on private land will be avoided to the extent possible. However, where needed to support compliance, they will be slated later in the EWMP implementation schedule as described in Section 4.3.5.

4.3.4 Identify the Combination of BMPs Expected to Attain Numeric Goals (Step 4)

The iterative RAA process will ultimately result in combinations of BMPs predicted by the customized WMMS to cost-effectively attain the Numeric Goals. As shown in Figure 4-12, the RAA output for a key Numeric Goal-milestone combinations will present BMPs in the following manner:

- Individual jurisdictions: each jurisdiction will have its own set of BMPs to attain the Numeric Goals (top of Figure 4-12). In addition, each jurisdiction will receive a detail BMP "recipe" for each subwatershed within its jurisdiction (bottom of Figure 4-12).
- Regional BMPs: the regional BMPs, including Regional EWMP Projects selected by the BCWMA Group according to the decision process (see Section 3.1), will be included. In the EWMP, these BMPs will be identified with details on location (cross streets) and concepts for the projects (capacity, footprint, etc.).
- Distributed BMPs: for each jurisdiction and each of the 115 subwatersheds, a total treatment capacity ("treatment depth" expressed in inches of runoff) to be achieved by distributed BMPs will be identified. Within that treatment capacity, recommendations for the types of distributed BMPs to implement will be provided. The BCWMA Group members will have flexibility to substitute one type of distributed BMP for another type during adaptive management, as long as the total treatment capacity is achieved for the subwatershed (bottom of Figure 4-12). The model identifies the capacities of distributed BMPs needed in each of the 115 subwatersheds, but does not identify specific locations (cross streets) for the distributed BMPs within a subwatershed. Also, there may be opportunities to leverage LID ordinances to achieve some distributed BMP capacity on private land (implemented by private developers).
- Institutional BMPs: for BCWMA Group members that choose to implement the modeled institutional BMPs (enhanced street sweeping, enhanced irrigation control, or brake pad replacement) those enhanced BMPs will be highlighted in the RAA output. In addition, a small percentage will be assumed to apply to all other "non-modeled" institutional BMP enhancements.

A unique set of BMPs will be identified for each interim and final TMDL and other EWMP milestones[5] that occur in the next two Permit cycles. In contrast, TMDL milestones that occur more than two Permit cycles in the future (but prior to the final TMDL compliance dates) will not be considered to the same level of detail. The BMP sequencing process is described in the next subsection.

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5 Because EPA TMDLs, Category 2 WQ Priorities, and Category 3 WQ Priorities do not have adopted TMDL implementation schedules, the EWMP shall propose milestones to address them.

Jurisdiction	Total Number of Regional BMPs	Total Capacity of Distributed BMPs				Non-structural BMPs/MCMs	
		Treat-ment Depth (inches)	Green streets (ft)	Bio-retention (ft^3)	LID on private (ft^3)	Enhanced Irrigation ordinances	Enhanced sweeping
City A	6	0.54	884,323	662,676	421,567	●	
City B	3	0.37	97,634	88,954	14,623	·	●
City C	2	0.34	56,534	47,453	7,890	●	
City D	2	0.12	45,323	39,494	6,375	●	
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
City Z	4	0.48	297,634	188,954	114,623		●

Jurisdictional Sub-area (sub-watershed)	Total Number of Regional BMPs	Total Capacity of Distributed BMPs				Non-structural BMPs/MCMs	
		Treat-ment Depth (inches)	Green streets (ft)	Bio-retention (ft^3)	LID on private (ft^3)	Enhanced Irrigation ordinances	Enhanced sweeping
1	1	0.54	4,323	675	567	●	
2	0	0	0	0	0	●	
3	1	0.24	534	453	890	●	
4	2	0	0	0	0	●	
.	.	.	.	.	.	.	
.	.	.	.	.	.	.	
115	0	0.68	8,634	4,954	3,623	●	

Figure 4-12 Hypothetical Example of RAA Output for One Set of Numeric Goals for the Entire Watershed (Top Panel, One Row Per Jurisdiction) and for an Individual Jurisdiction (Bottom Panel, one Row per Subwatershed)

The BMP numbers, types, capacities and locations are completely hypothetical, for illustration purposes only. Note the output (bottom) is separated into 115 subwatersheds. This type of output will be generated each interim and final TMDL milestones that occur in the next two Permit cycles.

4.3.5 Using the RAA to Support BMP Scheduling (Step 5)

The TMDL and EWMP milestones/compliance dates establish the pace at which BMPs must be implemented. Traditionally, the approach of TMDL implementation plans has been focused on *final* TMDL compliance, whereas the Permit compliance paths offered to EWMPs increase emphasis on *milestones*. For each interim and final TMDL milestones that occur in the next two Permit cycles, the combination of BMPs expected to result in attainment of the corresponding Numeric Goals will be identified by the RAA. In addition, the control measures to attain final TMDL Numeric Goals (even if beyond two Permit terms) will be identified to support long-term planning. An illustration of the BMP scheduling to account for milestones is shown in Figure 4-13.

The TMDL milestones for the Ballona Creek watershed are shown in Table 1-5, which illustrates the potentially complicated sequence based on multiple pollutants. For example, in the two years following submittal of the EWMP, there are milestones for both metals and toxics. As such, the limiting pollutant analysis will be important for establishing the pace of BMPs. Furthermore, dry weather milestones tend to occur earlier in the schedule than wet weather milestones. Because the structural BMPs implemented for wet weather will also be relied on for dry weather reductions, the pacing to attain dry weather milestones may be dependent on the pacing to attain wet weather milestones. It is important to note that Table 1-5 does not show the EWMP milestones (for Category 2 and 3 WQ Priorities), which will be established during EWMP development.

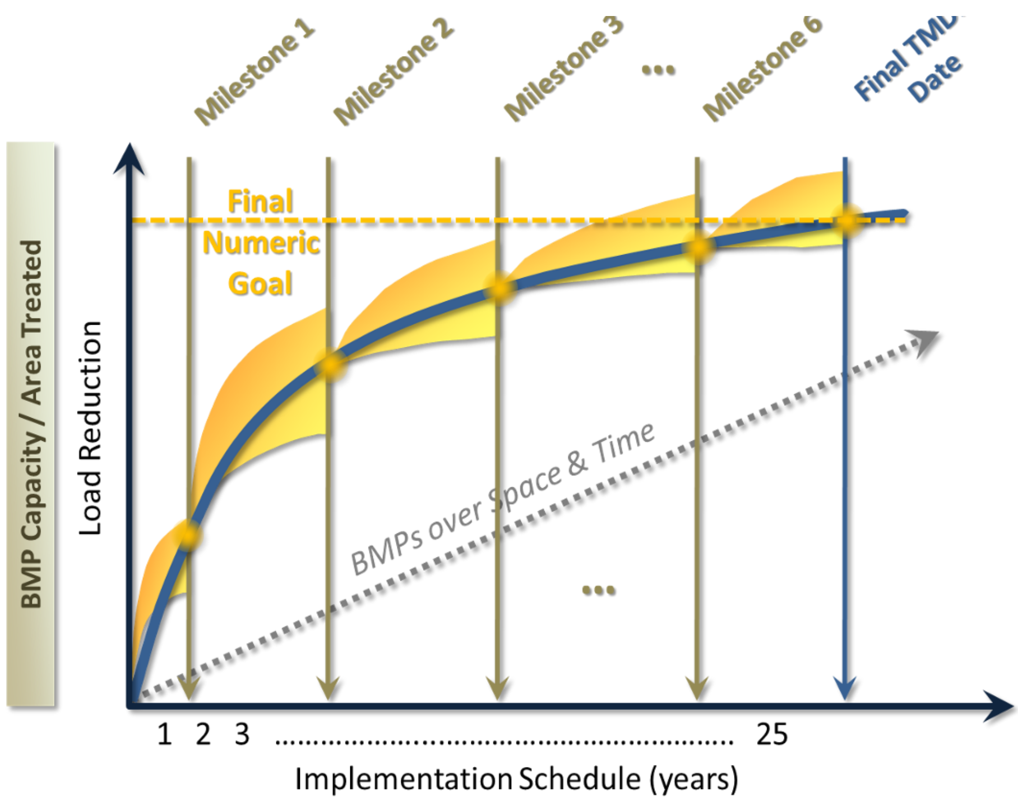

Figure 4-13 Illustration of BMP Scheduling based on TMDL and EWMP Milestones

A unique set of BMPs will be generated for each interim and final TMDL milestones that occur in the next two Permit cycles. The width of the yellow bands represents the relative cumulative BMP capacity to be constructed over the course of each milestone period. The BMPs being implemented during early versus late milestones will likely reflect the BMP preferences shown in Figure 4 11 (*i.e.*, BMPs on private land will be implemented late in the schedule).

4.4 Conclusions

The previous efforts used to develop WMMS will be leveraged to develop the RAA for the Ballona Creek EWMP. The EWMPs will drive innovative approaches for using models to select BMPs to address WQ Priorities based on an array of pollutants over implementation schedules that differ by pollutant. The models used to develop the RAA will also support adaptive management as additional monitoring data are collected and watershed conditions and regulatory requirements change. The RAA developed for the Ballona Creek EWMP will include detailed appendices to document the methods and assumptions used to select BMPs and demonstrate the BMPs will be effective.

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Section 5
EWMP Development

The EWMP Work Plan provides the foundation for the EWMP development process that will culminate in the submittal of the EWMP Plan to the LARWQCB by June 2015. The Work Plan reflects collaboration by the BCWMG members in the formulation of the EWMP Plan. The following subsections briefly describe the formal stakeholder process and EWMP development schedule and milestones.

Comments on the analysis conducted to develop the Work Plan as well as the approaches contained herein to complete the EWMP Implementation of the EWMP Work Plan will be considered in the EWMP. Specially, it is the intention of the BCWMG to follow up with LARWQCB staff and other interested parties.

5.1 Stakeholder Process

Members of the BCWMG participated in the Watershed Management Program Technical Advisory Committee and associated subcommittees. The goals of the BCWMG participation were to gain a better understanding of the perspectives of the interested parties as it related to County-wide considerations for EWMP development and to provide input on the considerations. Additionally, the BCWMG is participating in a EWMP stakeholder outreach process lead by the City of Los Angeles, which is intended to provide additional opportunities for all interested parties to provide meaningful input on their issues and concerns, and attempt to address them in the approach taken during EWMP development.

The BCWMG has identified stakeholders comprised of the following groups in an attempt to provide meaningful opportunities for collaboration and consensus building:

- Key city administrators, stormwater program managers, council districts, etc.,
- Environmental and community organizations, and
- Collaborating governmental agencies, *e.g.*, LARWQCB, US EPA Region 9, Caltrans, and the US Army Corps of Engineers.

A series of three EWMP workshops have been designed to engage the stakeholders by providing a common and consistent orientation to the EWMP process. The first workshop was held during the development of the EWMP Work Plan on April 10, 2014 and included not only the Ballona Creek watershed interested parties, but also four additional watersheds within the County: Upper Los Angeles River, Dominguez Channel, Santa Monica Bay Jurisdictions 2 and 3, and Marina del Rey.

The topics for each of the three workshops are as follows:

1. **Workshop No.1 – Input for the Draft EWMP Work Plans**
   Date: April 10, 2014

The first workshop initiated the formal stakeholder process and the target audience was local and "regional" stakeholders. The agenda consisted of introducing the planned EWMP stakeholder process, explaining the relevance and context of the EWMP process, and soliciting input from stakeholders on regional and distributed projects to potentially include in the EWMP. The second half of this workshop included breakout sessions for watershed-specific discussions and project solicitation.

2. **Workshop No.2 – Draft EWMP Work Plans/RAA Preliminary Results/Regional Projects**
   Target date: October 2014

The second workshop will include a brief recap of the first workshop and highlights of feedback from stakeholders. As with the first workshop, the target audience for this workshop will be the local and regional stakeholders. The agenda will focus on a presentation of the EWMP Work Plan and explain how the input received at the first workshop was addressed in the draft plans. Preliminary results of the RAA will be presented and discussed. Potential regional projects and the GIS tools used for the initial screening will also be discussed. An advance notice, including a more detailed agenda, will be sent out to all stakeholders.

3. **Workshop No.3 – Input into the Draft EWMP Plan**
   Target date: Late 2014/Early 2015

The third workshop will be specific to the Ballona Creek watershed. The purpose of the third workshop will be to provide a summary of activities and work products to date, and to present the outline and key elements of the Draft EWMPs to solicit input. A primary objective of the third workshops will be to present the revised list of proposed regional projects and solicit input. The target audience will be local stakeholders; however, regional stakeholders will also be invited.

5.2 Project Schedule and Milestones

The EWMP Plan will be developed in much the same manner as this initial Work Plan. Draft work memoranda will be developed to address key study elements as indicated in the schedule provided in the June 2013 NOI. These memoranda will describe the analysis conducted, results and recommendations for consideration by the Watershed Management Groups (WMG) members. The major tasks and associated milestone deadlines are summarized in Table 5-1.

Table 5-1 Ballona EWMP Development Schedule

Deliverable	Description	Milestone Deadline
Approach to Addressing Water Quality Priorities not Addressed by a State TMDL Memorandum	TMDLs adopted by the LARWQCB were incorporated into the Permit as WQBELs, RWLs, and a corresponding compliance schedule to meet final milestones TMDLs was adopted by USEPA. Other WBPCs not addressed by a LARWQCB TMDL do not have a commensurate set of interim and final milestones. The memorandum will describe the approach to establishing appropriate milestones for the EWMP.	July 2014 – March 2015
Regional Projects and Initial Screening Memorandum	This memorandum describes the process for assembling a comprehensive list of potential regional projects, and the screening process employed to ultimately identify regional projects to be included in the EWMP.	April 2014 – March 2015
Watershed Control Measures and RAA Results Memorandum	This memorandum describes the WMMS model development for the RAA and key modeling assumptions. It incorporates regional projects presented in the *Regional Projects and Initial Screening Memo*, summarizes the results of the RAA and provides a recommended program of implementation to achieve the water quality goals established in the *Water Quality Improvement Memorandum*.	September 2014 – March 2015
Project Schedules and Cost Estimates Memorandum	This memorandum summarizes the costs and schedules for proposed watershed control measures recommended in the *Watershed Control Measures and RAA Results Memorandum* that will serve as the basis for the recommended EWMP Plan.	December 2014 – March 2015
Draft EWMP Plan	Compiles relevant findings contained in the Work Plan as well as the content of the four memoranda prepared during the EWMP Plan development process.	February 2015 – May 2015
Final EWMP Plan (to the LARWQCB)	Describes the EWMP Plan that will serves as the basis for MS4 NPDES compliance by the BCWMG members.	May 2015 – June 28, 2015

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Section 6
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Appendix 1.A
Notice of Intent

CITY OF LOS ANGELES

CALIFORNIA

ERIC GARCETTI
MAYOR

BUREAU OF SANITATION

ENRIQUE C. ZALDIVAR
DIRECTOR

TRACI J. MINAMIDE
CHIEF OPERATING OFFICER

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December 23, 2013

Mr. Sam Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 W. Fourth Street, Suite 200
Los Angeles, CA 90013

Attention: Mr. Ivar Ridgeway

RESPONSE TO THE REVIEW OF THE NOTIFICATION OF INTENT TO DEVELOP AN ENHANCED WATERSHED MANAGEMENT PROGRAM FOR THE BALLONA CREEK WATERSHED MANAGEMENT GROUP

Dear Mr. Unger:

On behalf of the Ballona Creek Watershed Management Group (Group), the City of Los Angeles, the lead agency for the Group, and the City of Beverly Hills clarify and submit additional information in response to the Board's letter of December 11, 2013 regarding the review of the Notice of Intent (NOI) submitted by the Group on June 27, 2013. The Group acknowledges the Board's staff thorough review and anticipates the provided information will address the comments.

Comments from the Regional Board's staff and the Group's responses are summarized in the table below and are reflected in the attached Revised NOI. Should you have any questions, please contact Hubertus (Huub) Cox of my staff at (213) 485-3984 or Hubertus.Cox@LACity.org.

Comments from the Regional Board	Location in the Revised NOI
Bullet No 1.: On page 2, the resolution numbers for the …	Page 2, Table 1.
Bullet No. 2: The City of Beverly Hills needs to identify…	Page 52, Attachment 8.
Bullet No. 3: The City of Los Angeles proposed to implement Phase II…	Page 51, Attachment 7.
Bullet No. 4: The City of Los Angeles Needs to quantify the expected…	Page 51, Attachment 7.

Sincerely,

Shahram Kharaghani, PhD, PE, BCEE
City of Los Angeles Stormwater Manager

SK/HC:RT
WPDCR:
Attachment

cc
Adel Hagekhalil, Bureau of Sanitation, City of Los Angeles
Huub Cox, Watershed Protection Division, Bureau of Sanitation, City of Los Angles
Daniel Cartagena, Department of Public Works City of Beverly Hills
Damian Skinner, City of Culver City
Sharon Perlstein, City of West Hollywood
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica
Angela George, County of Los Angeles, Department of Public Works
Gary Hidlebrand, Los Angeles County Flood Control District
Dave Smith, NPDES Program, USEPA Region IX
Jennifer Fordyce, Office of Chief Counsel, State Water Board

REVISED NOTICE OF INTENT

Enhanced Watershed Management Program and Coordinated Integrated Monitoring Program

Ballona Creek Watershed

City of Los Angeles
County of Los Angeles
Los Angeles County Flood Control District
City of Beverly Hills
City of West Hollywood
City of Culver City
City of Inglewood
City of Santa Monica

December 23, 2013

1. Introduction

The Cities of Los Angeles, Culver City, Beverly Hills, West Hollywood, Inglewood, and Santa Monica, the County of Los Angeles, and the Los Angeles County Flood Control District, collectively the Ballona Creek Enhanced Watershed Management Program (EWMP) agencies, respectfully submit this Notification of Intent (NOI) to develop an EWMP for the Ballona Creek watershed per Part VI.C.4.b.i of Order No. R4-2012-0175 (MS4 Permit). Additionally, this NOI includes a statement of the Ballona Creek EWMP agencies' intent to follow a Coordinated Integrated Monitoring Program (CIMP) approach.

The Ballona Creek watershed is the largest sub-watershed in the Santa Monica Bay Watershed Management Area, encompassing approximately 128 square miles. The 303(d) List has identified Ballona Creek and Ballona Estuary as being impaired by several pollutants. Accordingly, the California Regional Water Quality Control Board, Los Angeles Region (LARWQCB) and the U.S. Environmental Protection Agency (USEPA) have adopted and/or established several TMDLs for the receiving waters in the Ballona Creek watershed. The Ballona Creek EWMP agencies propose the development of an EWMP specifically for the Ballona Creek watershed as the most effective approach to utilize opportunities to retain and reuse runoff and to address the unique challenges of the watershed.

The Ballona Creek EWMP agencies have been collaborating as one watershed since the first Ballona Creek TMDLs were adopted by the LARWQCB. The TMDL monitoring in Ballona Creek and Estuary have been implemented in a coordinated manner and is being cost-shared by all Ballona Creek EWMP agencies as well as Caltrans. The City of Los Angeles will be the lead agency for developing the EWMP and CIMP. Development of the EWMP Work Plan, CIMP, and EWMP Plan will be a collaborative process between all Ballona Creek EWMP agencies, coordinated with the Technical Advisory Committee as well as with watershed stakeholders.

The following sections satisfy the EWMP requirements for NOI submittal as provided by Section VI.C.4.b of the MS4 Permit and the CIMP notification requirements as provided by Attachment E Section IV.C.1. Additionally, the following sections provide the LARWQCB with information on the approach that the Ballona Creek EWMP agencies intend to follow for EWMP development.

2. Notification of Intent (Section VI.C.4.b.i and Attachment E Section IV.C.1.)

The Ballona Creek EWMP agencies notify the LARWQCB by this NOI of their intention to collaboratively develop an EWMP for the Ballona Creek watershed, and request submittal of the final work plan by 18 months after the effective date of the MS4 Permit (June 28, 2014) and submittal of the draft EWMP Plan by 30 months after the effective date of the MS4 Permit (June 28, 2015).

Additionally, the Ballona Creek EWMP agencies notify the LARWQCB by this NOI of their intention to collaboratively develop an CIMP for the Ballona Creek watershed, and request submittal of the Draft CIMP 18 months after the effective date of the MS4 Permit (June 28, 2014).

3. Interim and final TMDL compliance deadlines (Section VI.C.4.b.ii)

Table 1 lists the TMDLs that have specifically been developed for the Ballona Creek watershed and the TMDLs that apply to the Ballona Creek watershed as a subwatershed in the Santa Monica Bay Watershed Management Area. Interim and final compliance deadlines of the Ballona Creek Trash and Santa Monica Bay Debris TMDLs and final compliance deadlines of other TMDLs occurring prior to the anticipated approval date of the EWMP (April 28, 2016) are included in Table 2. Tables 1 and 2 do not include the Santa Monica Bay Beaches Bacteria TMDLs because the waste load allocations of these TMDLs for the receiving waters in the Ballona Creek watershed are provided by the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL.

The watershed control measures that will be implemented to meet the requirements of the interim and final trash water quality based effluent limits (WQBELs) and all other final WQBELs are described in more detail in Section 12 of this NOI submittal.

Table 1. TMDLs applicable to Ballona Creek watershed.

TMDL	LARWQCB Resolution Number	Effective Date and/or EPA Approval Date
Ballona Creek Trash TMDL	2004-023	08/11/2005
Ballona Creek Estuary Toxic Pollutants TMDL	2005-008	01/11/2006
Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL	2006-011	04/27/2007
Ballona Creek Metals TMDL	2007-015	10/29/2008
Santa Monica Bay Nearshore and Offshore Debris TMDL	R10-010	03/20/2012
Santa Monica Bay DDTs and PCBs TMDL	NA	03/26/2012
Ballona Creek Wetlands TMDL for Sediment and Invasive Exotic Vegetation	NA	03/26/2012

Table 2. Interim (trash) and final TMDL compliance deadlines prior to EWMP approval

TMDL	Milestone	Interim/Final	Deadline
Ballona Creek Trash TMDL	20% reduction of baseline load	Interim	09/30/2006
	30% reduction of baseline load	Interim	09/30/2007
	40% reduction of baseline load	Interim	09/30/2008
	50% reduction of baseline load	Interim	09/30/2009
	60% reduction of baseline load	Interim	09/30/2010
	70% reduction of baseline load	Interim	09/30/2011
	80% reduction of baseline load	Interim	09/30/2012
	90% reduction of baseline load	Interim	09/30/2013
	96.7% reduction of baseline load	Interim	09/30/2014
	100% reduction of baseline load	Final	09/30/2015
Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL	Compliance with allowable exceedance days for summer and winter dry weather	Final	04/27/2013
Ballona Creek Metals TMDL	100% of MS4 drainage area complies with dry-weather waste load allocations	Final	01/11/2016
Santa Monica Bay Nearshore and Offshore Debris TMDL	20% reduction from baseline load	Interim	03/20/2016

4. Geographical scope (Section VI.C.4.b.iii.(1))

The Ballona Creek watershed is approximately 128 square miles and comprised of the Cities of Beverly Hills and West Hollywood, and portions of the Cities of Los Angeles, Inglewood, Culver City, and Santa Monica as well as unincorporated areas of the County of Los Angeles. Attachment 1 provides a map of the watershed boundaries and the delineations of the land areas of the MS4 permittees and other entities within the watershed.

Ballona Creek and Estuary are collectively approximately 9.5 miles long and divided in three hydrological units:

- Ballona Creek Reach 1 is approximately 2 miles long from Cochran Avenue to National Boulevard. This portion of the creek is channelized with vertical concrete walls.
- Ballona Creek Reach 2 is approximately 4 miles long between National Boulevard and Centinela Avenue where Ballona Estuary starts. Reach 2 is also channelized for the most part with trapezoidal walls.
- Ballona Estuary starts at Centinela Creek and continues to the Pacific Ocean. This portion is approximately 3.5 miles, under tidal influence and channelized, but with a soft bottom.

Major tributaries to Ballona Creek include Benedict Canyon Channel (Reach 2), Sepulveda Canyon Channel (Reach 2), and Centinela Creek (Ballona Estuary). Other water bodies in the watershed include Del Rey Lagoon and Ballona Wetlands, which are both connected to the Ballona Estuary through tide gates. The City of Los Angeles is the responsible agency for Del Rey Lagoon whose tributary area is approximately 25 acres. The Ballona Wetlands encompass approximately 626 acres (541 acres of natural wetlands area and 85 acres of roads, parking lots, levees and other structures). Approximately 460 acres of the Ballona Wetlands are located within the Ballona Creek watershed whereas the remaining portion is located in the Marina del Rey watershed. The Ballona Wetlands are owned and/or managed by the California Department of Fish and Wildlife and the State Land Commission.

All Ballona Creek EWMP agencies have agreed to collectively develop the Ballona Creek EWMP. Therefore, the Ballona Creek EWMP will cover all of the areas owned by the MS4 permittees within the watershed as shown in Attachment 2. The total area of the Ballona Creek watershed is 128 square miles and a breakdown of the area by MS4 permittee and other agencies is provided in Table 4. Collectively, the MS4 permittees in the Ballona Creek watershed have jurisdiction over 123 square miles or 96% of the total watershed area. The Ballona Creek EWMP agencies have no jurisdiction over the land that is owned by the State of California (i.e., California Department of Fish and Wildlife, the State Lands Commission, and Caltrans) and the US Government, but the MS4 permittees will seek collaboration with these agencies in the development of the Ballona Creek EWMP. All drainage infrastructure operated and maintained by the LACFCD within the Ballona Creek Watershed Management Area will be covered under this EWMP.

Table 4. Ballona Creek watershed land area distribution and EWMP participation

Agency	EWMP agency	Land area (acres)	% of EWMP area
City of Los Angeles	Yes	65,272.89	83.21
County of Los Angeles	Yes	3,164.76	4.03
Los Angeles County Flood Control District	Yes	NA	
City of Beverly Hills	Yes	3,618.95	4.61
City of Culver City	Yes	3,125.00	3.98
City of Inglewood	Yes	1,907.72	2.43
City of West Hollywood	Yes	1,135.00	1.45
City of Santa Monica	Yes	217.31	0.28
Area of EWMP agencies		**78,441.63**	**100**
Caltrans	No	1,651.33	
State of California	No	909.34	
US Government	No	674.49	
Total Ballona Creek watershed area		**81,676.79**	

5. Plan concept (Section VI.C.4.b.iii.(1))

The Ballona Creek EWMP agencies have collectively developed several Implementation Plans with strategies for compliance with the Ballona Creek/Estuary Bacteria, Toxic Pollutants and Metals TMDLs. These implementation and compliance strategies are based on a multi-pollutant approach with a focus on green infrastructure BMPs that maximize the retention and use of urban runoff as a resource for recharging aquifers and for irrigation and other uses. Many of the green infrastructure projects proposed in the TMDL Implementation Plans, both distributed and regional, were identified by Ballona Creek watershed stakeholders. The Ballona Creek EWMP will build on the TMDL implementation plans, re-evaluate the proposed watershed control measures, identify additional regional projects to maximize opportunities for retaining all non-stormwater runoff and stormwater from the 85^{th} percentile, 24-hour storm event, and identify additional watershed control measures for those areas in the watershed that cannot be addressed by a regional project.

The Ballona Creek watershed is highly urbanized with single-family residential and multi-family residential as the largest land use categories (37 and 22% of the total area, respectively). It is estimated that 49% of watershed is impervious area consisting of roof tops, road and other impermeable surfaces. These numbers illustrate the challenges for urban runoff management in the Ballona Creek watershed in general but, at the same time, they illustrate the potential for improving the water quality and beneficially using urban runoff by developing and implementing an EWMP. Despite the built-out environment, the Ballona Creek watershed provides many opportunities for regional and multi-benefit projects:

- Open space accounts for approximately 17% of the watershed area, and is predominantly available in the northern part of the watershed and in the Baldwin Hills area (Attachment 2). These areas may be used for locating regional projects, in addition to the many parks which predominantly located in the central portion of the watershed;

- Groundwater levels in the Ballona Creek watershed are at least 20 ft below ground level (Attachment 3) in most areas, thereby not restricting the use of infiltration BMPs; and
- The majority of the watershed has soils with infiltration rates that allow the use of green infrastructure BMPs with infiltration (Attachment 4).

Based on the available information, the Ballona Creek EWMP agencies believe that opportunities exist, within the agencies' collective jurisdictional areas, for collaboration on multi-benefit projects that will meet the intent of the EWMP approach. A typical example of a regional, multi-benefit project that was included in the Ballona Creek TMDL Implementation Plans is the Rancho Cienega Sports Complex Regional Best Management Practices Project. This project proposes to divert dry weather runoff and stormwater from a storm drain as well as on-site runoff for treatment in an underground cistern, pervious pavement, and a bioretention basin. The drainage area tributary to the project is approximately 8,000 acres and the estimated volume of captured runoff for infiltration is 75-125 acre-feet/year.

6. Cost estimate (Section VI.C.4.b.iii.(2))

The Ballona Creek EWMP agencies collaboratively prepared a scope of work and cost estimate for developing the Work Plan, the CIMP and the EWMP for the Ballona Creek watershed. It is estimated that the cost for the development of the plans is approximately $1.32M. This estimate includes $269k for the Work Plan, $154k for the CIMP, $660k for the EWMP Plan, and $234k for project coordination and meetings. This estimate assumes that the CIMP and EWMP will, in part, be based on the existing TMDL Coordinated Monitoring Plans and Implementation Plans. In addition, the Ballona Creek EWMP agencies will contribute several hundred thousands of dollars in the contract administration costs and to in-kind services.

7. Memorandum of Understanding (Section VI.C.4.b.iii.(3))

Attachment 5 includes the final draft of the Memorandum of Understanding between the City of Los Angeles as the lead agency and the other Ballona Creek EWMP agencies. All agencies have committed to the execution of the agreement as indicated by the signed letters of intent (Attachment 6). The agreement will be executed before December 28, 2013.

8. Interim milestones and deadlines for plan development (section VI.C.4.b.iii.(4))

Table 5 summarizes the interim milestone and deadlines for Work Plan, CIMP, and EWMP Plan development which is based on the scope of work for developing the Work Plan, CIMP, and EWMP as agreed to by the Ballona Creek EWMP agencies. In addition to the bimonthly agency coordination meetings and coordination meetings with the Technical Advisory Committee, the schedule in Table 5 assumes one workshop with local watershed stakeholders for each plan (Work Plan, CIMP, and EWMP). Interim milestones in Table 5 are the expected due dates of draft Technical Memoranda that will summarize the information and approaches for development of the specified components of the final Work Plan, CIMP, and EWMP Plan. It is expected that the draft technical memos will not be finalized, per se, rather the information presented in the memos will be revised based on comments and presented in the Work Plan, CIMP, and EWMP Plan.

Table 5. Proposed interim milestones and deadlines for plan development

Deliverable	Milestones and Deadlines
Work Plan	
Draft Technical memos • Identification of water quality priorities • Existing and future watershed control measures, identification of potential regional projects • Reasonable assurance analysis approach • BMP selection approaches	December 2013 – March 2014
Draft Work Plan	April 2014
Final Work Plan submitted to the LARWQCB	June 2014
Coordinated Integrated Monitoring Plan	
Draft Technical memos • Outfall and receiving water monitoring approach • Monitoring sites selection • New development and redevelopment effectiveness tracking	March 2014
Draft CIMP	April 2014
Final Draft CIMP submitted to the LARWQCB	June 2014
Enhanced Watershed Management Program	
Draft Technical memos • Approach to US EPA TMDLs, 303(d) listings, other exceedances of RWLs • Final selection of regional projects • Feasibility analyses of regional projects, customization of MCMs, identification of other BMPs • Project schedules and cost estimates	December 2014 – March 2015
Draft EWMP	April 2015
Final Draft EWMP submitted to the LARWQCB	June 2015
Final EWMP submitted to the LARWQCB	January 2016
Approval of final EWMP by LARWQCB	April 2016

9. Structural BMP (Section VI.C.4.b.iii.(5))

In accordance to Section VI.C.4.b.iii(5), the Ballona Creek EWMP agencies commit to implementing one structural BMP project that provides meaningful water quality improvement within 30 months of the effective date (June 28, 2015). The City of Los Angeles plans to implement Phase II of the Mar Vista Recreation Center Stormwater Best Management Practices Project to fulfill this requirement for the Ballona Creek EWMP. More information on this project can be found in Attachment 7.

10. LID ordinance (Sections VI.C.4.b.iii.(6) and VI.C.4.c.iv. (1))

Table 6 summarizes the status of Low Impact Development (LID) ordinances by the various BC EWMP agencies. As presented in Table 6, greater than 50% of the land area addressed by the geographical scope of the EMWP is addressed by an LID ordinance that is in place or under development.

Table 6. Summary of percent EWMP area addressed by LID ordinances

EWMP agency	Status LID Ordinance	% Area addressed by LID Ordinance
City of Los Angeles	In Place	83.21
County of Los Angeles	Draft Ordinance	4.03
LACFCD	NA	
City of Beverly Hills	Draft Ordinance	4.61
City of Culver City	Draft Ordinance	3.98
City of Inglewood	Draft Ordinance	2.43
City of West Hollywood	Draft Ordinance	1.45
City of Santa Monica	In Place	0.28
Total EWMP Area covered by LID ordinance		**100**

Status Descriptions:

- In Place – Permittee has adopted an LID Ordinance that is in compliance with the requirements of the MS4 Permit for its portion in the watershed. For the City of Los Angeles: its LID Ordinance became operative on May 12, 2012. The City of Los Angeles is currently amending sections of the LID Ordinance, as well as its Stormwater and Urban Runoff Pollution Control Ordinance (L.A.M.C. Chapter VI, Article 4.4) to meet all the MS4 permit requirements.
- Draft Ordinance – Permittee has completed or will complete by June 28, 2013 the development of a draft LID Ordinance that is in compliance with the MS4 Permit for its portion in the watershed.

11. Green street polices (Sections VI.C.4.b.iii.(6) and VI.C.4.c.iv. (2))

Table 7 summarizes the status of green street policies by the various BC EWMP agencies. As presented in Table 7, greater than 50% of the land area addressed by the geographical scope of the EMWP is addressed by green streets policies that are in place or under development.

Table 7. Summary of percent EWMP area addressed by Green Street policies

EWMP agency	Status green street policies	% EWMP area
City of Los Angeles	In Place	83.21
County of Los Angeles	Draft Policy	4.03
LACFCD	NA	
City of Beverly Hills	Draft Policy	4.61
City of Culver City	Draft Policy	3.98
City of Inglewood	Draft Policy	2.43
City of West Hollywood	Draft Policy	1.45
City of Santa Monica	In Place	0.28
Total EWMP Area covered by Green Street Polices		**100**

Status Descriptions:

- In Place – Permittee has adopted a Green Street Policy that is in compliance with the requirements of the MS4 Permit for its portion in the watershed.
- Draft Policy – Permittee has completed or will complete by June 28, 2013 the development of a draft Green Street Policy that is in compliance with the MS4 Permit for its portion in the watershed.

12. Implementation of watershed control measures during plan development (Sections VI.C.4.b.ii)

The Ballona Creek EWMP agencies have developed several TMDL Implementations with structural and institutional watershed control measures for a multi-pollutant and multi-benefit approach, as well as the timelines for implementation to meet the WQBELs and/or receiving water limitations of the various TMDLs. Table 8 summarizes the TMDL Implementation Plans that have been developed to date. The Ballona Creek EWMP agencies will continue their efforts to implement the actions of the TMDL Implementation Plans concurrently with the development of the Ballona Creek watershed EWMP.

Table 8. Implementation Plans for Ballona Creek watershed TMDLs

Implementation Plan	Agencies	Plan status
Implementation Plan for Ballona Creek Bacteria TMDL	Cities of Los Angeles, Culver City, Beverly Hills, West Hollywood, Inglewood, and Santa Monica; Caltrans	Draft plan submitted 11/25/2009 for LARWQCB review
Implementation Plan for Ballona Creek Metals TMDL	Cities of Los Angeles, Culver City, Beverly Hills, West Hollywood, Inglewood, and Santa Monica; Caltrans	Final plan submitted 10/07/2010
Implementation Plan for Ballona Estuary Toxic Pollutants TMDL	Cities of Los Angeles, Culver City, Beverly Hills, West Hollywood, Inglewood, and Santa Monica; Caltrans	Final plan submitted 06/13/2012
Multi-Pollutant TMDL Implementation Plan for the Unincorporated Area of Ballona Creek	County of Los Angeles	Final plan submitted 10/5/2010 (for Metals TMDL) and 11/14/2012 (for Toxics TMDL); Draft plan (Bacteria TMDL) submitted for LARWQCB review 10/26/2009

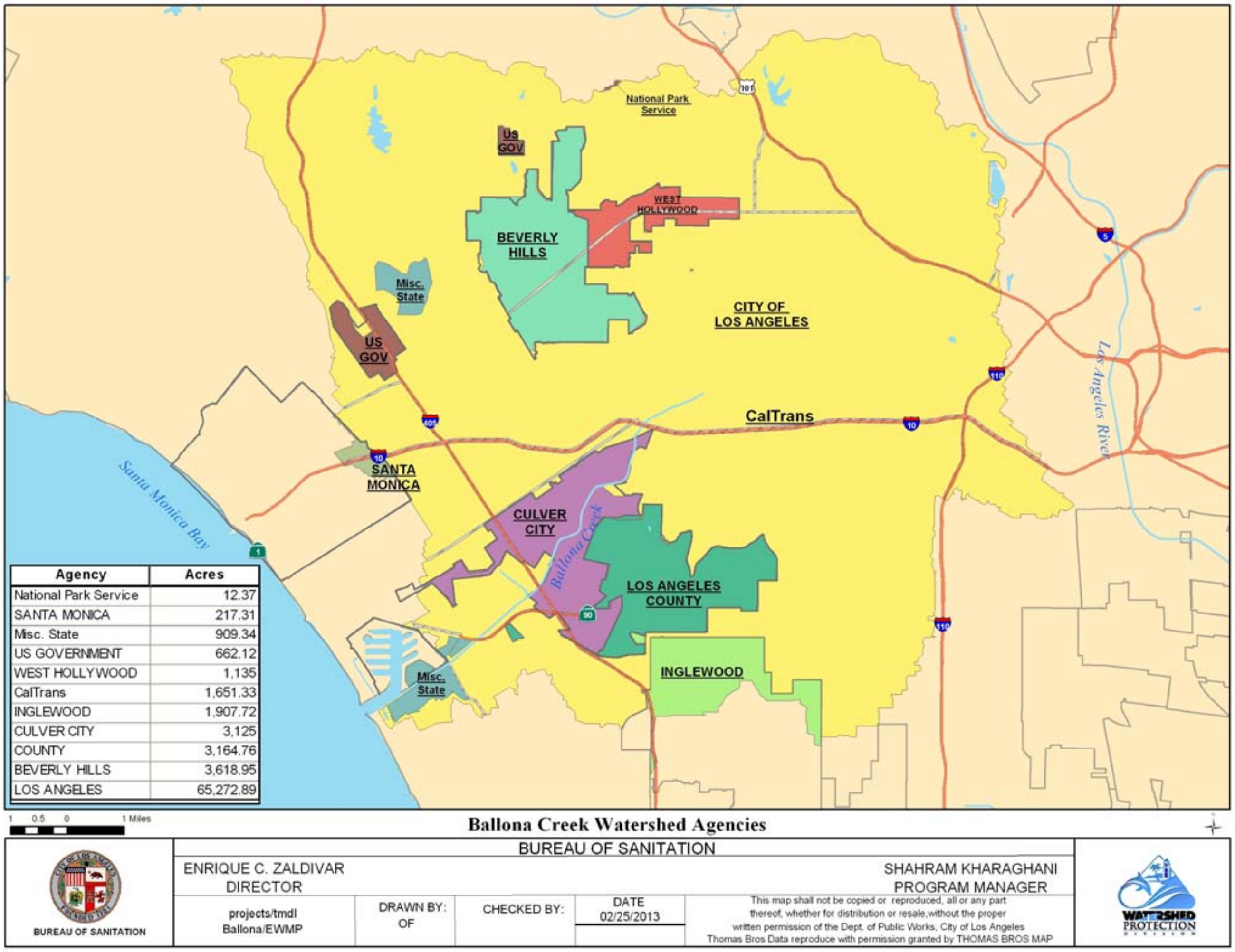
Four TMDLs have interim and/or final compliance milestones prior to the final approval of the EWMP by April 28, 2016 as summarized in Table 2. The Ballona Creek EWMP agencies will continue the implementation of watershed control measures concurrently with EWMP Plan development to ensure compliance with these interim and/or final milestones, as follows:

- **Interim and final milestones of the Ballona Creek Trash TMDL**: Each EWMP agency has developed its own program for compliance with this TMDL. Agency-specific programs and the status of implementation and compliance are provided in Attachment 8.
- **Final dry weather milestone of the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL**: The following EWMP agencies have submitted Time Schedule Order requests for this compliance milestone to the LARWQCB in April 2013: City of Los Angeles, County of Los Angeles, City of Culver City,

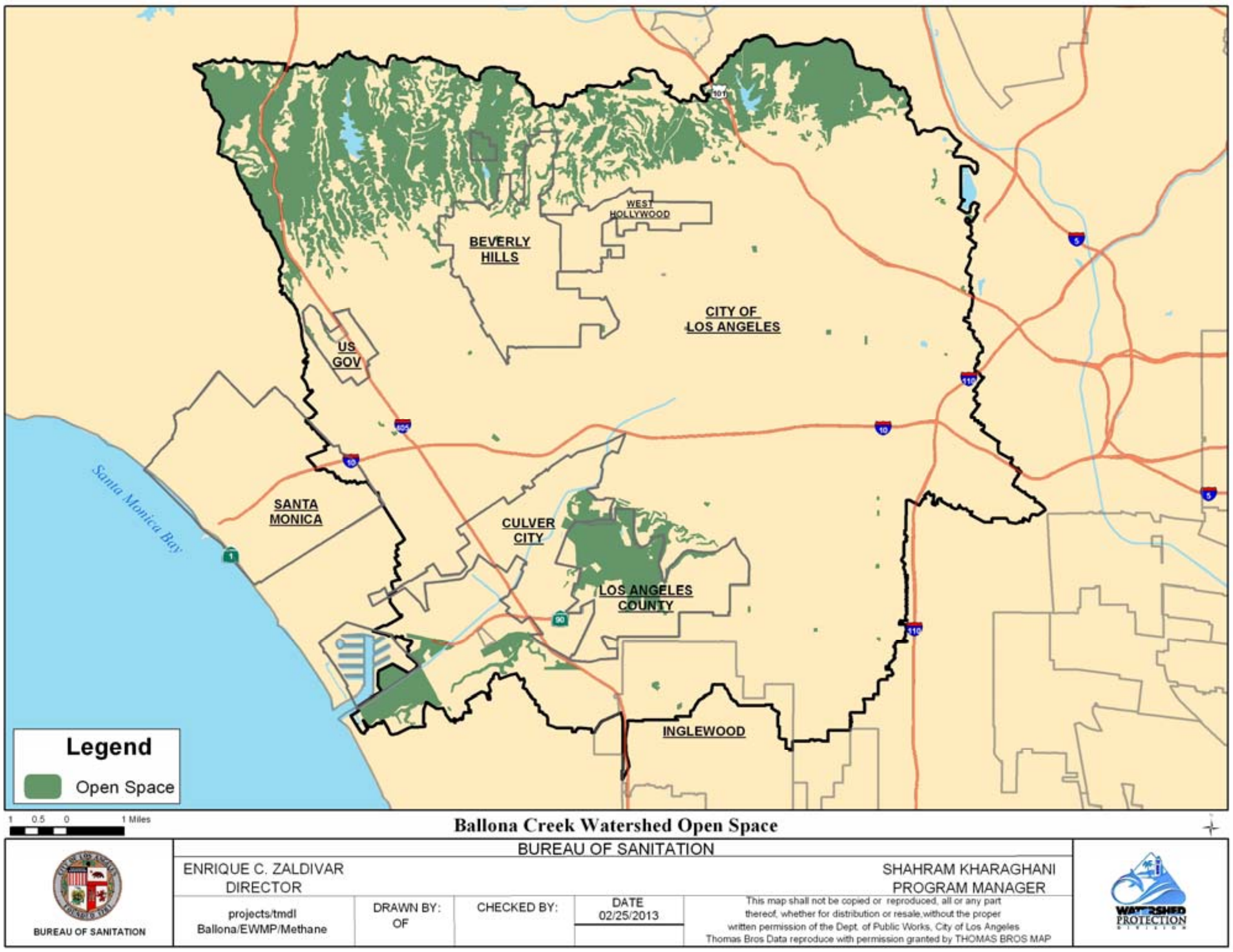
City of West Hollywood, City of Beverly Hills, and City of Inglewood. The requests provide for detailed action plans that the agencies collectively and individually will take to ensure compliance with their respective Time Schedule Orders. The City of Santa Monica did not submit a TSO request as all of its dry weather runoff to Ballona Creek is captured and treated by the Westside Water Quality Improvement Project.

- **Final dry weather compliance milestone of the Ballona Creek Metals TMDL**: The final compliance milestone date is January 11, 2016. As included in Attachment 9, monthly monitoring of Ballona Creek has indicated that the concentrations of copper, lead, zinc and selenium during dry weather consistently meet the TMDL receiving water limitations due to the implementation of our current watershed control measures. As such, the Ballona Creek EWMP agencies are on schedule with meeting the dry weather milestones.
- **Interim milestone for the Santa Monica Bay Debris TMDL**: The interim milestone of a 20% reduction from the trash baseline load by March 2016, is already being met through compliance with the Ballona Creek Trash TMDL requirements.

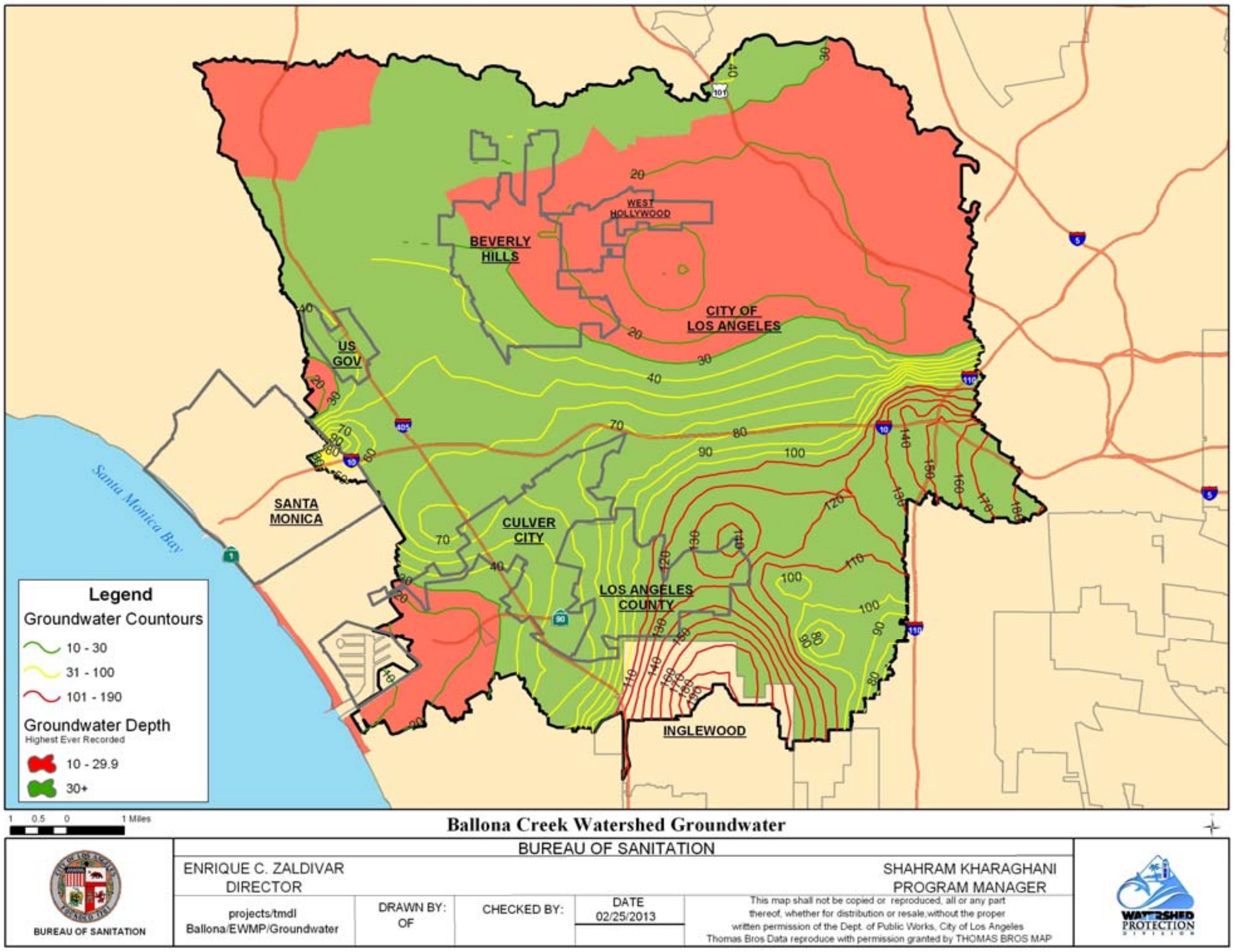
Attachment 1. Ballona Creek watershed and MS4 permittees.



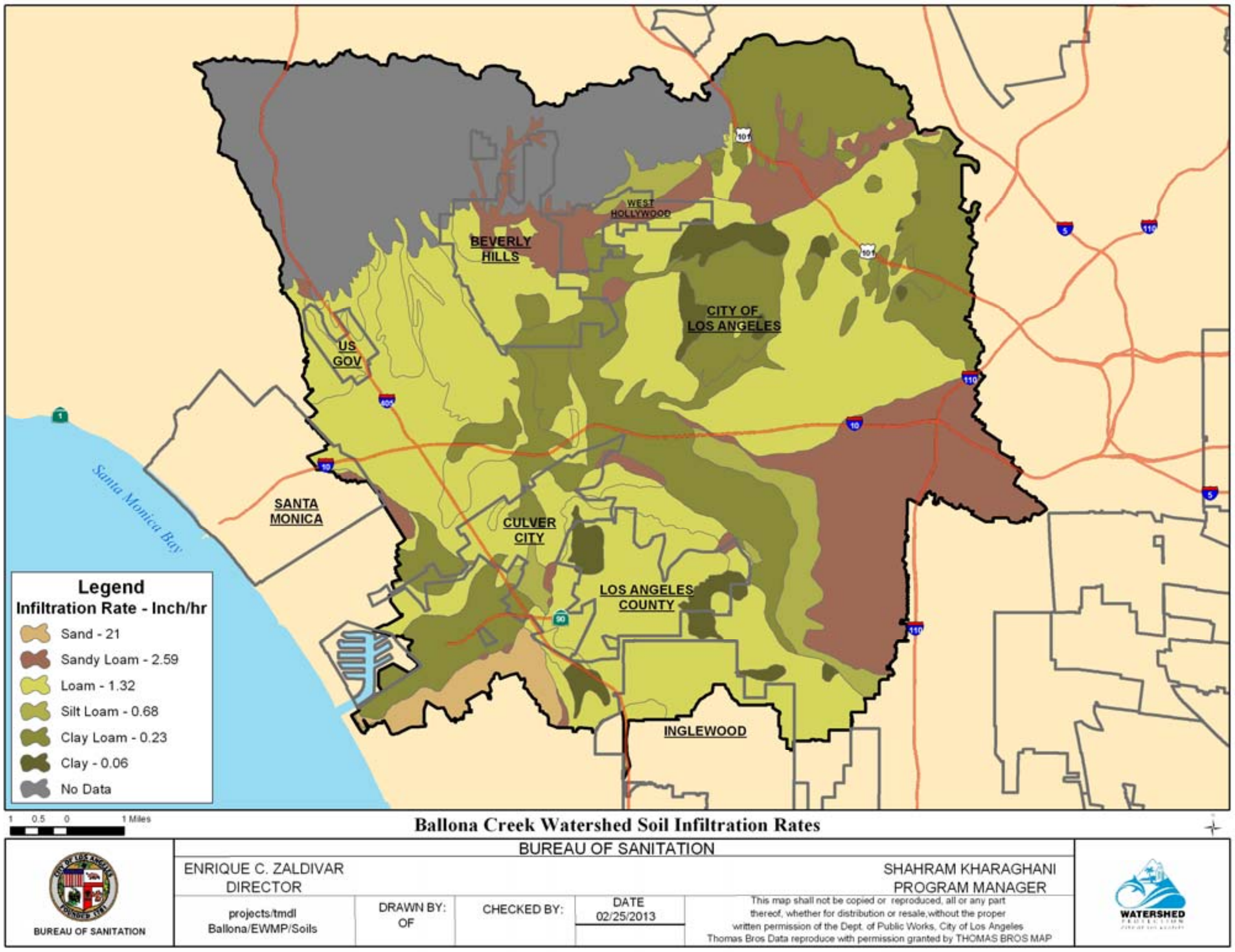
Attachment 2. Open space in Ballona Creek watershed.



Attachment 3. Groundwater level in Ballona Creek watershed.



Attachment 4. Soils and infiltration rates in Ballona Creek watershed.



Attachment 5. Final Draft Memorandum of Understanding for cost sharing of plan development.

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE CITY OF LOS ANGELES, THE CITY OF BEVERLY HILLS,THE CITY OF CULVER CITY, THE CITY OF INGLEWOOD, THE CITY OF SANTA MONICA, THE CITY OF WEST HOLLYWOOD, THE LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, AND THE COUNTY OF LOS ANGELES

REGARDING THE ADMINISTRATION AND COST SHARING FOR DEVELOPMENT OF THE ENHANCED WATERSHED MANAGEMENT PROGRAM FOR THE BALLONA CREEK WATERSHED

This Memorandum of Understanding (MOU) is made and entered into as of the date of the last signature set forth below by and between: the City of Los Angeles, a municipal corporation; the City of Beverly Hills, a municipal corporation; the City of Culver City, a municipal corporation; the City of Inglewood, a municipal corporation; the City of Santa Monica, a municipal corporation; the City of West Hollywood, a municipal corporation; the Los Angeles County Flood Control District (LACFCD), a political subdivision of the State of California; and the County of Los Angeles, a political subdivision of the State of California. Collectively, these entities shall be known herein as "Parties" or individually as "Party."

WITNESSETH

WHEREAS, the Regional Water Quality Control Board, Los Angeles Region ("Regional Board") adopted National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit Order No. R4-2012-0175 ("MS4 Permit"); and

WHEREAS, the MS4 Permit became effective on December 28, 2012 and requires that the LACFCD, County of Los Angeles, and 84 of the 88 cities (excluding Avalon, Long Beach, Palmdale, and Lancaster) within the County of Los Angeles comply with the prescribed elements of the MS4 Permit; and

WHEREAS, the MS4 Permit identified the Parties as the MS4 permittees that are responsible for compliance with the MS4 Permit requirements pertaining to the Ballona Creek watershed in the Santa Monica Bay Watershed Management Area; and

WHEREAS, the Parties have agreed to collaborate on the development of an Enhanced Watershed Management Program (EWMP) for the Ballona Creek watershed of the Santa Monica Bay Watershed Management Area to comply with certain elements of the MS4 Permit; and

WHEREAS, the Parties agree that each shall assume full and independent responsibility for ensuring its own compliance with the MS4 Permit despite the collaborative approach of the MOU; and

WHEREAS, the development of an EWMP includes the preparation of a Work Plan, a draft and final Coordinated Integrated Monitoring Program ("CIMP"), and a draft and final Enhanced Watershed Management Program Plan ("EWMP Plan"), collectively referred to herein as "Plans"; and

WHEREAS, the Parties collaboratively prepared a final Scope of Work and Request for Proposal to obtain a Consultant for preparing the Plans that will satisfy the requirements of the MS4 Permit; and

WHEREAS, the Parties have determined that hiring a Consultant to prepare and deliver the Plans will be beneficial to the Parties and they desire to participate and will provide funding in accordance with the cost allocation on Exhibit A; and

WHEREAS, the Parties have agreed that the total cost for developing the Plans shall not exceed $1,382,903 including the project administration and management cost but excluding 10% contingency; and

WHEREAS, the Parties have agreed to retain the City of Los Angeles to coordinate the services of a Consultant to develop the Plans, the Parties have agreed to share in the cost and pay the City of Los Angeles for these consultant services as provided by Exhibit A of this MOU, and the City of Los Angeles has agreed to act on behalf of all Parties in the preparation of the Plans and the coordination of the consultant services;

NOW, THEREFORE, in consideration of the mutual benefits to be derived by the Parties, and of the promises contained in this MOU, the Parties agree as follows:

Section 1. Recitals: The recitals set forth above are fully incorporated into this MOU.

Section 2. Purpose: The purpose of this MOU is to cooperatively fund the preparation and submittal of the Plans to the Regional Board.

Section 3. Cooperation: The Parties shall fully cooperate with one another to attain the purpose of this MOU.

Section 4. Voluntary: This MOU is voluntarily entered into for the purpose of preparing and submitting the Plans to the Regional Board.

Section 5. Term: This MOU shall become effective on the last date of execution by the Parties or December 28, 2013, whichever comes first, and shall remain and continue to remain in effect until June 30, 2016. If a Party does not execute this MOU by December 28, 2013, that Party shall be excluded from this MOU and this MOU shall become effective on December 28, 2013 by execution by the remaining Parties.

Section 6. Assessment for Proportional Cost: The Parties agree to pay the City of Los Angeles for preparation and delivery of the Plans in the amounts shown in Table (4) of Exhibit A, based on the total costs shown in Tables (1) and (2) and the cost allocation formula shown in Table (3) of Exhibit A, attached hereto and made part of this MOU by this reference. The City of Los Angeles will invoice the Parties in two installments upon execution of this MOU as shown in Table (4) of Exhibit A, based on the allocated costs for developing the Plans by the Consultant and the project administration and management costs at a percentage of 5% of the allocated costs for development of the Plans. At the end of each fiscal year, the City of Los Angeles will provide the Agencies with a statement with the actual expenditures. Unexpended funds at the termination of this MOU will be returned to the Parties in accordance with the cost allocation formula set forth in Table (3) of Exhibit A.

Section 7. City of Los Angeles agrees:

a. To solicit proposals for, award and administer a Consultant contract for the preparation and delivery of the Plans. The City of Los Angeles will be compensated for the administration and management of the Consultant contract as described in Exhibit A.

b. To utilize the funds deposited by the Parties only for the administration of the Consultant contract, project management, and the preparation and completion of the Plans.

c. To provide the Parties with an electronic copy of the technical memos, draft Plans and completed Plans within 7 business days of receipt from the Consultant.

d. To invoice the Parties in the amounts and according to the schedule shown in Table (4) of Exhibit A.

e. To provide an accounting within 90 days after the termination of the MOU or within 90 days after the early termination of the MOU pursuant to Section 11. The City of Los Angeles shall return the unused portion of all funds deposited with the City of Los Angeles in accordance with the cost allocation formula set forth in Table (3) in Exhibit A.

Section 8. The Parties further agree:

a. To make a full faith effort to cooperate with one another to achieve the purposes of this MOU by providing information about project opportunities, reviewing deliverables in a timely manner, informing administration and council.

b. To fund the cost of the preparation and delivery of the Plans and to pay the City of Los Angeles for the preparation and delivery of the Plans based on the cost allocation shown in Exhibit A. This includes the costs incurred by the City of Los Angeles for administering the Consultant services between awarding the Consultant contract and the execution of this MOU.

c. To grant access rights and entry to the City of Los Angeles and the Consultant during the terms of this MOU to the Parties' facilities (i.e. storm drains, channels, catch basins, properties, etc.) ("Facilities") to achieve the purposes of this MOU. Prior to exercising said right of entry, the City of Los Angeles or their Consultant shall provide written notice to the Parties at least 72 hours in advance. For the purposes of this provision, written notice shall include notice delivered via e-mail that has been delivered to the Parties' representatives identified in Exhibit B.

Section 9. Invoice and Payment

a. Payment: The Parties shall pay the City of Los Angeles their proportional share of the cost for the preparation and delivery of the Plans and project administration and management as shown in Table (4) of Exhibit A. Payments are due within sixty (60) days of receiving the invoice from the City of Los Angeles.

b. Invoice: The City of Los Angeles will invoice Parties in two installments in the amounts shown in Table (4) of Exhibit A. The first invoice will be sent upon execution of this MOU or in January 2014, whichever comes first. The second invoice will be sent in July 2014.

c. Contingency: The City of Los Angeles will notify the Parties if actual expenditures are anticipated to exceed the cost estimates contained in Exhibits A and obtain approval of such expenditures from all Parties. Upon approval, the Parties agree to reimburse the City of Los Angeles for their proportional share of these additional expenditures at an amount not to exceed 10% of the original cost estimate as shown in Exhibit A. This 10% contingency will not be invoiced, unless actual expenditures exceed the original cost estimate. Expenditures that exceed the 10% contingency will require an amendment of this MOU.

Section 10. Indemnification

Each Party shall indemnify, defend, and hold harmless each other Party, including its special districts, elected and appointed officers, employees, and agents, from and against any and all liability, including but not limited to demands, claims, actions, fees, costs, and expenses (including attorney and expert witness fees), arising from or connected with the respective acts of each Party arising from or related to this MOU; provided, however, that no party shall indemnify another party for that party's own negligence or willful misconduct.

In light of the provisions of Section 895.2 of the Government Code of the State of California imposing certain tort liability jointly upon public entities solely by reason of such entities being parties to an agreement (as defined in Section 895 of said Code), each of the Parties hereto, pursuant to the authorization contained in Section 895.4 and 895.6 of said Code, shall assume the full liability imposed upon it or any of its officers, agents, or employees, by law for injury caused by any act or omission occurring in the performance of this MOU to the same extent that such liability would be imposed in the absence of Section 895.2 of said Code. To achieve the above stated purpose, each Party indemnifies, defends, and holds harmless each other Party for any liability, cost, or expense that may be imposed upon such other Party solely by virtue of said Section 895.2. The provisions of Section 2778 of the California Civil Code are made a part hereof as if incorporated herein.

Section 11. Termination

a. This MOU may be terminated upon the express written agreement of all Parties. If this MOU is terminated, all Parties must agree on the equitable redistribution of remaining funds deposited, if there are any, or payment of invoices due at the time of termination. Completed work shall be owned by all Parties. Rights to uncompleted work by the Consultant still under contract will be held by the Party or Parties who fund the completion of such work.

b. If a Party fails to substantially comply with any of the terms or conditions of this MOU, that Party shall forfeit its rights to work completed through this MOU, but no such forfeiture shall occur unless and until the defaulting Party has first been given notice of its default and a reasonable opportunity to cure the alleged default.

Section 12. General Provisions

a) Notices. Any notices, bills, invoices, or reports relating to this MOU, and any request, demand, statement or other communication required or permitted hereunder shall be in writing and shall be delivered to the Representative of the Party at the address set forth in Exhibit B. Parties shall promptly notify each other of any change of contact information, including personnel changes, provided in Exhibit B. Written notice shall include notice delivered via email or fax. A notice shall be deemed to have been received on (a) the date of delivery, if delivered by hand during regular business hours, or by confirmed facsimile or by email; or (b) on the third (3) business day following mailing by registered or certified mail (return receipt requested) to the addresses set forth in Exhibit B.

b) Administration. For the purpose of this MOU, the parties hereby designate as their respective Party Representatives the persons named in Exhibit B. The designated Party Representatives, or their respective designees, shall administer the terms and conditions of this MOU on behalf of their respective Party. Each of the persons signing below on behalf of a Party represents and warrants that they are authorized to sign this MOU on behalf of such Party.

c) Relationship of Parties. The Parties are and shall remain at all times as to each other, wholly independent entities. No Party to this MOU shall have power to incur any debt, obligation, or liability on behalf of another Party unless expressly provided to the contrary by this MOU. No employee, agent, or officer of a Party shall be deemed for any purpose whatsoever to be an agent, employee or officer of another Party.

d) Binding Effect. This MOU shall be binding upon and inure to the benefit of each Party to this MOU and their respective heirs, administrators, representatives, successors and assigns.

e) Amendment. The terms and provisions of this MOU may not be amended, modified or waived, except by an instrument in writing signed by all the Parties. This section applies to, but is not limited to, amendments proposed to address regulatory changes in the MS4 permit, modifications to the Scope of Work, or changes in the number of Parties to this MOU. For the City of Los Angeles, the Director of Bureau of Sanitation or his/her designee is authorized to execute such amendments.

f) Waiver. Waiver by any Party to this MOU of any term, condition, or covenant of this MOU shall not constitute a waiver of any other term, condition, or covenant. Waiver by any Party to any breach of the provisions of this MOU shall not constitute a waiver of any other provision, nor a waiver of any subsequent breach or violation of any provision of this MOU.

g) Law to Govern; Venue. This MOU shall be interpreted, construed and governed according to the laws of the State of California. In the event of litigation between the Parties, venue in the state trial courts shall lie exclusively in the County of Los Angeles.

h) No Presumption in Drafting. The Parties to this MOU agree that the general rule that an MOU is to be interpreted against the Party drafting it, or causing it to be prepared shall not apply.

i) Entire Agreement. This MOU constitutes the entire agreement of the Parties with respect to the subject matter hereof and supersedes all prior or contemporaneous agreements, whether written or oral, with respect thereto.

j) Severability. If any term, provision, condition or covenant of this MOU is declared or determined by any court or competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions of this MOU shall not be affected thereby and this MOU shall be read and constructed without the invalid, void, or unenforceable provision(s).

k) Counterparts. This MOU may be executed in any number of counterparts, each of which shall be an original, but all of which taken together shall constitute but one and the same instrument, provided, however, that such counterparts shall have been delivered to all Parties to this MOU.

l) All Parties have been represented by counsel in the preparation and negotiation of this MOU. Accordingly, this MOU shall be construed according to its fair language.

IN WITNESS WHEREOF, the Parties hereto have caused this MOU to be executed by their duly authorized representatives and affixed as of the date of signature of the Parties:

CITY OF LOS ANGELES

Date: ______________________ By: ___________________

Capri W. Maddox, President

Board of Public Works

ATTEST:

By: _______________________

June Lagmay

City Clerk

APPROVED AS TO FORM:

Michael N. Feuer

City Attorney

By: ____________________

John A. Carvalho

Deputy City Attorney

CITY OF BEVERLY HILLS

Date: ____________________ By: __________________________

Jeffrey C. Kolin, City Manager

ATTEST:

____

Mahdi Aluzri

Acting Director of Public

Works & Transportation

APPROVED AS TO FORM:

By: _______________________

Laurence Wiener

City Attorney

CITY OF CULVER CITY

Date: ____________________ By: __________________________

P. Lamont Ewell

City Manager

APPROVED AS TO CONTENT

____

Charles Herbertson,

Public Works Director

APPROVED AS TO FINANCING:

____

Chief Financial Officer

APPROVED AS TO FORM:

By: __________________________

Carol Schwab

City Attorney

CITY OF INGLEWOOD

Date: ___________________

By: ____________________________

Roosevelt F. Dorn

Mayor

ATTEST:

By: ____________________________

Yvonne Horton

City Clerk

APPROVED AS TO FORM:

By: ____________________________

Cal Saunders

City Attorney

CITY OF SANTA MONICA

Date: ___________________ By: __________________________

Rod Gould, City Manager

ATTEST:

By: __________________________

Sarah P. Gorman

City Clerk

APPROVED AS TO FORM:

By: ___________________________

Marsha Jones Moutrie,

City Attorney

CITY OF WEST HOLLYWOOD

Date: ______________________ By: ___________________________

Paul Arevalo

City Manager

ATTEST:

By: ___________________________

APPROVED AS TO FORM:

By: ___________________________

Michael Jenkins

City Attorney

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

By ___________________________

Chief Engineer

APPROVED AS TO FORM:

John F. Krattli

County Counsel

By

____ ________________________
Deputy Date

COUNTY OF LOS ANGELES

By

GAIL FARBER Date

APPROVED AS TO FORM:

John F. Krattli

County Counsel

By

Deputy Date

EXHIBIT A

Total estimated cost, cost-sharing and City of Los Angeles invoicing for Ballona Creek Enhanced Watershed Management Program: development of Work Plan, Coordinated Integrated Monitoring Program, EWMP Plan

Table 1. Estimated Consultant Contract Cost

Deliverable	Due Date	Estimated Cost
Work Plan	June 28, 2014	$269,300
CIMP	June 28, 2014	$154,045
EWMP Plan	June 28, 2015 (draft plan) January 28, 2016 (final plan)	$659,495
Project Management, Coordination & Meetings	Ongoing	$234,210
Estimated Contract Cost	**-**	**$ 1,317,050**

Table 2. Estimated Total Cost and LACFCD Contribution

Item	Estimated Cost
Contract	$1,317,050
Project Administration & Management (5%)	$65,853
Estimated Total Cost	**$1,382,903**
LACFCD Contribution (10%)	-$138,290
Cost for area cost sharing	**$1,244,613**

Table 3. Cost Allocation Formula for Area Cost Sharing and Estimated Total Cost by Party

Party	Acres	Percent of Area[(1)] (%)	Total Cost
City of Los Angeles	65,272.89	83.21	$1,035,642
City of Beverly Hills	3,618.95	4.62	$57,501
City of Culver City	3,125.00	3.98	$49,536
City of Inglewood	1,907.72	2.43	$30,244
City of Santa Monica	217.31	0.28	$3,485
City of West Hollywood	1,135.00	1.45	$18,047
County of Los Angeles	3,164.76	4.03	$50,158
LACFCD	NA	NA	$138,290
Total	**78,441.63**	**100**	**$1,382,903**

[1] Areas owned by Caltrans, State Parks, and U.S. Government have been excluded from the total area of the Ballona Creek watershed.

Table 4. City of Los Angeles Invoicing Schedule and Invoice Amounts to Parties

Party	First Invoice (Jan 2014)	Second Invoice (Jul 2014)	Total Invoice Amount	Contingency (10%)[1]	Total Cost including Contingency
City of Beverly Hills	$28,750.50	$28,750.50	$57,501.00	$5,750.10	$63,251.10
City of Culver City	$24,768.00	$24,768.00	$49,536.00	$4,953.60	$54,489.60
City of Inglewood	$15,122.00	$15,122.00	$30,244.00	$3,024.40	$33,268.40
City of Santa Monica	$1,742.50	$1,742.50	$3,485.00	$348.50	$3,833.50
City of West Hollywood	$9,023.50	$9,023.50	$18,047.00	$1,804.70	$19,851.70
County of Los Angeles	$25,079.00	$25,079.00	$50,158.00	$5,015.80	$55,273.80
LACFCD	$69,145.00	$69,145.00	$138.290.00	$13,829.00	$152,119.00

[1]Contingency is 10% of the total invoice amount. Contingency will not be invoiced unless there is a need for its expenditure as agreed by all Parties.

EXHIBIT B

Ballona Creek Watershed Party Representatives

1. City of Los Angeles
   Department of Public Works
   Bureau of Sanitation, Watershed Protection Division
   1149 S. Broadway
   Los Angeles, CA 90015
   Party Representative: Shahram Kharaghani, Division Manager
   E-mail: Shahram.Kharaghani@Lacity.org
   Phone: (213) 485-0587
   Fax: (213) 485-3939

2. City of Beverly Hills
   455 North Rexford Drive
   Beverly Hills, CA90210
   Party Representative: Daniel Cartagena, Senior Management Analyst
   dcartagena@beverlyhills.org
   Phone No.: (310) 285-1189
   Fax: (310) 278-1838

3. City of Culver City
   9770 Culver Blvd., 2nd Floor
   Culver City, CA90232-0507
   Party Representative: Charles D. Herbertson, Director of Public Works/City Engineer
   charles.herbertson@culvercity.org
   Phone No.: (310) 253-5630
   Fax: (310) 253-5626

4. City of Inglewood
   Public Works Department
   1 Manchester Blvd.
   Inglewood, CA90301
   Party Representative: Lauren Amimoto, Senior Administrative Analyst
   lamimoto@cityofinglewood.org
   Phone No.: (310) 412-5192
   Fax: (310) 412-5552

5. City of Santa Monica
   Public Works Department
   Civil Engineering Division
   1437 4th Street, Suite 300
   Santa Monica, CA90401
   Rick Valte
   Email: rick.valte@smgov.net
   Phone No.: (310) 458-8234
   Fax: (310) 393-4425

6. City of West Hollywood
   Department of Transportation and Public Works
   8300 Santa Monica Blvd.
   West Hollywood, CA 90069-6216
   Party Representative: Sharon Perlstein, City Engineer
   Sperlstein@weho.org
   Phone No.: (323) 848-6368
   Fax: (323) 848-6564

7. County of Los Angeles
Department of Public Works
Watershed Management Division, 11th Floor
900 South Fremont Avenue
Alhambra, CA 91803-1331
Party Representative: Gary Hildebrand
E-mail: GHILDEB@dpw.lacounty.gov
Phone: (626) 458-4300
Fax: (626) 457-1526

8. Los Angeles County Flood Control District
Department of Public Works
Watershed Management Division, 11th Floor
900 South Fremont Avenue
Alhambra, CA 91803-1331
Party Representative: Gary Hildebrand
E-mail: GHILDEB@dpw.lacounty.gov
Phone: (626) 458-4300
Fax: (626) 457-1526

Attachment 6. Letters of intent by Ballona Creek EWMP agencies.

CITY OF LOS ANGELES
CALIFORNIA

ANTONIO R. VILLARAIGOSA
MAYOR

BUREAU OF SANITATION

ENRIQUE C. ZALDIVAR
DIRECTOR

TRACI J. MINAMIDE
CHIEF OPERATING OFFICER

VAROUJ S. ABKIAN
ADEL H. HAGEKHALIL
ALEXANDER E. HELOU
ASSISTANT DIRECTORS

NEIL M. GUGLIELMO
ACTING CHIEF FINANCIAL OFFICER

WATERSHED PROTECTION DIVISION
1149 SOUTH BROADWAY, 10TH FLOOR
LOS ANGELES, CA 90015
TEL: (213) 485-0587
FAX: (213) 485-3939

June 20, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Attention: Renee Purdy

Dear Mr. Unger:

CITY OF LOS ANGELES COMMITMENT TO PARTICIPATE IN AND SHARE THE COST FOR DEVELOPMENT OF ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR THE BALLONA CREEK WATERSHED

The City of Los Angeles submits this letter of intent with our commitment to participate in and share the cost for the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed as outlined in the Notice of Intent submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the MS4 Permit (Order No. R4-2012-0175) and the CIMP notification requirements specified in Attachment E Section IV.C.1.

The Ballona Creek Watershed Group consists of the following MS4 Permittees: the City of Los Angeles (lead agency for EWMP and CIMP development), the County of Los Angeles, Los Angeles County Flood Control District, the City of Beverly Hills, the City of Culver City, the City of Inglewood, the City of Santa Monica, and the City of West Hollywood. The final draft agreement to fund program development by the Ballona Creek Watershed Group has been included in the Notice of Intent and the City of Los Angeles is committed to execute this agreement prior to December 28, 2013.

Should you have any questions regarding this correspondence, please contact me at shahram.kharaghani@lacity.org or phone (213) 485-0587 or your staff may contact Huub Cox at hubertus.cox@lacity.org or phone (213) 485-3984.

Sincerely,

SHAHRAM KHARAGHANI, Ph.D., P.E., BCEE
Program Manager

SK:HC:RT
WPDCR9038

Mr. Sam Unger
City of Los Angeles Letter of Intent for Ballona Creek Watershed
June 20, 2013
Page 2

cc: Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Enrique Zaldivar, City of Los Angeles, BOS
Adel Hagekhalil, City of Los Angeles, BOS
Gary Hildebrand, County of Los Angeles
Daniel Cartagena, City of Beverly Hills
Sharon Perlstein, City of West Hollywood
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

GAIL FARBER, Director

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: WM-7

June 24, 2013

Mr. Samuel Unger, P.E.
Executive Officer
California Regional Water Quality
Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Attention Ms. Renee Purdy

Dear Mr. Unger:

LETTER OF INTENT – LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
BALLONA CREEK WATERSHED
ENHANCED WATERSHED MANAGEMENT PROGRAM
AND COORDINATED INTEGRATED MONITORING PROGRAM

The Los Angeles County Flood Control District (LACFCD) submits this Letter of Intent to participate in and share the cost of the development of an Enhanced Watershed Management Program (EWMP) and a Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek Watershed. This Letter of Intent serves to satisfy the EWMP notification requirements of Section VI.C.4.b.iii(3) of Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit) and the CIMP requirements of Section IV.C.1 of Attachment E of the Municipal Separate Storm Sewer System Permit.

The Ballona Creek EWMP agencies consist of the following: City of Los Angeles as the coordinating agency for EWMP and CIMP development, County of Los Angeles, LACFCD, and cities of Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood. The Ballona Creek EWMP agencies have included a final draft Memorandum of Understanding as Attachment 5 of the Notice of Intent. The LACFCD intends to submit a final Memorandum of Understanding to the County of Los Angeles Board of Supervisors (which is the LACFCD's governing body) for approval prior to December 28, 2013.

Mr. Samuel Unger
June 24, 2013
Page 2

If you have any questions, please contact Ms. Terri Grant at (626) 458-4309 or tgrant@dpw.lacounty.gov.

Very truly yours,

GAIL FARBER
Chief Engineer of the Los Angeles County Flood Control District

RP:jht
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cc: City of Beverly Hills
City of Culver City
City of Inglewood
City of Los Angeles
City of Santa Monica
City of West Hollywood

GAIL FARBER, Director

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: WM-7

June 24, 2013

Mr. Samuel Unger, P.E., Executive Officer
California Regional Water Quality
Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Attention Ms. Renee Purdy

Dear Mr. Unger:

LETTER OF INTENT – COUNTY OF LOS ANGELES
BALLONA CREEK WATERSHED
ENHANCED WATERSHED MANAGEMENT PROGRAM
AND COORDINATED INTEGRATED MONITORING PROGRAM

The County of Los Angeles (County) submits this Letter of Intent to participate in and share the cost of the development of an Enhanced Watershed Management Program (EWMP) and a Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek Watershed. This Letter of Intent serves to satisfy the EWMP notification requirements of Section VI.C.4.b.iii(3) of Order No. R4-2012-0175 (Municipal Separate Storm Sewer System Permit) and the CIMP requirements of Section IV.C.1 of Attachment E of the Municipal Separate Storm Sewer System Permit.

The Ballona Creek EWMP agencies consist of the following: City of Los Angeles as the coordinating agency for EWMP and CIMP development, County, Los Angeles County Flood Control District, and cities of Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood. The Ballona Creek EWMP agencies have included a final draft Memorandum of Understanding as Attachment 5 of the Notice of Intent. The County intends to submit a final Memorandum of Understanding to its Board of Supervisors for approval prior to December 28, 2013.

Mr. Samuel Unger
June 24, 2013
Page 2

If you have any questions, please contact Ms. Angela George at (626) 458-4325 or ageorge@dpw.lacounty.gov.

Very truly yours,

GAIL FARBER
Director of Public Works

RP:jht
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cc: City of Beverly Hills
City of Culver City
City of Inglewood
City of Los Angeles
City of Santa Monica
City of West Hollywood

BEVERLY HILLS

Jeffrey Kolin, City Manager

June 3, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Attention: Renee Purdy

CITY OF BEVERLY HILLS COMMITMENT TO PARTICIPATE IN AND SHARE THE COST FOR DEVELOPMENT OF ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR THE BALLONA CREEK WATERSHED

Dear Mr. Unger,

The City of Beverly Hills submits this letter of intent with our commitment to participate in and share the cost for the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed as outlined in the Notice of Intent submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the MS4 Permit (Order No. R4-2012-0175) and the CIMP notification requirements specified in Attachment E Section IV.C.1.

The Ballona Creek Watershed Group consists of the following MS4 Permittees: the City of Los Angeles (lead agency for EWMP and CIMP development), the County of Los Angeles, Los Angeles County Flood Control District, the City of Beverly Hills, the City of Culver City, the City of Inglewood, the City of Santa Monica, and the City of West Hollywood. The final draft agreement to fund program development by the Ballona Creek Watershed Group has been included in the Notice of Intent and the City of Beverly Hills is committed to execute this agreement prior to December 28, 2013.

Should you have any questions regarding this correspondence, please contact Daniel E. Cartagena at 310.285.1189 or dcartagena@beverlyhills.org.

Sincerely,

Jeffrey Kolin
City Manager,
City of Beverly Hills

cc: Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Shahram Kharaghani, City of Los Angeles
Gary Hildebrand, County of Los Angeles
Daniel Cartagena, City of Beverly Hills
Sharon Perlstein, City of West Hollywood
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica

CITY OF WEST HOLLYWOOD

CITY HALL
8300 SANTA MONICA BLVD.
WEST HOLLYWOOD, CA
90069-6216
TEL: (323) 848-6400
FAX: (323) 848-6562

TTY: For hearing impaired
(323) 848-6496

OFFICE OF THE
CITY MANAGER

PAUL AREVALO
CITY MANAGER

May 30, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Attention: Renee Purdy

CITY OF WEST HOLLYWOOD COMMITMENT TO PARTICIPATE IN AND SHARE THE COST FOR DEVELOPMENT OF AN ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR THE BALLONA CREEK WATERSHED

Dear Mr. Unger;

The City of West Hollywood submits this letter of intent with our commitment to participate in and share the cost for the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed as outlined in the Notice of Intent submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the MS4 Permit (Order No. R4-2012-0175) and the CIMP notification requirements specified in Attachment E Section IV.C.1.

The Ballona Creek Watershed Group consists of the following MS4 Permittees: the City of Los Angeles (lead agency for EWMP and CIMP development), the County of Los Angeles, Los Angeles County Flood Control District, the City of Beverly Hills, the City of Culver City, the City of Inglewood, the City of Santa Monica, and the City of West Hollywood. The final draft agreement to fund program development by the Ballona Creek Watershed Group has been included in the Notice of Intent and the City of West Hollywood is committed to execute this agreement prior to December 28, 2013.

Should you have any questions regarding this correspondence, please contact Sharon Perlstein, City Engineer, at (323) 848-6383.

Sincerely,

Paul Arevalo
City Manager

CITY OF WEST HOLLYWOOD

cc:
Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Shahram Kharaghani, City of Los Angeles
Gary Hildebrand, County of Los Angeles
Daniel Cartagena, City of Beverly Hills
Sharon Perlstein, City of West Hollywood
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica

Culver CITY
PUBLIC WORKS DEPARTMENT
ENVIRONMENTAL PROGRAMS & OPERATIONS DIVISION
9505 Jefferson Boulevard, Culver City, California, 90232

Charles D. Herbertson, P.E., L.S.
Public Works Director/City Engineer

Damian Skinner
Environmental Programs & Operations Division Manager

(310) 253-6445
FAX (310) 253-6430

June 3, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, CA 90013

ATTN: Renee Purdy

CITY OF CULVER CITY'S COMMITMENT TO PARTICIPATE IN AND SHARE THE COST FOR DEVELOPMENT OF AN ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR THE BALLONA CREEK WATERSHED

Dear Mr. Unger,

The City of Culver City submits this Letter of Intent (LOI) with our commitment to participate in and share the cost for the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed as outlined in the Notice of Intent (NOI) submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the Municipal Separate Storm Sewer System Permit (MS4 Permit), Order No. R4-2012-0175, and the CIMP notification specified in Attachment E, Section IV.C.1.

The Ballona Creek Watershed Group consists of the following MS4 Permittees:

- City of Los Angeles, lead agency for EWMP/CIMP development;
- County of Los Angeles and Los Angeles County Flood Control District;
- Cities of Beverly Hills, Culver City, Inglewood, Santa Monica and West Hollywood.

The final draft agreement to fund program development by the Ballona Creek Watershed Group has been included in the NOI and the City of Culver City is committed to execute this agreement prior to December 28, 2013.

Should you have any questions regarding this correspondence, please contact Damian Skinner at (310) 253-6421 or damian.skinner@culvercity.org.

Sincerely,

Charles D. Herbertson, P.E., P.L.S.
Director of Public Works & City Engineer

cc:
Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Shahram Kharaghani, City of Los Angeles
Gary Hildebrand, County of Los Angeles
Daniel Cartagena, City of Beverly Hills
Sharon Perlstein, City of West Hollywood
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica

Culver City Employees take pride in effectively providing the highest levels of service to enrich the quality of life for the community by building on our tradition of more than seventy-five years of public services, by our present commitment, and by our dedication to meet the challenges of the future

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Inglewood California

Public Works Department
ONE MANCHESTER BOULEVARD / INGLEWOOD, CA. 90301 / P.O. BOX 6500 / INGLEWOOD, CA. 90312
Telephone (310) 412-5333 / Fax (310) 412-5552
www.cityofinglewood.org

LOUIS A. ATWELL, P.E.
PUBLIC WORKS DIRECTOR

June 11, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Attention: Renee Purdy

CITY OF INGLEWOOD'S COMMITMENT TO PARTICPITE IN AND SHARE THE COST OF DEVELOPMENT OF ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR BALLONA CREEK WATERSHED

Dear Mr. Unger;

The City of Inglewood (City) submits this letter of intent with our commitment to participate in and share the cost of the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for the Ballona Creek watershed by the Ballona Creek Watershed Group as outlined in the Notice of Intent submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the MS4 Permit (Order No. R4-2012-0175) and the CIMP notification requirements as provided by Attachment E Section IV.C.1. The Ballona Creek Watershed Group consists of the following MS4 Permittees: the City of Los Angeles (lead agency for EWMP and CIMP development), the County of Los Angeles, Los Angeles County Flood Control District, the City of Beverly Hills, the City of Culver City, the City of Inglewood, the City of Santa Monica, and the City of West Hollywood. This letter of intent is also to satisfy the requirements of Part VI.C.4.b.iii.(3) in the new MS4 Permit The final draft agreement to fund plan development by the Ballona Creek Watershed Group has been included in the Notice of Intent and the City is committed to execute this agreement prior to December 28, 2013.

Should you have any questions regarding this correspondence, please contact Lauren Amimoto, Senior Administrative Analyst at (310) 412-5192 or by email at lamimoto@cityofinglewood.org

Sincerely,

Louis A. Atwell, PE
Director of Public Works

cc:
Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Shahram Kharaghani, City of Los Angeles
Gary Hildebrand, County of Los Angeles
Daniel Cartagena, City of Beverly Hills
Sharon Perlstein, City of West Hollywood
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica

City of
Santa Monica®

Office of the City Manager
1685 Main Street
PO Box 2200
Santa Monica, California 90407-2200

June 17, 2013

Samuel Unger, Executive Officer
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Attention: Renee Purdy

CITY OF SANTA MONICA COMMITMENT TO PARTICIPATE IN AND SHARE THE COST FOR DEVELOPMENT OF ENHANCED WATERSHED MANAGEMENT PROGRAM AND COORDINATED INTEGRATED MONITORING PROGRAM FOR THE JURISDICTIONAL GROUPS 2 AND 3 (J2 and J3) OF THE SANTA MONICA BAY WATERSHED

Dear Mr. Unger;

The CITY OF SANTA MONICA submits this letter of intent with our commitment to participate in and share the cost for the development of an Enhanced Watershed Management Program (EWMP) and Coordinated Integrated Monitoring Program (CIMP) for J2 and J3 of the Santa Monica Bay watershed as outlined in the Notice of Intent submitted by the City of Los Angeles to meet the requirements of Part VI.C.4.b of the MS4 Permit (Order No. R4-2012-0175) and the CIMP notification requirements specified in Attachment E Section IV.C.1.

The J2 and J3 of the Santa Monica Bay Watershed Group consists of the following MS4 Permittees: the City of Los Angeles (lead agency for EWMP and CIMP development), the County of Los Angeles, Los Angeles County Flood Control District, the City of Santa Monica, and the City of El Segundo. The final draft agreement to fund program development by J2 and J3 of the Santa Monica Bay Watershed Group has been included in the Notice of Intent and the CITY OF SANTA MONICA is committed to execute this agreement prior to December 28, 2013.

tel: 310 458-8301 • fax: 310 917-6640

Should you have any questions regarding this correspondence, please contact Rick Valte at (310) 458-8234.

Sincerely,

ROD GOULD
City Manager

cc:
Renee Purdy, California Regional Water Quality Control Board, Los Angeles Region
Ivar Ridgeway, California Regional Water Quality Control Board, Los Angeles Region
Shahram Kharaghani, City of Los Angeles
Gary Hildebrand, County of Los Angeles
Rick Valte, City of Santa Monica
Stephanie Katsouleas, City of El Segundo

Attachment 7. Mar Vista Recreation Center Stormwater BMP Project Fact Sheet.

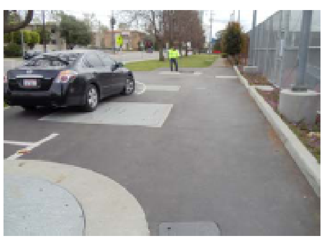
Mar Vista Recreation Center
Stormwater Best Management Practices Project

Project Description

This project involves construction in two phases to clean urban runoff from an existing 78-inch storm drain in Sawtelle Blvd. and to use the water for irrigation in Mar Vista Park. Phase I facilities include: 1) storm drain diversion structure; 2) trash maintenance hole; 3) stormwater lift station; 4) hydrodynamic separator; 5) 270,000-gallon underground detention tank; 6) disinfection facility; 7) overflow/return piping; and 8) pump and control systems. Phase I was completed by the end of 2010 and the project is currently operated at limited capacity as a treat & release facility. The objective of Phase II is to include an irrigation system to beneficially use the treated water at the park, to increase the treatment capacity of the facility and associated pollutant load reductions, and to conduct a facility optimization project to fine-tune the grey and green infrastructure components of the project and optimize overall performance of the facility.

Project Location

The project is located at the Mar Vista Recreation Center in the 11th Council District. The park, located west of the 405 Freeway at the corner of Sawtelle Blvd and Palms Blvd, is owned and operated by the City of Los Angeles Department of Recreation and Parks. The project will capture dry and wet weather runoff from a 243-acre drainage area that is predominantly made up of high-density residential neighborhoods and transportation corridors within the Ballona Creek watershed.



Targeted Pollutants & Other Project Benefits

The primary objective of the project is to remove bacteria from urban runoff in the Mar Vista subwatershed, but the project will also capture other pollutants of concern, such as trash, oil & grease, suspended sediments, and heavy metals. Whereas Phase I of the project will treat and return the runoff to the storm drain system, Phase II of the project will treat and retain the runoff for on-site uses thereby increasing the volumetric capacity of the facility and increasing the pollutant load reductions of, in particular, metals and toxics. Collectively, Phases I and II of the Mar Vista Recreation Center Stormwater BMP Project will assist the watershed to comply with the Ballona Creek TMDL regulations for indicator bacteria and metals, and the Ballona Estuary TMDL for toxic pollutants. In addition, the project will also support local water conservation efforts by using the cleaned water for irrigation.

Schedule & Project Funding

Phase I has been completed. The estimated total cost to design and construct Phase II is approximately $1.5 million. Phase II is expected to be completed by December 2014.

CITY OF LOS ANGELES SANITATION DEPARTMENT OF PUBLIC WORKS WATERSHED PROTECTION

Attachment 7. Mar Vista Recreation Center Stormwater BMP Project Phase II Fact Sheet

Mar Vista Recreation Center Stormwater BMP Project Phase II includes the following stormwater beneficial reuse components:

- Stormwater drip irrigation system for 43 shrubs, 86 bushes, and 68 trees
- Installation of a irrigation pump station and associated components
- Creation of 3,800 square feet of plant community
- Installation of back-flow prevention system
- Construction of flow containment curbs

The Phase II project components are expected remove 6,000 gallons per day (5.5 acre-ft/year) of stormwater and provide additional storage space for the underground cisterns that were constructed during Phase I. Additionally, as described in Table 7A, total recoverable metals such as Copper, Lead, and Zinc will be removed.

Table 7A. Water Quality Benefits provided by Mar Vista Stormwater BMP Phase II.

WATER QUALITY BENEFITS													
Total Recoverable Metals in Kilograms removed by Mar Vista Rec Center Stormwater Quality Improvement Phase II in a typical year**													
	Jan	Feb	Mar*	Apr*	May	Jun	Jul	Aug	Sep	Oct*	Nov*	Dec*	TOTAL
Cu	0.78	0.15	0.609	0.73	0.15	0.21	0.20	0.29	0.24	3.498	5.655	0.52	**13.0**
Pb	0.19	0.013	0.332	0.28	0.006	0.018	0.02	0.04	0.03	1.049	1.413	0.13	**3.52**
Zn	5.11	0.62	3.861	3.48	0.343	1.10	0.89	1.55	0.77	59.28	22.64	2.84	**102**
*Wet-weather samples.													
**Metal concentrations from sampling station BC-4 (Sepulveda Channel) during 2012 calender year are used.													

Attachment 8. Specific actions and status of compliance by EWMP agencies for compliance with interim and final milestones of the Ballona Creek Trash TMDL.

EWMP agency	Implementation status Ballona Creek Trash TMDL
City of Los Angeles	As of December 2012, City has retrofitted approximately 28,700 catch basins with screens, installed 3 mainline hydrodynamic devices and 10 netting systems and is on target for the 90% interim milestone. 100% compliance will be demonstrated through the City's Trash TMDL Quantification Study of Institutional Measures.
County of Los Angeles	319 out of a total of 399 catch basins have been retrofitted with full capture devices. The remaining 80 catch basins will be retrofitted by 2014 to meet the 100% milestone.
LACFCD	NA
City of Beverly Hills	The City of Beverly Hills remains committed to achieve minimum control of the 9 measures listed in the current MS4 Permit relative to trash management with such programs as: An enhanced weekly citywide street sweeping program and daily service of approximately 200 trash receptacles located throughout the City's public right-of-way. Further, Beverly Hills has budgeted $900,000 towards the installation of Trash Excluders for all City-owned stormdrains to meet 2015 Trash Effluent Limitations.
City of Culver City	On schedule for interim milestones through institutional measures including street sweeping, trash receptacles, and catch basin cleaning. Currently, two CDS units have been installed (serving 54 catch basins), 206 catch basins have been equipped with ARS and 152 catch basins with CPS. Remaining catch basins will be retrofitted by end of 2013.
City of Inglewood	On schedule for interim milestones through institutional measures including street sweeping, trash receptacles, and catch basin cleaning. Currently, 205 city owned catch basins are being retrofitted with a Connector Pipe Screen (CPS) devices and the city is in the process of obtaining a permit from Los Angeles County to retrofit an additional 200 county owned catch basins with CPS.
City of West Hollywood	On schedule with interim and final TMDL milestones through implementation of multiple of institutional measures including street sweeping, trash collection, catch basin cleaning, outreach, and enforcement. As of December 2012, 150 catch basins have been retrofitted with screens or inserts.
City of Santa Monica	A full-capture trash BMP at the Westside Water Quality Improvement Project has been installed to remove trash from all runoff from City of Santa Monica to Ballona Creek.

Attachment 9. Summary of Ballona Creek Metals TMDL monitoring.

The following table provides the percentage of the watershed area that meets the dry weather waste load allocations for total metals. Total metals were determined on a monthly basis at four sampling locations along Ballona Creek as specified in the Coordinated Monitoring Plan for the Ballona Creek Metals TMDL.

	Percent Area Meeting WLA			
Sampling Date	Total Copper	Total Lead	Total Selenium	Total Zinc
02/05/2009	100%	100%	100%	100%
03/12/2009	100%	100%	100%	100%
04/29/2009	100%	100%	100%	100%
05/14/2009	98%	100%	100%	100%
06/04/2009	58%	100%	100%	100%
07/14/2009	98%	100%	100%	100%
08/11/2009	80%	100%	100%	100%
09/01/2009	100%	100%	100%	100%
10/06/2009	38%	100%	100%	100%
11/10/2009	100%	100%	100%	100%
12/21/2009	100%	100%	100%	100%
1/25/2010	100%	100%	100%	100%
2/17/2010	100%	100%	100%	100%
3/9/2010	100%	100%	100%	100%
4/7/2010	100%	100%	100%	100%
5/17/2010	62%	100%	100%	100%
6/28/2010	100%	100%	100%	100%
7/13/2010	100%	100%	100%	100%
8/10/2010	100%	100%	100%	100%
9/13/2010	80%	100%	100%	100%
04/25/2011	100%	100%	100%	100%
06/14/2011	100%	100%	100%	100%
07/12/2011	100%	100%	100%	100%
08/23/2011	100%	100%	100%	100%
09/13/2011	100%	100%	100%	100%
2/22/2012	100%	100%	100%	100%
5/15/2012	100%	100%	100%	100%

February 26, 2014

Dr. Shahram Kharaghani
City of Los Angeles
Department of Public Works, Bureau of Sanitation
Watershed Protection Division
1149 South Broadway, 10th Floor
Los Angeles, CA 90015

Ms. Sharon Perlstein, City Engineer
City of West Hollywood
Department of Transportation and
Public Works
8300 Santa Monica Boulevard
West Hollywood, CA 90069

Mr. Jeffrey Kolin
City Manager
City of Beverly Hills
455 North Rexford Drive
Beverly Hills CA 90210

Mr. Charles D. Herbertson
Director of Public Works and City Engineer
City of Culver City
9770 Culver Blvd., 2nd Floor
Culver City, CA 90232

Mr. Louis A. Atwell, Director
City of Inglewood
Public Works Department
1 Manchester Boulevard
Inglewood, CA 90301

Mr. Rod Gould
City Manager
City of Santa Monica
1685 Main Street
Santa Monica, CA 90407

Ms. Gail Farber, Director
County of Los Angeles
Department of Public Works
Watershed Management Division, 11th Floor
900 South Fremont Avenue
Alhambra, CA 91803

Ms. Gail Farber, Chief Engineer
Los Angeles County Flood Control District
Department of Public Works
Watershed Management Division, 11th Floor
900 South Fremont Avenue
Alhambra, CA 91803

APPROVAL OF REVISED NOTIFICATION OF INTENT TO DEVELOP AN ENHANCED WATERSHED MANAGEMENT PROGRAM, PURSUANT TO THE LOS ANGELES COUNTY MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT (NPDES PERMIT NO. CAS004001; ORDER NO. R4-2012-0175)

Dear Permittees participating in the Ballona Creek Watershed group:

In a letter dated December 11, 2013, the California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board or Board) provided its review of the Ballona Creek Watershed notification of intent (NOI) to develop an enhanced watershed management program (EWMP). As part of their NOI, Permittees pursuing an EWMP are required to identify, and commit to fully implement by June 28, 2015, a structural best management practice (BMP) or suite of BMPs at a scale that provides meaningful water quality improvement within each watershed covered by the EWMP. The structural BMP(s) must be in addition to BMPs that are required to meet interim or final trash TMDL effluent limitations or other final effluent limitations applicable in the watershed with deadlines prior to April 28, 2016. The structural BMP(s) identified in the NOI are subject to Executive Officer approval. The NOI identified Phase II of the Mar Vista Recreation Center Stormwater BMP project as the structural BMP to meet the above mentioned requirement.

In its letter, the Board requested additional information about the water quality improvements to be achieved by Phase II of the Mar Vista Recreation Center Stormwater BMP project. Specifically, for the Board to fully evaluate the project, Permittees needed to provide the water quality components of Phase II of the Mar Vista Recreation Center Stormwater BMP project and the expected increase in water quality improvements to be achieved by implementing Phase II of the project.

On December 23, 2013, the Regional Water Board received the revised NOI for the Ballona Creek Watershed EWMP. Board staff has reviewed the revised NOI for compliance with all notification requirements of Part VI.C of Order No. R4-2012-0175 and has determined that all the notification requirements have been met.

Pursuant to section VI.C.4.b.iii.(5) of the Order, the proposed structural best management practices (BMPs) are subject to approval by the Regional Water Board Executive Officer. The City of Los Angeles proposes to implement Phase II of the Mar Vista Recreation Center Stormwater BMP project. Phase II of the project will treat and retain the runoff for on-site irrigation and infiltration; currently the treated runoff is discharged back to the MS4. Phase II of the project is expected to remove 6,000 gallons per day of storm water and the pollutants in the storm water runoff, which include copper, lead and zinc.

The Board has concluded that Phase II of the project will result in a meaningful improvement in water quality by infiltrating the treated storm water instead of discharging into Ballona Creek; therefore, the proposed Phase II of the Mar Vista Recreation Center Stormwater BMP project is approved.

The work plan for development of the Ballona Creek Watershed EWMP is due by June 28, 2014. Please submit the work plan to losangeles@waterboards.ca.gov with the subject line "LA County MS4 Permit – Enhanced Watershed Management Program Work Plan" with copies to Ivar.Ridgeway@waterboards.ca.gov and Rebecca.Christmann@waterboards.ca.gov.

If you have any questions, please contact Mr. Ivar Ridgeway, Storm Water Permitting, at (213) 620-2150 or Ms. Rebecca Christmann at (213) 576-6786.

Sincerely,

Samuel Unger

Samuel Unger, P.E.
Executive Officer

cc: Hubertus Cox, City of Los Angeles
Daniel Cartagena, City of Beverly Hills
Damian Skinner, City of Culver City
Lauren Amimoto, City of Inglewood
Rick Valte, City of Santa Monica
Angela George, County of Los Angeles, Department of Public Works
Gary Hildebrand, Los Angeles County Flood Control District
David Smith, NPDES Program, USEPA Region IX
Jennifer Fordyce, Office of Chief Counsel, State Water Board

Appendix 1.B Los Angeles County Flood Control District Background Information

In 1915, the Los Angeles County Flood Control Act established the Los Angeles County Flood Control (LACFCD) and empowered it to manage flood risk and conserve stormwater for groundwater recharge. In coordination with the United States Army Corps of Engineers, the LACFCD developed and constructed a comprehensive system that provides for the regulation and control of flood waters through the use of reservoirs and flood channels. The system also controls debris, collects surface stormwater from streets, and replenishes groundwater with stormwater, imported water, and recycled water. The LACFCD covers the 2,753 square-mile portion of Los Angeles County south of the east-west projection of Avenue S, excluding Catalina Island. It is a special district governed by the County of Los Angeles Board of Supervisors, and its functions are carried out by the Los Angeles County Department of Public Works. The LACFCD service area is shown in Figure 1.

Unlike cities and counties, the LACFCD does not own or operate any municipal sanitary sewer systems, public streets, roads, or highways. The LACFCD operates and maintains storm drains and other appurtenant drainage infrastructure within its service area. The LACFCD has no planning, zoning, development permitting, or other land use authority within its service area. There is a Municipal Separate Storm Sewer System (MS4) Permit (Order No. R4-2012-0175; National Pollutant Discharge Elimination System [NPDES] Permit No. CAS004001) for Los Angeles County. The permittees that have such land use authority are responsible under this Permit for inspecting and controlling pollutants from industrial and commercial facilities, development projects, and development construction sites. *(2012 Permit, Part II.E, p. 17.)*

The MS4 Permit language clarifies the unique role of the LACFCD in stormwater management programs: "[g]iven the LACFCD's limited land use authority, it is appropriate for the LACFCD to have a separate and uniquely-tailored stormwater management program. Accordingly, the stormwater management program minimum control measures imposed on the LACFCD in Part VI.D of this Order differ in some ways from the minimum control measures imposed on other Permittees. Namely, aside from its own properties and facilities, the LACFCD is not subject to the Industrial/Commercial Facilities Program, the Planning and Land Development Program, and the Development Construction Program. However, as a discharger of storm and non-stormwater, the LACFCD remains subject to the Public Information and Participation Program and the Illicit Connections and Illicit Discharges Elimination Program. Further, as the owner and operator of certain properties, facilities and infrastructure, the LACFCD remains subject to requirements of a Public Agency Activities Program." *(2012 Permit, Part II.F, p. 18.)*

Consistent with the role and responsibilities of the LACFCD under the Permit, the [E]WMPs and CIMPs reflect the opportunities that are available for the LACFCD to collaborate with permittees having land use authority over the subject watershed area. In some instances, the opportunities are minimal, however the LACFCD remains responsible for compliance with certain aspects of the MS4 permit as discussed above.

In some instances, in recognition of the increased efficiency of implementing certain programs regionally, the LACFCD has committed to responsibilities above and beyond its obligations under the 2012 Permit. For example, although under the 2012 Permit the Public Information and Participation Program (PIPP) is a responsibility of each Permittee, the LACFCD is committed to implementing certain regional elements of the PIPP on behalf of all Permittees at no cost to the Permittees. These regional elements include:

- Maintaining a countywide hotline (888-CLEAN-LA) and website (www.888cleanla.com) for public reporting and general stormwater management information at an estimated annual cost of $250,000. Each Permittee can utilize this hotline and website for public reporting within its jurisdiction.
- Broadcasting public service announcements and conducting regional advertising campaigns at an estimated annual cost of $750,000.
- Facilitating the dissemination of public education and activity-specific stormwater pollution prevention materials at an estimated annual cost of $100,000.
- Maintaining a stormwater website at an estimated annual cost of $10,000.

The LACFCD will implement these elements on behalf of all Permittees starting July 2015 and through the Permit term. With the LACFCD handling these elements regionally, Permittees can better focus on implementing local or watershed-specific programs, including student education and community events, to fully satisfy the PIPP requirements of the 2012 Permit.

Similarly, although water quality monitoring is a responsibility of each Permittee under the 2012 Permit, the LACFCD is committed to implement certain regional elements of the monitoring program. Specifically, the LACFCD will continue to conduct monitoring at the seven existing mass emissions stations required under the previous Permit. The LACFCD will also participate in the Southern California Stormwater Monitoring Coalition's Regional Bioassessment Program on behalf of all Permittees. By taking on these additional responsibilities, the LACFCD wishes to increase the efficiency and effectiveness of these programs.

Figure 1. Los Angeles County Flood Control District Service Area

Appendix 2.A
Supporting Information for the Receiving Water Analysis

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include an evaluation of existing water quality conditions, including characterization of receiving water quality. Data were compiled to identify constituents exceeding applicable water quality objectives. Applicable water quality objectives were obtained from the California Toxics Rule (CTR), Basin Plan, and relevant TMDLs. Applicable water quality objectives from the CTR and Basin Plan were selected based on the beneficial uses identified in the Basin Plan (summarized in Table 1). Generally, the water quality objectives utilized included those established for the protection of aquatic life, contact recreation and human health related to the consumption of organisms. Bed and suspended sediment quality data were compared to TMDL targets. Given the significant number of water quality constituents and corresponding water quality objectives the following steps were taken:

- The first step in the analysis was to develop a list of constituents that were sampled for but were never detected in any water body within the EWMP area and therefore would not fall into one of the three Permit categories (Table 2). A list of these constituents is presented in Attachment 1.
- Next, constituents that were detected but the sample results never exceeded a corresponding water quality objective and therefore would not fall into one of the three Permit categories were identified. A list of these constituents is presented in Attachment 2.
- All other constituents (*i.e.*, all constituents detected and with sample results that had at least one result greater than an applicable water quality objective) were subject to further analysis. Summary tables are presented in Attachment 3. These tables generally include the following attributes:

    Applicable water body segments (*i.e.*, tributaries, reaches, etc.)

    TMDL target or applicable water quality objective (*e.g.*, CTR and/or Basin Plan)

    Applicable wet or dry weather conditions

    Date range of data

    Total number of samples, number of samples exceeding the water quality objectives, percent exceedance frequency, and number of exceedances in the past five years of available data

    Whether or not the number of exceedances suggested an impairment per the State's 303(d) Listing Policy[1]

    Average, median, maximum, and minimum of sample results

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[1] 2004 Water Quality Control Policy for Developing California's Clean Water Act Section 303 (d) List.

Table 1. Ballona Creek Watershed Designated Beneficial Uses as Presented in the Los Angeles Region Basin Plan

Water Body	REC1	LREC-1	REC2	HFS	MUN	NAV	COMM	WARM	EST	MAR	WILD	RARE	MIGR	SPWN	SHELL	WET [b]
Ballona Creek Estuary (ends at Centinela Creek) [c,w]	E		E			E	E		E	E	E	E[e]	E[f]	E[f]	E	
Ballona Lagoon [c]	E		E			E	E		E	E	E	E[e]	E[f]	E[f]	E	E
Ballona Wetlands [c]	E		E						E		E	E[e]	E[f]	E[f]		E
Del Rey Lagoon [c]	E		E			E	E		E		E	E[e]	E[f]	E[f]		E
Ballona Creek Reach 2 (Estuary to National Blvd.)	P[s,au]	E	E	Y[av]	P*			P			P					
Ballona Creek Reach 1 (above National Blvd.)	P[s,au]		E	Y[av]	P*			P			E					

E: Existing beneficial use P: Potential beneficial use

b: Waterbodies designated as WET may have wetlands habitat associated with only a portion of the waterbody. Any regulatory action would require a detailed analysis of the area.

c: Coastal waterbodies which are also listed in Coastal Features Table (2-3) or in Wetlands Table (2-4) of the Basin Plan. Ballona Lagoon, while listed in the Basin Plan as part of the Ballona Creek watershed, is actually in the Marina del Rey watershed. In order to be consistent with the Basin Plan, Ballona Lagoon is shown in this table, but recognize that it will be addressed in the Marina del Rey EWMP.

e: One or more rare species utilizes all ocean, bays, estuaries, and coastal wetlands for foraging and/or nesting.

f: Aquatic organisms utilize all bays, estuaries, lagoons, and coastal wetlands, to a certain extent, for spawning and early development. This may include migration into areas which are heavily influenced by freshwater inputs.

s: Access prohibited by Los Angeles County Department of Public Works.

w: These areas are engineered channels. All references to Tidal Prisms in Regional Board documents are functionally equivalent to estuaries

* Asterisked MUN designations are designated under SB 88-63 and RB 89-03. Some designations may be considered for exemption at a later date (See pages 2-3, 4 for more details).

au: The REC-1 use designation does not apply to recreational activities associated with the swimmable goal as expressed in the Federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use in the Basin Plan, or the associated bacteriological objectives set to protect those activities. However, water quality objectives set to protect other REC-1uses associated with the fishable goal as expressed in the Federal Clean Water Act section 1010(a)(2) shall remain in effect for waters where the (au) footnote appears.

av: The High Flow Suspension only applies to water contact recreational activities associated with the swimmable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use, noncontact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological objectives set to protect those activities. Water quality objectives set to protect (1) other recreational uses associated with the fishable goal as expressed in the federal Clean Water Act section 101(a)(2) and regulated under the REC-1 use and (2) other REC-2 uses (*e.g.*, uses involving the aesthetic aspects of water) shall remain in effect at all times for waters where the (av) footnote appears.

Table 2. Water Body-Pollutant Classification Categories (Permit Section IV.C.5.a.ii)

Category	Water Body-Pollutant Combinations (WBPCs)
1 Highest Priority	WBPCs for which TMDL Water Quality-Based Effluent Limits (WQBELs) and/or Receiving Water Limitations (RWLs) are established in Part VI.E and Attachments L and O of the MS4 Permit.
2 High Priority	WBPCs for which data indicate water quality impairment in the receiving water according to the State's Listing Policy, regardless of whether the pollutant is currently on the 303(d) List and for which the MS4 discharges may be causing or contributing.
3 Medium Priority	WBPCs for which there are insufficient data to indicate impairment in the receiving water according to the State's Listing Policy, but which exceed applicable receiving water limitations contained in the MS4 Permit and for which MS4 discharges may be causing or contributing to the exceedance.

For the analysis presented in Attachment 3, the determination of weather condition was based on the designation provided by the sampling program. If no information was provided by the sampling program, flow records were reviewed. If flow on the sample date exceeded the definition of wet weather of 64 cubic feet per second (cfs) identified in the 2013 Ballona Creek Metals TMDL, it was identified as a wet weather sample.

A large proportion of the data included non-detect values. Using these data to calculate summary statistics requires methods for dealing with the inherent uncertainty in characterizing the true range of water quality conditions. The method used to consider non-detect data results is typically known as regression on order statistics (ROS). Use of the ROS method, when statistical criteria are met, more appropriately estimates actual values than the commonly employed practice of assuming one half the detection limit for non-detect values. Criteria for sufficient data to use the ROS method are: 1) at least 20 percent and preferably 50 percent detected data and 2) at least three unique detected values. Instances of insufficient detected data results are noted in the summary tables as <20 percent detect Attachment 3.

In addition to the results for water data presented in Attachment 3, sediment data for samples collected from bed sediments in the Ballona Creek Estuary and suspended sediments collected in Ballona Creek and Centinela Creek are compared to TMDL targets and summarized in tables presented in Attachment 4.

Summary of Key Findings of Receiving Water Data Analysis

The following provides a summary of key findings from the receiving water data analysis. It is not intended to be a detailed discussion of all the results of the data analysis. Instead, the summary highlights outcomes of the data analysis that may affect the constituents addressed by the EWMP and/or the way the EWMP will approach addressing the constituent. For example, some constituents addressed by the Metals TMDL appear to exceed less frequently than in the past and as such, are discussed in this subsection. Conversely, indicator bacteria continue to exceed on a frequent basis and nothing "new" was learned from the data analysis. As such, indictor bacteria are not discussed in this subsection. The key findings are organized as follows:

- Summary of findings related to the Metals TMDL.
- Identification of constituents that are not currently on the 303(d) List, but appear to meet the listing requirements.

- Identification of constituents that exhibited exceedances of relevant water quality objectives, but do not meet the 303(d) listing requirements.
- Identification of current 303(d) listed constituents not addressed by a TMDL that appear to meet the delisting requirements.

Key Findings Related to the Metals TMDL

Wet weather is the primary condition where exceedances of metals criteria and TMDL targets persist. Over the past five years, copper, lead and zinc exceedances during dry weather are infrequent. As noted in the 2013 Metals TMDL Amendment, selenium does not appear to be an issue during wet or dry weather. The following provides a generalized summary of the key findings from data collected over the past five years (note that percentages are rounded) (see Attachment 3 for detailed summary):

- Dissolved Copper: Consistently exceeds in wet weather (40 percent-90 percent) but rarely in dry weather (0 percent-4 percent).
- Total Copper: Consistently exceeds in wet weather (>90 percent), but rarely in dry weather (0 percent-4 percent).
- Dissolved Lead: Rarely exceeds during wet or dry weather (0 percent-2 percent).
- Total Lead: Consistently exceeds in wet weather (>90 percent), but rare in dry weather (0 percent-2 percent).
- Dissolved Zinc: Consistently exceeds CTR criteria in wet weather (0 percent-20 percent), but does not exceed in dry weather.
- Total Zinc: Consistently exceeds in wet weather (>75 percent), but rare in dry weather (<1 percent).
- Total Selenium: Only one sample out of 200 exceeded during wet or dry weather.

Constituents Not on the 303(d) List, But Appear to Meet Listing Requirements

The data analysis identified a number of constituents exceeding relevant water quality objectives, at a frequency that appears to meet the 303(d) listing criteria. The following identifies the constituents by waterbody and discusses the frequency of exceedances during relevant conditions (*e.g.*, wet and/or dry weather). Table 3 presents a summary of the information. A more detailed summary of the analysis can be found in the tables presented in Attachment 3.

Table 3. Summary of Key Findings – Constituents Not Currently on the 303(d) List, But Appear to Meet Listing Criteria

Waterbody	Constituent	W/D	% Exceed	% Exceed in Past 5 Years	Source of Water Quality Objective (WQO)
Ballona Creek Estuary	Zinc Dissolved	Wet	13%	NS	CTR Saltwater Acute
	Zinc Total	Wet	19%	NS	CTR Saltwater Acute
	Copper Dissolved	Wet	60%	NS	CTR Saltwater Acute
	Copper Total	Wet	69%	NS	CTR Saltwater Acute
	Copper Dissolved	Dry	48%	6%	CTR Saltwater Chronic

Table 3. Summary of Key Findings – Constituents Not Currently on the 303(d) List, But Appear to Meet Listing Criteria (continued)

Waterbody	Constituent	W/D	% Exceed	% Exceed in Past 5 Years	Source of Water Quality Objective (WQO)
	Copper Total	Dry	52%	6%	CTR Saltwater Chronic
	Lead Dissolved	Dry	18%	0%	CTR Saltwater Chronic
	Lead Total	Dry	21%	0%	CTR Saltwater Chronic
	Nickel Dissolved	Dry	22%	NS	CTR Saltwater Chronic
	Nickel Total	Dry	26%	NS	CTR Saltwater Chronic
	Mercury Total	Wet	29%	NS	CTR HH Organism
	Mercury Total	Dry	23%	NS	CTR HH Organism
	Dibenzo(a,h)anthracene	Dry	13%	13%	CTR HH Organism
	Indeno(1,2,3-cd)pyrene	Dry	13%	13%	CTR HH Organism
	Silver Dissolved	Wet	10%	0%	CTR Freshwater Acute
Ballona Creek Reach 1	Silver Total	Wet	10%	0%	CTR Freshwater Acute
	Mercury Total	Wet	30%	NS	CTR HH Organism
	Mercury Total	Dry	27%	NS	CTR HH Organism
	Benzo(a)anthracene	Wet	8%	10%	CTR HH Organism
Ballona Creek Reach 2	Mercury Total	Wet	10%	0%	CTR HH Organism
	Mercury Total	Dry	22%	13%	CTR HH Organism
	pH	Dry	24%	29%	BP Minimum/Maximum
	4,4'-DDE	Wet	11%	19%	CTR HH Organism
Centinela Creek	pH	Dry	80%	0%	BP Minimum/Maximum
Sepulveda Channel					

BP = Basin Plan CTR = California Toxics Rule NS = Not Sampled
HH Organism = Human Health Organisms only criteria

Constituents Exceeding Objectives, But Do Not Meet the Listing Requirements

The data analysis identified a number of constituents as exceeding relevant water quality objectives, but not at a frequency that meets the 303(d) listing criteria. Table 4 identifies the constituents by waterbody and includes the frequency of exceedances during relevant conditions (*e.g.*, wet and/or dry weather). A more detailed summary of the analysis can be found in the tables presented in Attachment 3.

Table 4. Summary of Key Findings – Constituents Exceeding Objectives, But That Do Not Appear to Meet Listing Criteria

Waterbody	Constituent	W/D	% Exceed	% Exceed in Past 5 Years	Source of Water Quality Objective (WQO)
Ballona Creek Estuary	Silver Dissolved	Wet	6%	NS	CTR Saltwater Acute
	Silver Total	Wet	6%	NS	CTR Saltwater Acute
	Zinc Total	Dry	2%	0%	CTR Saltwater Chronic
Ballona Creek	Cadmium Total	Wet	5%	0%	CTR Freshwater Acute
Ballona Creek Reach 2	3,4 Benzofluoranthene	Wet	1.7%	2.6%	CTR HH Organism
	4,4'-DDE	Wet	1.8%	2.6%	CTR HH Organism
	Ammonia-N	Dry	3.7%	6.7%	BP 30-day Acute early life stage
	Benzo(a)pyrene	Wet	1.5%	2.6%	CTR HH Organism
	Bis(2-Ethylhexyl) phthalate	Wet	6.5%	5.3%	CTR HH Organism
	Bis(2-Ethylhexyl) phthalate	Dry	7.7%	0%	CTR HH Organism
	Cadmium Total	Wet	1.9%	0%	CTR Freshwater Acute
	Chrysene	Wet	1.5%	2.6%	CTR HH Organism
	Indeno(1,2,3-cd)pyrene	Wet	1.5%	2.6%	CTR HH Organism
	Silver Dissolved	Wet	1%	0%	CTR Freshwater Acute
	Silver Total	Wet	1.9%	0%	CTR Freshwater Acute
	alpha-chlordane	Wet	1.8%	2.6%	CTR HH Organism
	gamma-chlordane	Wet	1.8%	2.6%	CTR HH Organism
	Diazinon	Wet	3.3%	0%	USEPA Freshwater Acute
	Oxygen Dissolved	Wet	4.7%	0%	BP Single Sample Minimum
	Cyanide Total	Wet	7.1%	5.3%	CTR Freshwater Acute
		Dry	3.8%	0%	CTR Freshwater Chronic
	pH	Wet	9.5%	15%	BP Minimum/Maximum
Centinela Creek	4,4'-DDT	Wet	3.7%	6%	CTR HH Organism
	Benzo(a)anthracene	Wet	4.5%	6%	CTR HH Organism
	Benzo(k)fluoranthene	Wet	3.7%	6%	CTR HH Organism
	Bis(2-Ethylhexyl) phthalate	Wet	9.1%	9.1%	CTR HH Organism
	Cadmium Total	Wet	5.3%	0%	CTR Freshwater Acute
	Chrysene	Wet	3.7%	6%	CTR HH Organism
	Silver Total	Wet	5.3%	13%	CTR Freshwater Acute
	Indeno(1,2,3-cd)pyrene	Wet	3.7%	6%	CTR HH Organism
	pH	Wet	18.2%	NS	BP Minimum/Maximum
		Dry	33.3%	NS	BP Minimum/Maximum
Sepulveda Channel	Bis(2-Ethylhexyl) phthalate	Wet	9.1%	NS	CTR HH Organism
	Diazinon	Wet	9.1%	NS	USEPA Freshwater Acute
	Cyanide Total	Wet	9.1%	NS	CTR Freshwater Acute

BP = Basin Plan CTR = California Toxics Rule NS = Not Sampled

HH Organism = Human Health Organisms only criteria

Identification of Current 303(d) Listed Constituents Not Addressed by a TMDL that Meet the Delisting Requirements

Two of the three 303(d) listings not addressed by an existing TMDL were identified as potentially meeting delisting requirements: ammonia and cyanide.

Cyanide in Ballona Creek was listed based on three of 18 samples exceeding at the LA County mass emission station between October 2000 and April 2003. A review of the past 10 years of data indicates that only five of 82 samples exceed the applicable CTR criteria. For toxicants, the maximum number of exceedances allowed for delisting is shown in Table 4.1 (Page 14) of the Listing Policy and indicates that if the sample size is between 72 and 82 a constituent can be delisted if the number of exceedances is equal to or less than six. A more detailed summary of the analysis can be found in the tables presented in Attachment 3.

Data for ammonia and pH were collected by the Los Angeles Department of Public Works in Sepulveda Channel (Culver Blvd and at Ballona Creek locations) from May 1988 to July 1994. Additional ammonia, pH, and temperature data were collected by the City of Los Angeles in Sepulveda Channel at Culver Blvd. from May 2009 to October 2009 and by the Regional Board at six stations in Sepulveda Channel in January 2009. Table 5 presents a summary of the data.

Table 5. Summary of Ammonia Data used for the Delisting Analysis for Sepulveda Canyon Channel

Sampled by	Time Period	# of Samples	# of Exceedances	Delist if the # of exceedances ≤[1]
Historical Data				
Los Angeles County Department of Public Works	05/1988-07/1994	69	7	5
Recent Data				
City of Los Angeles	05/2009-10/2009	22	0	
Los Angeles Regional Board	01/2009	6	0	2
Total (recent data)		*28*	*0*	
Total (historical & recent)		**97**	**7**	**8**

[1] For toxicants, the maximum number of exceedances allowed for delisting is shown in Table 4.1 (Page 14) of the 303 (d) Listing Policy.

To calculate the number of exceedances presented Table 5, for each ammonia concentration, each sample result was compared to the applicable 30-day chronic criterion for ammonia (based on Basin Plan ammonia water quality objectives). The chronic-criterion value is calculated for each dataset using applicable pH and temperature data. For the historical data, temperature data were not available. Therefore, temperature was estimated on a monthly basis using recent data and historical temperatures[2].

[2] http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2214

The calculated criterion was compared to the corresponding ammonia concentration of the sample. The number of exceedances was then compared to the requirements for delisting presented in Section 4 of the Listing Policy. For toxicants, the maximum number of exceedances allowed for delisting is shown in Table 4.1 (Page 14) of the Listing Policy. As shown Table 5 above, the total number of exceedances is below the maximum number of exceedances allowed to delist per the Listing Policy. As a result, the available data demonstrates that Sepulveda Channel meets the water quality objectives for ammonia.

Attachment 1. List of Constituents that have not been Detected in Water

Constituents in this appendix were not detected in any available data reviewed.

Ballona Creek Estuary – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limits		Units
				Min DL	Max DL	
2,4'-DDD	2/5/2009	5/17/2010	16	0.001	0.003	µg/L
2,4'-DDE	2/5/2009	5/17/2010	16	0.001	0.003	µg/L
2,4'-DDT	2/5/2009	5/17/2010	16	0.003	0.004	µg/L
3,4 Benzofluoranthene	2/5/2009	5/17/2010	16	0.14	0.14	µg/L
4,4'-DDD	2/5/2009	5/17/2010	16	0.001	0.004	µg/L
4,4'-DDE	2/5/2009	5/17/2010	16	0.002	0.004	µg/L
4,4'-DDT	2/5/2009	5/17/2010	16	0.002	0.003	µg/L
Acenaphthene	2/5/2009	5/17/2010	16	0.13	0.13	µg/L
Acenaphthylene	2/5/2009	5/17/2010	16	0.13	0.13	µg/L
alpha-chlordane	2/5/2009	5/17/2010	14	0.001	0.07	µg/L
Anthracene	2/5/2009	5/17/2010	16	0.11	0.11	µg/L
Aroclor 1016	2/5/2009	5/17/2010	6	0.03	0.081	µg/L
Aroclor 1221	2/5/2009	5/17/2010	6	0.02	0.49	µg/L
Aroclor 1232	2/5/2009	5/17/2010	6	0.06	0.1	µg/L
Aroclor 1242	2/5/2009	5/17/2010	6	0.04	0.23	µg/L
Aroclor 1248	2/5/2009	5/17/2010	6	0.04	0.1	µg/L
Aroclor 1254	2/5/2009	5/17/2010	6	0.02	0.04	µg/L
Aroclor 1260	2/5/2009	5/17/2010	6	0.03	0.07	µg/L
Benzo(a)anthracene	2/5/2009	5/17/2010	16	0.14	0.14	µg/L
Benzo(a)pyrene	2/5/2009	5/17/2010	16	0.13	0.13	µg/L
Benzo(k)fluoranthene	2/5/2009	5/17/2010	16	0.11	0.11	µg/L
Chrysene	2/5/2009	5/17/2010	16	0.12	0.12	µg/L
Dieldrin	2/5/2009	5/17/2010	15	0.001	0.005	µg/L
Fluoranthene	2/5/2009	5/17/2010	16	0.02	0.02	µg/L
Fluorene	2/5/2009	5/17/2010	16	0.02	0.02	µg/L
gamma-chlordane	2/5/2009	5/17/2010	14	0.001	0.07	µg/L
Naphthalene	2/5/2009	5/17/2010	16	0.13	0.13	µg/L
Nonachlor, cis-	2/5/2009	5/17/2010	14	0.001	0.09	µg/L
Nonachlor, trans-	2/5/2009	5/17/2010	14	0.001	0.09	µg/L
Oxychlordane	2/5/2009	5/17/2010	14	0.002	0.08	µg/L
PCB 018	2/5/2009	3/9/2010	13	0.002	0.002	µg/L
PCB 028	2/5/2009	3/9/2010	13	0.002	0.002	µg/L

Ballona Creek Estuary – Constituents that have not been detected in water (continued)

Constituent	Date Range of Available Data		N	Detection Limits		Units
				Min DL	Min DL	
PCB 037	2/5/2009	3/9/2010	13	0.0036	0.0036	µg/L
PCB 044	2/5/2009	3/9/2010	13	0.0019	0.0019	µg/L
PCB 049	2/5/2009	3/9/2010	13	0.002	0.002	µg/L
PCB 052	2/5/2009	3/9/2010	13	0.0062	0.0062	µg/L
PCB 066	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 070	2/5/2009	3/9/2010	13	0.0013	0.0013	µg/L
PCB 074	2/5/2009	3/9/2010	13	0.00024	0.0024	µg/L
PCB 077	2/5/2009	3/9/2010	13	0.0018	0.0018	µg/L
PCB 081	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 087	2/5/2009	3/9/2010	13	0.0018	0.0018	µg/L
PCB 099	2/5/2009	3/9/2010	13	0.0023	0.0023	µg/L
PCB 101	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 105	2/5/2009	3/9/2010	13	0.0015	0.0015	µg/L
PCB 110	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 114	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 118	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 119	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 123	2/5/2009	3/9/2010	13	0.0015	0.0015	µg/L
PCB 126	2/5/2009	3/9/2010	13	0.0015	0.0015	µg/L
PCB 128	2/5/2009	3/9/2010	13	0.0017	0.0017	µg/L
PCB 138	2/5/2009	3/9/2010	13	0.0012	0.0012	µg/L
PCB 149	2/5/2009	3/9/2010	13	0.0017	0.0017	µg/L
PCB 151	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 153/168	2/5/2009	3/9/2010	13	0.0016	0.0031	µg/L
PCB 156	2/5/2009	3/9/2010	13	0.0015	0.0015	µg/L
PCB 157	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 158	2/5/2009	3/9/2010	13	0.0021	0.0021	µg/L
PCB 167	2/5/2009	3/9/2010	13	0.0018	0.0018	µg/L
PCB 169	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 170	2/5/2009	3/9/2010	13	0.0014	0.0014	µg/L
PCB 177	2/5/2009	3/9/2010	13	0.0016	0.0018	µg/L
PCB 180	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 183	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 187	2/5/2009	3/9/2010	13	0.0015	0.0015	µg/L
PCB 189	2/5/2009	3/9/2010	13	0.001	0.001	µg/L
PCB 194	2/5/2009	3/9/2010	13	0.0017	0.0017	µg/L
PCB 201	2/5/2009	3/9/2010	13	0.0016	0.0016	µg/L
PCB 206	2/5/2009	3/9/2010	13	0.0012	0.0012	µg/L

Ballona Creek Estuary – Constituents that have not been detected in water (continued)

Constituent	Date Range of Available Data		N	Detection Limits		Units
				Min DL	Min DL	
Pyrene	2/5/2009	5/17/2010	16	0.02	0.02	µg/L
Vanadium Dissolved	4/26/2001	5/31/2001	2	5	5	µg/L
Vanadium Total	4/26/2001	5/31/2001	2	5	5	µg/L

Ballona Creek Reach 2 – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
1,2 Benzanthracene	10/10/2002	6/12/2013	65	0.03	1.67	µg/L
1,2,4,5-Tetrachlorobenzene	10/17/2004	3/9/2005	6	1	1	µg/L
1,2,4-Trichlorobenzene	10/10/2002	6/12/2013	71	0.33	1	µg/L
1,2-Dichlorobenzene	10/10/2002	6/12/2013	71	0.05	1	µg/L
1,2-Diphenylhydrazine	10/10/2002	6/12/2013	71	0.33	3	µg/L
1,3-Dichlorobenzene	10/10/2002	6/12/2013	71	0.05	1	µg/L
1,4-Dichlorobenzene	10/10/2002	6/12/2013	71	0.05	1	µg/L
1-Chloronaphthalene	10/17/2004	3/9/2005	6	0.1	0.1	µg/L
1-Naphthylamine	10/17/2004	3/9/2005	6	3	3	µg/L
2- Chlorophenol	10/17/2005	6/12/2013	54	0.67	2	µg/L
2,3,4,6-Tetrachlorophenol	10/17/2004	3/9/2005	6	1	1	µg/L
2,4,5-TP	10/10/2002	6/12/2013	71	0.067	10	µg/L
2,4,5-Trichlophenol	10/17/2004	3/9/2005	6	1	1	µg/L
2,4,6-Trichlophenol	10/10/2002	6/12/2013	40	1	1	µg/L
2,4-D	10/10/2002	6/12/2013	71	0.015	10	µg/L
2,4'-DDD	10/31/2006	10/9/2013	37	0.003	0.05	µg/L
2,4'-DDE	10/31/2006	10/9/2013	37	0.002	0.05	µg/L
2,4'-DDT	10/31/2006	10/9/2013	37	0.002	0.01	µg/L
2,4-Dichlorophenol	10/10/2002	6/12/2013	73	0.33	2	µg/L
2,4-Dimethylphenol	10/10/2002	6/12/2013	73	0.67	2	µg/L
2,4-Dinitrophenol	10/10/2002	6/12/2013	73	1	3	µg/L
2,4-Dinitrotoluene	10/10/2002	6/12/2013	71	0.05	5	µg/L
2,6-Dichlorophenol	10/17/2004	3/9/2005	6	2	2	µg/L
2,6-Dinitrotoluene	10/10/2002	6/12/2013	71	0.05	5	µg/L
2-Chloroethyl Vinyl Ether	10/17/2005	4/9/2013	67	0.33	400	µg/L
2-Chloronaphthalene	10/10/2002	6/12/2013	71	0.1	10	µg/L
2-Chlorophenol	10/10/2002	3/9/2005	17	2	2	µg/L
2-Methylphenol	10/17/2004	3/9/2005	6	3	3	µg/L
2-Naphthylamine	10/17/2004	3/9/2005	6	3	3	µg/L
2-Nitroaniline	10/17/2004	3/9/2005	6	3	3	µg/L
2-Nitrophenol	10/10/2002	6/12/2013	73	1	3	µg/L

Ballona Creek Reach 2 – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
2-Picoline	10/17/2004	3/9/2005	6	3	3	µg/L
3,3-Dichlorobenzidine	10/10/2002	6/12/2013	71	1.67	5	µg/L
3-Nitroaniline	10/17/2004	3/9/2005	6	3	3	µg/L
4,4'-DDD	10/10/2002	10/9/2013	75	0.002	0.1	µg/L
4,4'-DDT	10/10/2002	10/9/2013	75	0.001	0.1	µg/L
4,6 Dinitro-2-methylphenol	10/10/2002	6/12/2013	71	1	5	µg/L
4-Bromophenyl phenyl ether	10/10/2002	6/12/2013	71	0.4	1.67	µg/L
4-chloro-3-methylphenol	10/10/2002	6/12/2013	73	1	3	µg/L
4-Chlorophenyl phenyl ether	10/10/2002	6/12/2013	71	0.04	1.67	µg/L
4-Methylphenol	10/17/2004	3/9/2005	6	3	3	µg/L
4-Nitroaniline	10/17/2004	3/9/2005	6	3	3	µg/L
4-Nitrophenol	10/10/2002	6/12/2013	73	1	3	µg/L
7,12-Dimethylbenz(a)anthracene	10/17/2004	3/9/2005	6	0.1	0.1	µg/L
Acenaphthene	10/10/2002	10/9/2013	91	0.05	1	µg/L
Acenaphthylene	10/10/2002	10/9/2013	91	0.05	2	µg/L
Acetophenone	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
Aldrin	10/10/2002	6/12/2013	70	0.004	0.05	µg/L
alpha,alpha-Dimethylphenethylamine	10/17/2004	3/9/2005	6	3	3	µg/L
alpha-BHC	10/10/2002	6/12/2013	70	0.003	0.05	µg/L
Aminobiphenyl	10/17/2004	3/9/2005	6	3	3	µg/L
Aniline	10/17/2004	3/9/2005	6	3	3	µg/L
Anthracene	10/10/2002	10/9/2013	91	0.05	2	µg/L
Aroclor 1016	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Aroclor 1221	10/10/2002	10/9/2013	94	0.01	0.5	µg/L
Aroclor 1232	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Aroclor 1242	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Aroclor 1248	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Aroclor 1254	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Aroclor 1260	10/10/2002	10/9/2013	90	0.01	0.5	µg/L
Atrazine	10/10/2002	6/12/2013	71	0.667	2	µg/L
Bentazon	10/17/2004	3/9/2005	6	2	2	µg/L
Benzidine	10/10/2002	6/12/2013	71	1.67	5	µg/L
Benzo(k)fluouranthene	10/10/2002	10/9/2013	91	0.1	2	µg/L
beta-BHC	10/10/2002	6/12/2013	70	0.005	0.05	µg/L
Bis(2-Chloroethoxy) methane	10/10/2002	6/12/2013	77	0.1	5	µg/L
Bis(2-Chloroethyl) ether	10/10/2002	6/12/2013	65	0.1	1	µg/L
Bis(2-Chloroisopropyl) ether	10/10/2002	6/12/2013	71	0.67	2	µg/L
Carbofuran	10/17/2004	4/9/2008	13	5	5	µg/L
Chlordane	10/17/2004	6/12/2013	59	0.01	0.1	µg/L
Chloroaniline	10/17/2004	3/9/2005	6	1	1	µg/L

Ballona Creek Reach 2 – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
Chlorpyrifos	11/12/2001	6/12/2013	77	0.02	0.05	µg/L
Cyanazine	10/10/2002	6/12/2013	71	0.667	2	µg/L
delta-BHC	10/10/2002	6/12/2013	70	0.005	0.05	µg/L
Dibenz(a,j)acridine	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
Dieldrin	10/10/2002	10/9/2013	90	0.002	0.1	µg/L
Dimethyl phthalate	10/10/2002	6/12/2013	71	0.5	2	µg/L
di-n-Octyl phthalate	10/10/2002	6/12/2013	64	1	10	µg/L
Diphenyl amine	10/17/2004	3/9/2005	6	1	1	µg/L
Diuron	10/17/2004	3/9/2005	6	1	1	µg/L
Endosulfan I	10/10/2002	6/12/2013	70	0.01	0.1	µg/L
Endosulfan II	10/10/2002	6/12/2013	70	0.004	0.1	µg/L
Endosulfan sulfate	10/10/2002	6/12/2013	70	0.05	0.1	µg/L
Endrin	10/10/2002	6/12/2013	70	0.006	0.1	µg/L
Endrin aldehyde	10/10/2002	6/12/2013	70	0.01	0.1	µg/L
Endrin ketone	10/17/2004	7/30/2009	24	0.1	1	µg/L
Ethyl methanesulfonate	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
Fluorene	10/10/2002	10/9/2013	91	0.02	0.1	µg/L
gamma-BHC (lindane)	10/10/2002	6/12/2013	70	0.004	0.05	µg/L
Glyphosate	10/10/2002	6/12/2013	71	5	25	µg/L
Heptachlor	10/10/2002	6/12/2013	70	0.003	0.05	µg/L
Heptachlor Epoxide	10/10/2002	6/12/2013	70	0.01	0.05	µg/L
Hexachlorobenzene	10/10/2002	6/12/2013	71	0.33	1	µg/L
Hexachlorobutadiene	10/10/2002	6/12/2013	71	0.33	1	µg/L
Hexachloro-cyclopentadiene	10/10/2002	6/12/2013	71	1.67	5	µg/L
Hexachloroethane	10/10/2002	6/12/2013	71	0.33	1	µg/L
Malathion	10/10/2002	6/12/2013	70	0.33	2	µg/L
Methoxychlor	10/17/2004	6/12/2013	54	0.5	0.5	µg/L
Methylcholanthrene	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
Methylmethanesulfonate	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
Molinate	10/17/2004	3/9/2005	6	2	2	µg/L
Naphthalene	10/10/2002	10/9/2013	91	0.05	0.2	µg/L
Nitrobenzene	10/10/2002	6/12/2013	71	0.05	1	µg/L
N-Nitroso-butyl amine	10/17/2004	3/9/2005	6	0.3	0.3	µg/L
N-Nitroso-di-n-propyl amine	10/10/2002	6/12/2013	71	0.3	5	µg/L
N-Nitrosopiperidine	10/17/2004	3/9/2005	6	1	1	µg/L
Nonachlor, cis-	10/6/2010	10/9/2013	20	0.001	0.005	µg/L
Oxychlordane	10/6/2010	10/9/2013	20	0.001	0.003	µg/L
Pentachlorophenol	10/10/2002	6/12/2013	71	0.67	2	µg/L
Phenacitin	10/17/2004	3/9/2005	6	3	3	µg/L
Phenols	10/10/2002	6/12/2013	70	0.33	1.5	µg/L

Ballona Creek Reach 2 – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
Pronamide	10/17/2004	3/9/2005	6	5	5	µg/L
Simazine	10/10/2002	6/12/2013	71	0.67	2	µg/L
Thiobencarb	11/12/2001	3/9/2005	6	1	1	µg/L
Toxaphene	10/10/2002	6/12/2013	70	0.24	1	µg/L

Centinela Creek – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
1,2 Benzanthracene	10/17/2005	4/25/2006	7	0.1	0.1	µg/L
1,2,4,5-Tetrachlorobenzene	10/17/2004	3/17/2005	7	1	1	µg/L
1,2,4-Trichlorobenzene	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
1,2-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1,2-Diphenylhydrazine	10/17/2004	4/25/2006	14	3	3	µg/L
1,3-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1,4-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1-Chloronaphthalene	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
1-Naphthylamine	10/17/2004	3/17/2005	7	3	3	µg/L
2- Chlorophenol	10/17/2005	4/25/2006	7	2	2	µg/L
2,3,4,6-Tetrachlorophenol	10/17/2004	3/17/2005	7	1	1	µg/L
2,4,5-TP	10/17/2004	4/25/2006	14	1	1	µg/L
2,4,5-Trichlophenol	10/17/2004	3/17/2005	7	1	1	µg/L
2,4,6-Trichlophenol	10/17/2004	4/25/2006	14	1	1	µg/L
2,4-D	10/17/2004	4/25/2006	14	10	10	µg/L
2,4'-DDD	10/6/2010	10/9/2013	16	0.003	0.004	µg/L
2,4'-DDT	10/6/2010	10/9/2013	16	0.002	0.005	µg/L
2,4-Dichlorophenol	10/17/2004	4/25/2006	14	2	2	µg/L
2,4-Dimethylphenol	10/17/2004	4/25/2006	14	2	2	µg/L
2,4-Dinitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
2,4-Dinitrotoluene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
2,6-Dichlorophenol	10/17/2004	3/17/2005	7	2	2	µg/L
2,6-Dinitrotoluene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
2-Chloroethyl Vinyl Ether	10/17/2005	4/25/2006	7	2.5	2.5	µg/L
2-Chloronaphthalene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
2-Chlorophenol	10/17/2004	3/17/2005	7	2	2	µg/L
2-Methylphenol	10/17/2004	3/17/2005	7	3	3	µg/L
2-Naphthylamine	10/17/2004	3/17/2005	7	3	3	µg/L
2-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
2-Nitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
2-Picoline	10/17/2004	3/17/2005	7	3	3	µg/L

Centinela Creek – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
3,3-Dichlorobenzidine	10/17/2004	4/25/2006	14	3	3	µg/L
3,4 Benzofluoranthene	10/17/2004	10/9/2013	30	0.1	2	µg/L
3-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
4,4'-DDD	10/17/2004	10/9/2013	30	0.002	0.1	µg/L
4,6 Dinitro-2-methylphenol	10/17/2004	4/25/2006	14	3	3	µg/L
4-Bromophenyl phenyl ether	10/17/2004	4/25/2006	14	1	1	µg/L
4-chloro-3-methylphenol	10/17/2004	4/25/2006	14	3	3	µg/L
4-Chlorophenyl phenyl ether	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
4-Methylphenol	10/17/2004	3/17/2005	7	3	3	µg/L
4-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
4-Nitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
7,12-Dimethylbenz(a)anthracene	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
Acenaphthene	10/17/2004	10/9/2013	30	0.05	0.13	µg/L
Acenaphthylene	10/17/2004	10/9/2013	30	0.05	0.13	µg/L
Acetophenone	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Aldrin	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
alpha,alpha-Dimethylphenethylamine	10/17/2004	3/17/2005	7	3	3	µg/L
alpha-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
alpha-chlordane	10/6/2010	10/9/2013	16	0.001	0.009	µg/L
Aminobiphenyl	10/17/2004	3/17/2005	7	3	3	µg/L
Aniline	10/17/2004	3/17/2005	7	3	3	µg/L
Anthracene	10/17/2004	10/9/2013	30	0.05	0.5	µg/L
Aroclor 1016	10/17/2004	10/9/2013	30	0.022	0.5	µg/L
Aroclor 1221	10/17/2004	10/9/2013	30	0.02	0.5	µg/L
Aroclor 1232	10/17/2004	10/9/2013	30	0.028	0.5	µg/L
Aroclor 1242	10/17/2004	10/9/2013	30	0.024	0.5	µg/L
Aroclor 1248	10/17/2004	10/9/2013	30	0.019	0.5	µg/L
Aroclor 1254	10/17/2004	10/9/2013	30	0.026	0.5	µg/L
Aroclor 1260	10/17/2004	10/9/2013	30	0.029	0.5	µg/L
Atrazine	10/17/2004	4/25/2006	14	2	2	µg/L
Bentazon	10/17/2004	3/17/2005	7	2	2	µg/L
Benzidine	10/17/2004	4/25/2006	14	3	3	µg/L
Benzo(a)pyrene	10/17/2004	10/9/2013	30	0.1	0.13	µg/L
Beryllium Dissolved	10/17/2004	4/25/2006	28	0.4	1	µg/L
beta-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Bis(2-Chloroethoxy) methane	10/17/2004	4/25/2006	21	0.1	0.1	µg/L
Bis(2-Chloroethyl) ether	10/17/2005	4/25/2006	7	0.1	0.1	µg/L
Bis(2-Chloroisopropyl) ether	10/17/2004	4/25/2006	14	1	1	µg/L
Butyl benzyl phthalate	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
Carbofuran	10/17/2004	3/17/2005	7	5	5	µg/L

Centinela Creek – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
Chlordane	10/17/2004	4/25/2006	14	0.05	0.1	µg/L
Chloroaniline	10/17/2004	3/17/2005	7	1	1	µg/L
Chlorpyrifos	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Chromium (6+) Dissolved	10/17/2004	4/25/2006	14	10	10	µg/L
Chromium (6+) Total	10/17/2004	4/25/2006	14	10	10	µg/L
Cyanazine	10/17/2004	4/25/2006	14	2	2	µg/L
delta-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Dibenz(a,j)acridine	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Dieldrin	10/17/2004	10/9/2013	30	0.002	0.1	µg/L
Diethyl phthalate	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Dimethyl phthalate	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
di-n-Butyl phthalate	10/17/2004	4/25/2006	14	1	1	µg/L
di-n-Octyl phthalate	10/17/2004	4/25/2006	14	1	1	µg/L
Diphenyl amine	10/17/2004	3/17/2005	7	1	1	µg/L
Diuron	10/17/2004	3/17/2005	7	1	1	µg/L
Endosulfan I	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endosulfan II	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endosulfan sulfate	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin aldehyde	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin ketone	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
Ethyl methanesulfonate	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Fluorene	10/17/2004	10/9/2013	30	0.02	0.1	µg/L
gamma-BHC (lindane)	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
gamma-chlordane	10/6/2010	10/9/2013	16	0.001	0.004	µg/L
Glyphosate	10/17/2004	4/25/2006	14	25	25	µg/L
Heptachlor	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Heptachlor Epoxide	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Hexachlorobenzene	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Hexachlorobutadiene	10/17/2004	4/25/2006	14	1	1	µg/L
Hexachloro-cyclopentadiene	10/17/2004	4/25/2006	14	3	3	µg/L
Hexachloroethane	10/17/2004	4/25/2006	14	1	1	µg/L
Manganese Dissolved	10/17/2004	3/17/2005	7	30	30	µg/L
Methoxychlor	10/17/2004	3/17/2005	7	0.5	0.5	µg/L
Methylcholanthrene	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Methylmethanesulfonate	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Molinate	10/17/2004	3/17/2005	7	2	2	µg/L
MTBE	10/17/2005	4/25/2006	7	1	1	µg/L
Nitrobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
N-Nitroso-butyl amine	10/17/2004	3/17/2005	7	0.3	0.3	µg/L

Centinela Creek – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
N-Nitroso-dimethyl amine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitroso-di-n-propyl amine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitrosodiphenylamine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitrosopiperidine	10/17/2004	3/17/2005	7	1	1	µg/L
Nonachlor, cis-	10/6/2010	10/9/2013	16	0.001	0.005	µg/L
Nonachlor, trans-	10/6/2010	10/9/2013	16	0.002	0.005	µg/L
Oxychlordane	10/6/2010	10/9/2013	16	0.001	0.003	µg/L
Pentachlorophenol	10/17/2004	4/25/2006	14	2	2	µg/L
Phenacitin	10/17/2004	3/17/2005	7	3	3	µg/L
Phenols	10/17/2004	4/25/2006	14	1	1	µg/L
Prometryn	10/17/2004	4/25/2006	14	2	2	µg/L
Pronamide	10/17/2004	3/17/2005	7	5	5	µg/L
Simazine	10/17/2004	4/25/2006	14	2	2	µg/L
Thallium Dissolved	10/17/2004	4/25/2006	14	5	5	µg/L
Thallium Total	10/17/2004	4/25/2006	14	5	5	µg/L
Thiobencarb	10/17/2004	3/17/2005	7	1	1	µg/L
Thorium Total	1/25/2005	2/21/2006	14	1	1	µg/L
Toxaphene	10/17/2004	4/25/2006	14	1	1	µg/L

Sepulveda Channel – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
1,2 Benzanthracene	10/17/2005	4/25/2006	7	0.1	0.1	µg/L
1,2,4,5-Tetrachlorobenzene	10/17/2004	3/17/2005	7	1	1	µg/L
1,2,4-Trichlorobenzene	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
1,2-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1,2-Diphenylhydrazine	10/17/2004	4/25/2006	14	3	3	µg/L
1,3-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1,4-Dichlorobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
1-Chloronaphthalene	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
1-Naphthylamine	10/17/2004	3/17/2005	7	3	3	µg/L
2- Chlorophenol	10/17/2005	4/25/2006	7	2	2	µg/L
2,3,4,6-Tetrachlorophenol	10/17/2004	3/17/2005	7	1	1	µg/L
2,4,5-TP	10/17/2004	4/25/2006	14	1	1	µg/L
2,4,5-trichlophenol	10/17/2004	3/17/2005	7	1	1	µg/L
2,4,6-trichlophenol	10/17/2004	4/25/2006	14	1	1	µg/L
2,4-D	10/17/2004	4/25/2006	14	10	10	µg/L
2,4-Dichlorophenol	10/17/2004	4/25/2006	14	2	2	µg/L
2,4-dimethylphenol	10/17/2004	4/25/2006	14	2	2	µg/L

Sepulveda Channel – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
2,4-Dinitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
2,4-Dinitrotoluene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
2,6-Dichlorophenol	10/17/2004	3/17/2005	7	2	2	µg/L
2,6-Dinitrotoluene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
2-Chloroethyl Vinyl Ether	10/17/2005	4/25/2006	7	2.5	2.5	µg/L
2-Chloronaphthalene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
2-Chlorophenol	10/17/2004	3/17/2005	7	2	2	µg/L
2-Methylphenol	10/17/2004	3/17/2005	7	3	3	µg/L
2-Naphthylamine	10/17/2004	3/17/2005	7	3	3	µg/L
2-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
2-Nitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
2-Picoline	10/17/2004	3/17/2005	7	3	3	µg/L
3,3-Dichlorobenzidine	10/17/2004	4/25/2006	14	3	3	µg/L
3,4 Benzofluoranthene	10/17/2004	4/25/2006	14	0.1	2	µg/L
3-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
4,4'-DDD	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
4,4'-DDE	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
4,4'-DDT	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
4,6 Dinitro-2-methylphenol	10/17/2004	4/25/2006	14	3	3	µg/L
4-Bromophenyl phenyl ether	10/17/2004	4/25/2006	14	1	1	µg/L
4-chloro-3-methylphenol	10/17/2004	4/25/2006	14	3	3	µg/L
4-Chlorophenyl phenyl ether	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
4-Methylphenol	10/17/2004	3/17/2005	7	3	3	µg/L
4-Nitroaniline	10/17/2004	3/17/2005	7	3	3	µg/L
4-Nitrophenol	10/17/2004	4/25/2006	14	3	3	µg/L
7,12-Dimethylbenz(a)anthracene	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
Acenaphthene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Acenaphthylene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Acetophenone	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Aldrin	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
alpha,alpha-Dimethylphenethylamine	10/17/2004	3/17/2005	7	3	3	µg/L
alpha-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Aminobiphenyl	10/17/2004	3/17/2005	7	3	3	µg/L
Aniline	10/17/2004	3/17/2005	7	3	3	µg/L
Anthracene	10/17/2004	4/25/2006	14	0.05	0.5	µg/L
Aroclor 1016	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Aroclor 1221	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Aroclor 1232	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Aroclor 1242	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Aroclor 1248	10/17/2004	4/25/2006	14	0.5	0.5	µg/L

Sepulveda Channel – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
Aroclor 1254	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Aroclor 1260	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Atrazine	10/17/2004	4/25/2006	14	2	2	µg/L
Bentazon	10/17/2004	3/17/2005	7	2	2	µg/L
Benzidine	10/17/2004	4/25/2006	14	3	3	µg/L
Benzo(a)anthracene	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
Benzo(a)pyrene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Benzo(g,h,i)perylene	10/17/2005	4/25/2006	7	1	1	µg/L
Benzo(k)fluoranthene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Beryllium Dissolved	10/17/2004	4/25/2006	28	0.4	1	µg/L
Beryllium Total	10/17/2004	4/25/2006	28	0.4	1	µg/L
beta-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Bis(2-Chloroethoxy) methane	10/17/2004	4/25/2006	21	0.1	0.1	µg/L
Bis(2-Chloroethyl) ether	10/17/2005	4/25/2006	7	0.1	0.1	µg/L
Bis(2-Chloroisopropyl) ether	10/17/2004	4/25/2006	14	1	1	µg/L
Butyl benzyl phthalate	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
Carbofuran	10/17/2004	3/17/2005	7	5	5	µg/L
Chlordane	10/17/2004	4/25/2006	14	0.05	0.1	µg/L
Chloroaniline	10/17/2004	3/17/2005	7	1	1	µg/L
Chromium (6+) Dissolved	10/17/2004	4/25/2006	14	10	10	µg/L
Chromium (6+) Total	10/17/2004	4/25/2006	14	10	10	µg/L
Chrysene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Cyanazine	10/17/2004	4/25/2006	14	2	2	µg/L
delta-BHC	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Dibenz(a,j)acridine	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Dibenzo(a,h)anthracene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Dieldrin	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Diethyl phthalate	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Dimethyl phthalate	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
di-n-Butyl phthalate	10/17/2004	4/25/2006	14	1	1	µg/L
di-n-Octyl phthalate	10/17/2004	4/25/2006	14	1	1	µg/L
Diphenyl amine	10/17/2004	3/17/2005	7	1	1	µg/L
Diuron	10/17/2004	3/17/2005	7	1	1	µg/L
Endosulfan I	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endosulfan II	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endosulfan sulfate	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin aldehyde	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Endrin ketone	10/17/2004	3/17/2005	7	0.1	0.1	µg/L
Ethyl methanesulfonate	10/17/2004	3/17/2005	7	0.3	0.3	µg/L

Sepulveda Channel – Constituents that have not been detected in water

Constituent	Date Range of Available Data		N	Detection Limit		Units
				Min DL	Max DL	
Fluoranthene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Fluorene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
gamma-BHC (lindane)	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Glyphosate	10/17/2004	4/25/2006	14	25	25	µg/L
Heptachlor	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Heptachlor Epoxide	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Hexachlorobenzene	10/17/2004	4/25/2006	14	0.5	0.5	µg/L
Hexachlorobutadiene	10/17/2004	4/25/2006	14	1	1	µg/L
Hexachloro-cyclopentadiene	10/17/2004	4/25/2006	14	3	3	µg/L
Hexachloroethane	10/17/2004	4/25/2006	14	1	1	µg/L
Indeno(1,2,3-cd)pyrene	10/17/2004	4/25/2006	14	0.1	0.1	µg/L
Isophorone	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Malathion	10/17/2004	4/25/2006	14	2	2	µg/L
Methoxychlor	10/17/2004	3/17/2005	7	0.5	0.5	µg/L
Methylcholanthrene	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Methylmethanesulfonate	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
Molinate	10/17/2004	3/17/2005	7	2	2	µg/L
MTBE	10/17/2005	4/25/2006	7	1	1	µg/L
Naphthalene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Nitrobenzene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
N-Nitroso-butyl amine	10/17/2004	3/17/2005	7	0.3	0.3	µg/L
N-Nitroso-dimethyl amine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitroso-di-n-propyl amine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitrosodiphenylamine	10/17/2004	4/25/2006	14	0.3	0.3	µg/L
N-Nitrosopiperidine	10/17/2004	3/17/2005	7	1	1	µg/L
Pentachlorophenol	10/17/2004	4/25/2006	14	2	2	µg/L
Phenacitin	10/17/2004	3/17/2005	7	3	3	µg/L
Phenanthrene	10/17/2004	4/25/2006	14	0.05	0.05	µg/L
Phenols	10/17/2004	4/25/2006	14	1	1	µg/L
Prometryn	10/17/2004	4/25/2006	14	2	2	µg/L
Pronamide	10/17/2004	3/17/2005	7	5	5	µg/L
Simazine	10/17/2004	4/25/2006	14	2	2	µg/L
Thallium Dissolved	10/17/2004	4/25/2006	14	5	5	µg/L
Thallium Total	10/17/2004	4/25/2006	14	5	5	µg/L
Thiobencarb	10/17/2004	3/17/2005	7	1	1	µg/L
Toxaphene	10/17/2004	4/25/2006	14	1	1	µg/L
TPH	10/17/2004	3/17/2005	7	1	1	mg/L

Attachment 2. List of Constituents that have been Detected in Water and do not Exceed Water Quality Objectives

Constituents in this appendix either did not exceed a water quality objective or there is no applicable water quality objective for the constituent.

Ballona Creek Estuary - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Antimony Dissolved	4/26/2001	2/21/2006	57	6	µg/L	1.1	18	NA	NA
Antimony Total	4/26/2001	2/21/2006	58	10	µg/L	1.1	18	4300	CTR HH Organism
Arsenic Dissolved	4/26/2001	8/19/2008	86	81	µg/L	1	10	36	CTR Saltwater Chronic
Arsenic Total	4/26/2001	8/19/2008	86	81	µg/L	1	10	36	CTR Saltwater Chronic
Barium Dissolved	4/26/2001	8/19/2008	87	83	µg/L	5	0.4	NA	NA
Barium Total	4/26/2001	8/19/2008	87	84	µg/L	2	0.4	NA	NA
Benzo(g,h,i)perylene	2/5/2009	5/17/2010	16	2	µg/L	0.03	0.03	NA	NA
Beryllium Dissolved	4/26/2001	2/21/2006	58	10	µg/L	0.006	1	NA	NA
Beryllium Total	4/26/2001	2/21/2006	58	10	µg/L	0.006	1	NA	NA
Cadmium Dissolved	4/26/2001	5/17/2010	102	59	µg/L	0.08	1	9.3	CTR Saltwater Chronic
Cadmium Total	4/26/2001	5/17/2010	16	15	µg/L	0.08	1	9.4	CTR Saltwater Chronic
Chromium Dissolved	4/26/2001	8/19/2008	86	40	µg/L	0.1	10	NA	NA
Chromium Total	4/26/2001	8/19/2008	86	55	µg/L	0.1	10	NA	NA
Cobalt Dissolved	4/26/2001	2/21/2006	56	26	µg/L	0.2	20	NA	NA
Cobalt Total	4/26/2001	2/21/2006	56	33	µg/L	0.2	20	NA	NA
E. coli	4/3/2001	8/29/2013	900	692	MPN/100ml	67	1000	NA	NA
Hardness	1/27/2004	5/17/2010	70	70	mg/L	AD	AD	NA	NA
Mercury Dissolved	4/26/2001	2/21/2006	58	23	µg/L	0.02	0.3	NA	NA
Phenanthrene	2/5/2009	5/17/2010	16	1	µg/L	0.01	0.01	NA	NA
Selenium Dissolved	5/31/2001	8/19/2008	83	67	µg/L	0.1	30	71	CTR Saltwater Chronic
Selenium Total	5/31/2001	8/19/2008	83	71	µg/L	0.1	30	71.1	CTR Saltwater Chronic
Thorium Dissolved	4/26/2001	2/21/2006	57	14	µg/L	25	0.5	NA	NA
Thorium Total	4/26/2001	2/21/2006	58	15	µg/L	0.5	25	NA	NA

NA - No Available adopted water quality objective
AD - All values reported detected, no detection limit provided

Ballona Creek Reach 2 - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
2,4,6-trichlophenol	10/10/2002	6/12/2013	33	1	µg/L	0.4	3.33	6.5	CTR HH Organism
Alkalinity	10/12/2000	6/12/2013	92	89	mg/L	2	2	NA	NA
Alkalinity as Bicarbonate	9/21/2010	11/20/2011	10	8	mg/L	2	2	NA	NA
Aluminum Dissolved	10/12/2000	6/12/2013	88	28	µg/L	50	1000	NA	NA
Aluminum Total	10/12/2000	6/12/2013	90	70	µg/L	50	1000	NA	NA
Antimony Dissolved	10/12/2000	6/12/2013	207	97	µg/L	0.2	18	NA	NA
Antimony Total	10/12/2000	6/12/2013	208	107	µg/L	0.2	18	4300	CTR HH Organism
Arsenic Dissolved	10/12/2000	6/12/2013	276	243	µg/L	0.2	10	150	CTR Freshwater Chronic
Arsenic Total	10/12/2000	6/12/2013	276	252	µg/L	0.2	10	150	CTR Freshwater Chronic
Barium Dissolved	10/12/2000	6/12/2013	265	257	µg/L	1	1	NA	NA
Barium Total	10/12/2000	6/12/2013	265	259	µg/L	1	1	NA	NA
Benzo(g,h,i)perylene	10/17/2005	10/9/2013	74	8	µg/L	0.03	1.67	NA	NA
Beryllium Dissolved	10/12/2000	6/12/2013	203	13	µg/L	0.006	1	NA	NA
Beryllium Total	10/12/2000	6/12/2013	205	18	µg/L	0.006	1	NA	NA
Bicarbonate	10/12/2000	12/5/2004	20	20	µg/L	AD	AD	NA	NA
BOD	10/12/2000	6/12/2013	93	88	mg/L	2	1	NA	NA
Boron Dissolved	10/12/2000	3/9/2005	22	16	mg/L	0.1	0.1	NA	NA
Boron Total	10/12/2000	3/9/2005	22	18	mg/L	0.1	0.1	NA	NA
Butyl benzyl phthalate	10/10/2002	6/12/2013	71	1	µg/L	0.1	3.33	5200	CTR HH Organism
Cadmium Dissolved	10/12/2000	6/12/2013	274	208	µg/L	0.5	10	HBC	CTR Freshwater Acute/Chronic
Calcium	10/12/2000	3/9/2005	22	22	µg/L	AD	AD	NA	NA
Carbonate	10/12/2000	3/9/2005	22	1	µg/L	2000	2000	NA	NA
Chloride Total	10/12/2000	6/12/2013	92	89	mg/L	1	1	NA	NA
Chromium Dissolved	10/12/2000	6/12/2013	274	208	µg/L	0.5	10	HBC	CTR Freshwater Acute/Chronic
Chromium Total	10/12/2000	6/12/2013	274	235	µg/L	0.5	10	HBC	CTR Freshwater Acute/Chronic
Chromium (6+) Dissolved	10/12/2000	6/12/2013	107	27	µg/L	0.25	10	11	CTR Freshwater Chronic
Chromium (6+) Total	10/10/2002	6/12/2013	77	34	µg/L	0.25	10	11.434	CTR Freshwater Chronic
Cobalt Dissolved	4/26/2001	2/21/2006	112	36	µg/L	0.2	20	NA	NA
Cobalt Total	4/26/2001	2/21/2006	112	51	µg/L	0.2	20	NA	NA
COD	10/12/2000	6/12/2013	92	87	mg/L	10	10	NA	NA
Dibenzo(a,h)anthracene	10/10/2002	10/9/2013	91	3	µg/L	0.02	0.1	0.049	CTR HH Organism
Diethyl phthalate	10/10/2002	6/12/2013	71	3	µg/L	0.5	2	120000	CTR HH Organism
di-n-Butyl phthalate	10/10/2002	6/12/2013	64	1	µg/L	1	10	12000	CTR HH Organism
Enterococcus	10/12/2000	4/9/2013	641	591	MPN/100ml	10	100	NA	NA
Fecal Coliform	10/12/2000	4/9/2013	425	420	MPN/100ml	20	20	NA	NA
Fluoranthene	10/10/2002	10/9/2013	91	17	µg/L	0.017	0.1	370	CTR HH Organism
Fluoride	10/12/2000	6/12/2013	91	83	mg/L	0.1	0.1	NA	NA

Ballona Creek Reach 2 - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Hardness	10/12/2000	10/9/2013	347	347	mg/L	AD	AD	NA	NA
Iron Dissolved	10/12/2000	6/12/2013	92	54	µg/L	50	100	NA	NA
Iron Total	10/12/2000	6/12/2013	92	84	µg/L	50	100	NA	NA
Isophorone	10/10/2002	6/12/2013	71	1	µg/L	0.05	1	600	CTR HH Organism
Kjeldahl-N	10/12/2000	6/12/2013	91	90	mg/L	0.1	0.1	NA	NA
Magnesium Total	10/12/2000	3/9/2005	22	22	µg/L	AD	AD	NA	NA
Manganese Dissolved	10/12/2000	3/9/2005	22	3	µg/L	30	100	NA	NA
Manganese Total	10/12/2000	3/9/2005	22	8	µg/L	30	100	NA	NA
MBAS	10/12/2000	6/12/2013	92	75	µg/L	10	50	NA	NA
Mercury Dissolved	10/12/2000	6/12/2013	203	30	µg/L	0.02	1	NA	NA
MTBE	10/17/2005	4/9/2013	54	1	µg/L	0.33	1	NA	NA
Nickel Dissolved	10/12/2000	6/12/2013	273	221	µg/L	0.5	20	HBC	CTR Freshwater Acute/Chronic
Nickel Total	10/12/2000	6/12/2013	274	234	µg/L	0.5	20	HBC	CTR Freshwater Acute/Chronic
Nitrate	10/12/2000	6/12/2013	92	87	mg/L	0.1	0.1	NA	NA
Nitrate-N	10/12/2000	6/12/2013	92	85	mg/L	0.03	0.5	NA	NA
Nitrite-N	10/12/2000	6/12/2013	87	47	mg/L	0.01	0.1	NA	NA
N-Nitroso-dimethyl amine	10/10/2002	6/12/2013	73	1	µg/L	0.3	5	8.1	CTR HH Organism
N-Nitrosodiphenylamine	10/10/2002	6/12/2013	73	1	µg/L	0.3	1	16	CTR HH Organism
Nonachlor, trans-	10/6/2010	10/9/2013	20	1	µg/L	0.002	0.005	NA	NA
Oil and Grease	10/12/2000	4/9/2013	82	49	mg/L	1.44	0.4	NA	NA
Petroleum Hydrocarbons Total	10/17/2005	4/9/2013	54	18	mg/L	1.5	0.4	NA	NA
Phenanthrene	10/10/2002	10/9/2013	91	10	µg/L	0.01	0.05	NA	NA
Phenolics Total	11/1/2006	4/9/2013	48	6	mg/L	0.03	0.1	4600000	CTR HH Organism
Phosphorus Total	10/12/2000	4/25/2006	39	38	mg/L	0.05	0.05	NA	NA
Phosphorus- Total (as P)	10/31/2006	6/12/2013	53	48	mg/L	0.05	0.05	NA	NA
Phosphorus-Dissolved	10/12/2000	6/12/2013	92	82	mg/L	0.05	0.05	NA	NA
Potassium	10/12/2000	3/9/2005	22	22	µg/L	AD	AD	NA	NA
Prometryn	10/10/2002	6/12/2013	71	2	µg/L	0.67	2	NA	NA
Pyrene	10/10/2002	10/9/2013	91	12	µg/L	0.017	0.05	11000	CTR HH Organism
Selenium Dissolved	10/12/2000	6/12/2013	268	203	µg/L	0.2	30	NA	NA
Sodium	10/12/2000	3/9/2005	22	22	µg/L	AD	AD	NA	NA
Specific Conductance	10/12/2000	6/12/2013	92	92	µmhos/cm	AD	AD	NA	NA
Streptococcus Fecal	10/12/2000	4/9/2013	82	80	MPN/100ml	20	20	NA	NA
Sulphate	10/12/2000	6/12/2013	92	90	mg/L	0.1	0.1	NA	NA
Thallium Dissolved	10/12/2000	6/12/2013	87	4	µg/L	0.1	5	NA	NA
Thallium Total	10/12/2000	6/12/2013	88	6	µg/L	0.1	5	6.3	CTR HH Organism
Thorium Dissolved	4/26/2001	2/21/2006	116	20	µg/L	25	0.5	NA	NA
Thorium Total	4/26/2001	2/21/2006	116	20	µg/L	0.5	25	NA	NA

Ballona Creek Reach 2 - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Total Coliform	10/12/2000	4/9/2013	641	637	MPN/100ml	1000	20	NA	NA
Total Dissolved Solids	10/12/2000	10/9/2013	96	94	mg/L	1	1	NA	NA
Total Organic Carbon	10/12/2000	6/12/2013	92	89	mg/L	0.5	0.4	NA	NA
Total Phenols	10/12/2000	4/25/2006	34	1	µg/L	100	100	4600000	CTR HH Organism
Total Settleable Solids	1/24/2013	11/21/2013	4	4	ml/l	AD	AD	NA	NA
Total Suspended Solids	10/12/2000	10/9/2013	140	137	mg/L	1	1	NA	NA
TPH	10/12/2000	3/9/2005	28	17	mg/L	1	1	NA	NA
Turbidity	10/12/2000	6/12/2013	93	93	NTU	AD	AD	NA	NA
Vanadium Dissolved	4/26/2001	5/31/2001	4	2	µg/L	5	5	NA	NA
Vanadium Total	4/26/2001	5/31/2001	4	2	µg/L	5	5	NA	NA
Volatile Suspended Solids	10/12/2000	6/12/2013	93	91	mg/L	1	1	NA	NA

NA - No Available adopted water quality objective
HBC - Hardness Based Criteria, as defined by CTR
AD - All values reported detected, no detection limit provided

Ballona Creek Reach 1 - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits Min	Detection Limits Max	WQO	Source of Lowest Water Quality Objective (WQO) Value
Antimony Dissolved	4/26/2001	2/21/2006	57	14	µg/L	1.1	18	NA	NA
Antimony Total	4/26/2001	2/21/2006	58	17	µg/L	1.1	18	4300	CTR HH Organism
Arsenic Dissolved	4/26/2001	1/8/2009	92	88	µg/L	10	10	150	CTR Freshwater Chronic
Arsenic Total	4/26/2001	1/8/2009	92	89	µg/L	10	10	150	CTR Freshwater Chronic
Barium Dissolved	4/26/2001	2/21/2006	92	92	µg/L	AD	AD	NA	NA
Barium Total	4/26/2001	1/8/2009	92	92	µg/L	AD	AD	NA	NA
Beryllium Dissolved	4/26/2001	2/21/2006	58	4	µg/L	0.006	1	NA	NA
Beryllium Total	4/26/2001	2/21/2006	58	5	µg/L	0.006	1	NA	NA
Cadmium Dissolved	4/26/2001	12/5/2010	99	42	µg/L	0.01	1	HBC	CTR Freshwater Acute/Chronic
Chromium Dissolved	4/26/2001	1/8/2009	91	83	µg/L	0.7	10	HBC	CTR Freshwater Acute/Chronic
Chromium Total	4/26/2001	1/8/2009	91	83	µg/L	0.7	10	HBC	CTR Freshwater Acute/Chronic
Cobalt Dissolved	4/26/2001	2/21/2006	56	17	µg/L	0.2	20	NA	NA
Cobalt Total	4/26/2001	2/21/2006	56	26	µg/L	0.2	20	NA	NA
Enterococcus	4/3/2001	1/8/2009	279	242	MPN/100ml	10	100	NA	NA
Fecal Coliform	6/25/2009	8/29/2013	210	210	MPN/100ml	AD	AD	NA	NA
Hardness	1/27/2004	10/9/2013	116	116	mg/L	AD	AD	NA	NA
Mercury Dissolved	4/26/2001	2/21/2006	58	15	µg/L	0.02	0.3	NA	NA
Nickel Dissolved	4/26/2001	1/8/2009	90	70	µg/L	0.5	20	HBC	CTR Freshwater Acute/Chronic
Nickel Total	4/26/2001	1/8/2009	91	75	µg/L	0.5	20	HBC	CTR Freshwater Acute/Chronic
Selenium Dissolved	5/31/2001	1/8/2009	90	84	µg/L	0.2	30	NA	NA
Thorium Dissolved	4/26/2001	2/21/2006	56	25	µg/L	25	0.5	NA	NA
Thorium Total	4/26/2001	2/21/2006	58	24	µg/L	0.5	25	NA	NA
Total Coliform	4/3/2001	1/8/2009	279	248	MPN/100ml	1000	1000	NA	NA
Vanadium Dissolved	4/26/2001	5/31/2001	2	1	µg/L	5	5	NA	NA
Vanadium Total	4/26/2001	5/31/2001	2	1	µg/L	5	5	NA	NA

NA - No Available adopted water quality objective
HBC - Hardness Based Criteria, as defined by CTR
AD - All values reported detected, no detection limit provided

Centinela Creek - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits Min	Detection Limits Max	WQO	Source of Lowest Water Quality Objective (WQO) Value
2,4'-DDE	10/6/2010	10/9/2013	16	1	µg/L	0.002	0.003	NA	NA
Alkalinity	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Aluminum Dissolved	10/17/2004	4/25/2006	14	4	µg/L	100	100	NA	NA
Aluminum Total	10/17/2004	4/25/2006	14	12	µg/L	100	100	NA	NA

Centinela Creek - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Ammonia-N	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	HBC	BP 30-day Chronic early life stage fish present
Antimony Dissolved	10/17/2004	4/25/2006	28	22	µg/L	2	2	NA	NA
Antimony Total	10/17/2004	4/25/2006	28	23	µg/L	2	2	4300	CTR HH Organism
Arsenic Dissolved	10/17/2004	1/8/2009	62	61	µg/L	5	5	150	CTR Freshwater Chronic
Arsenic Total	10/17/2004	1/8/2009	62	62	µg/L	AD	AD	150	CTR Freshwater Chronic
Barium Dissolved	10/17/2004	1/8/2009	62	62	µg/L	AD	AD	NA	NA
Barium Total	10/17/2004	1/8/2009	62	62	µg/L	AD	AD	NA	NA
Benzo(g,h,i)perylene	10/17/2005	10/9/2013	23	6	µg/L	0.03	1	NA	NA
Beryllium Total	10/17/2004	4/25/2006	28	1	µg/L	0.4	1	NA	NA
Bicarbonate	10/17/2004	12/5/2004	4	4	µg/L	AD	AD	NA	NA
BOD	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Boron Dissolved	10/17/2004	3/17/2005	7	6	mg/L	0.1	0.1	NA	NA
Boron Total	10/17/2004	3/17/2005	7	6	mg/L	0.1	0.1	NA	NA
Cadmium Dissolved	10/17/2004	5/6/2013	78	61	µg/L	0.03	1	HBC	CTR Freshwater Acute/Chronic
Calcium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Carbonate	10/17/2004	3/17/2005	7	1	µg/L	2000	2000	NA	NA
Chloride Total	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Chromium Dissolved	10/17/2004	1/8/2009	60	58	µg/L	0.21	5	HBC	CTR Freshwater Acute/Chronic
Chromium Total	10/17/2004	1/8/2009	61	60	µg/L	0.21	0.21	HBC	CTR Freshwater Acute/Chronic
Cobalt Dissolved	1/25/2005	2/21/2006	14	9	µg/L	0.2	0.2	NA	NA
Cobalt Total	1/25/2005	2/21/2006	14	12	µg/L	0.2	0.2	NA	NA
COD	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Cyanide Total	10/17/2004	4/25/2006	14	4	mg/L	10	10	5.2 - 22	CTR Freshwater Chronic and Acute
Diazinon	10/17/2004	4/25/2006	14	7	µg/L	0.01	0.01	NA	NA
Dibenzo(a,h)anthracene	10/17/2004	10/9/2013	30	3	µg/L	0.1	0.1	0.049	CTR HH Organism
Enterococcus	1/17/2002	1/8/2009	99	98	MPN/100ml	10	10	NA	NA
Fecal Coliform	10/17/2004	4/25/2006	14	14	MPN/100ml	AD	AD	NA	NA
Fluoranthene	10/17/2004	10/9/2013	30	12	µg/L	0.02	0.1	370	CTR HH Organism
Fluoride	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Hardness	10/17/2004	12/17/2010	64	64	mg/L	AD	AD	NA	NA
Iron Dissolved	10/17/2004	4/25/2006	14	7	µg/L	100	100	NA	NA
Iron Total	10/17/2004	4/25/2006	14	13	µg/L	100	100	NA	NA
Isophorone	10/17/2004	4/25/2006	14	2	µg/L	0.05	0.05	600	CTR HH Organism
Kjeldahl-N	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Lead Dissolved	10/17/2004	5/6/2013	78	61	µg/L	1	5	HBC	CTR Freshwater Acute/Chronic
Magnesium Total	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Manganese Total	10/17/2004	3/17/2005	7	5	µg/L	30	30	NA	NA
Malathion	10/17/2004	4/25/2006	14	1	µg/L	2	2	NA	NA

Centinela Creek - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
MBAS	10/17/2004	4/25/2006	14	13	µg/L	50	50	NA	NA
Mercury Dissolved	10/17/2004	4/25/2006	28	2	µg/L	0.022	1	NA	NA
Mercury Total	10/17/2004	4/25/2006	28	4	µg/L	0.022	1	0.051	CTR HH Organism
Naphthalene	10/17/2004	10/9/2013	30	1	µg/L	0.05	0.13	NA	NA
Nickel Dissolved	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	HBC	CTR Freshwater Acute/Chronic
Nickel Total	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	HBC	CTR Freshwater Acute/Chronic
Nitrate	10/17/2004	4/25/2006	14	13	mg/L	0.1	0.1	NA	NA
Nitrate-N	10/17/2004	4/25/2006	14	12	mg/L	0.5	0.5	NA	NA
Nitrite-N	10/17/2004	4/25/2006	14	6	mg/L	0.03	0.03	NA	NA
Oil and Grease	10/17/2004	4/25/2006	14	2	mg/L	1	1	NA	NA
Oxygen Dissolved	10/17/2004	4/25/2006	13	13	mg/L	AD	AD	5	BP Single sample minimum
Petroleum Hydrocarbons Total	10/17/2005	4/25/2006	7	4	mg/L	1	1	NA	NA
Phenanthrene	10/17/2004	10/9/2013	30	10	µg/L	0.01	0.05	NA	NA
Phosphorus Total	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Phosphorus-Dissolved	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Potassium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Pyrene	10/17/2004	10/9/2013	30	9	µg/L	0.02	0.05	11000	CTR HH Organism
Selenium Dissolved	10/17/2004	1/8/2009	60	48	µg/L	0.1	5	NA	NA
Silver Dissolved	10/17/2004	12/17/2010	64	27	µg/L	0.02	1	HBC	CTR Freshwater Acute
Sodium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Specific Conductance	10/17/2004	4/25/2006	14	14	µmhos/cm	AD	AD	NA	NA
Streptococcus Fecal	10/17/2004	4/25/2006	14	14	MPN/100ml	AD	AD	NA	NA
Sulphate	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Thorium Dissolved	1/25/2005	2/21/2006	14	4	µg/L	1	1	NA	NA
Total Coliform	1/25/2005	2/21/2006	99	99	MPN/100ml	AD	AD	NA	NA
Total Dissolved Solids	10/17/2004	10/9/2013	18	18	mg/L	AD	AD	NA	NA
Total Organic Carbon	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Total Phenols	10/17/2004	4/25/2006	14	1	µg/L	100	100	4600000	CTR HH Organism
Total Settleable Solids	1/25/2013	11/20/2013	5	5	ml/l	AD	AD	NA	NA
Total Suspended Solids	10/17/2004	10/9/2013	18	18	mg/L	AD	AD	NA	NA
TPH	10/17/2004	3/17/2005	7	1	mg/L	1	1	NA	NA
Turbidity	10/17/2004	4/25/2006	14	14	NTU	AD	AD	NA	NA
Volatile Suspended Solids	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA

NA – No Available adopted water quality objective provided HBC - Hardness Based Criteria, as defined by CTR AD - All values reported detected, no detection limit

Sepulveda Channel - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Alkalinity	10/17/2004	4/25/2006	14	14	mg/L	NA	NA	NA	NA
Aluminum Dissolved	10/17/2004	4/25/2006	14	2	µg/L	100	100	NA	NA
Aluminum Total	10/17/2004	4/25/2006	14	13	µg/L	100	100	NA	NA
Ammonia-N	10/17/2004	10/15/2009	35	35	mg/L	AD	AD	HBC	BP 30-day Chronic early life stage fish present
Antimony Dissolved	10/17/2004	4/25/2006	28	17	µg/L	2	5	NA	NA
Antimony Total	10/17/2004	4/25/2006	28	20	µg/L	2	2	4300	CTR HH Organism
Arsenic Dissolved	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	150	CTR Freshwater Chronic
Arsenic Total	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	150	CTR Freshwater Chronic
Barium Dissolved	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	NA	NA
Barium Total	10/17/2004	1/8/2009	61	61	µg/L	AD	AD	NA	NA
Bicarbonate	10/17/2004	12/5/2004	4	4	µg/L	AD	AD	NA	NA
BOD	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Boron Dissolved	10/17/2004	3/17/2005	7	5	mg/L	0.1	0.1	NA	NA
Boron Total	10/17/2004	3/17/2005	7	6	mg/L	0.1	0.1	NA	NA
Cadmium Dissolved	10/17/2004	12/5/2010	74	40	µg/L	0.01	1	HBC	CTR Freshwater Acute/Chronic
Cadmium Total	10/17/2004	12/5/2010	74	50	µg/L	0.01	1	HBC	CTR Freshwater Acute/Chronic
Calcium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Chloride Total	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Chlorpyrifos	10/17/2004	4/25/2006	14	1	µg/L	0.05	0.05	0.041	USEPA Freshwater Chronic
Chromium Dissolved	10/17/2004	1/8/2009	60	58	µg/L	0.21	5	HBC	CTR Freshwater Acute/Chronic
Chromium Total	10/17/2004	1/8/2009	60	60	µg/L	AD	AD	HBC	CTR Freshwater Acute/Chronic
Cobalt Dissolved	1/25/2005	2/21/2006	14	14	µg/L	AD	AD	NA	NA
Cobalt Total	1/25/2005	2/21/2006	14	14	µg/L	AD	AD	NA	NA
COD	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Enterococcus	1/17/2002	1/8/2009	99	98	MPN/100ml	10	10	NA	NA
Fecal Coliform	10/17/2004	10/25/2012	188	187	MPN/100ml	20	20	NA	NA
Fluoride	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Hardness	10/17/2004	10/9/2013	132	132	mg/L	AD	AD	NA	NA
Iron Dissolved	10/17/2004	4/25/2006	14	8	µg/L	100	100	NA	NA
Iron Total	10/17/2004	4/25/2006	14	14	µg/L	AD	AD	NA	NA
Kjeldahl-N	10/17/2004	4/25/2006	14	14	mg/L	NA	NA	NA	NA
Lead Dissolved	10/17/2004	9/17/2013	126	100	µg/L	0.01	5	HBC	CTR Freshwater Acute/Chronic
Magnesium Total	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Manganese Dissolved	10/17/2004	3/17/2005	7	4	µg/L	30	30	NA	NA
Manganese Total	10/17/2004	3/17/2005	7	6	µg/L	30	30	NA	NA
MBAS	10/17/2004	4/25/2006	14	10	µg/L	50	50	NA	NA
Mercury Dissolved	10/17/2004	4/25/2006	28	1	µg/L	0.022	1	NA	NA

Sepulveda Channel - Constituents that have been detected but do not exceed relevant water quality objective

Constituent	Date Range of Available Data		N	N detects	Units	Detection Limits		WQO	Source of Lowest Water Quality Objective (WQO) Value
						Min	Max		
Mercury Total	10/17/2004	4/25/2006	28	4	µg/L	0.022	1	0.051	CTR HH Organism
Nickel Dissolved	10/17/2004	1/8/2009	60	60	µg/L	AD	AD	HBC	CTR Freshwater Acute/Chronic
Nickel Total	10/17/2004	1/8/2009	60	60	µg/L	AD	AD	HBC	CTR Freshwater Acute/Chronic
Nitrate	10/17/2004	4/25/2006	14	13	mg/L	0.1	0.1	NA	NA
Nitrate-N	10/17/2004	4/25/2006	14	13	mg/L	0.5	0.5	NA	NA
Nitrite-N	10/17/2004	4/25/2006	14	5	mg/L	0.03	0.03	NA	NA
Oil and Grease	10/17/2004	4/25/2006	14	1	mg/L	1	1	NA	NA
Oxygen Dissolved	10/17/2004	4/25/2006	13	13	mg/L	AD	AD	5	BP Single sample minimum
Petroleum Hydrocarbons Total	10/17/2005	4/25/2006	7	3	mg/L	1	1	NA	NA
Phosphorus Total	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Phosphorus-Dissolved	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Potassium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Pyrene	10/17/2004	4/25/2006	14	1	µg/L	0.05	0.05	11000	CTR HH Organism
Selenium Dissolved	10/17/2004	1/8/2009	61	55	µg/L	5	5	NA	NA
Silver Dissolved	10/17/2004	12/5/2010	74	31	µg/L	0.02	1	HBC	CTR Freshwater Acute
Silver Total	10/17/2004	12/5/2010	74	37	µg/L	0.02	1	HBC	CTR Freshwater Acute
Sodium	10/17/2004	3/17/2005	7	7	µg/L	AD	AD	NA	NA
Specific Conductance	10/17/2004	4/25/2006	14	14	µmhos/cm	AD	AD	NA	NA
Streptococcus Fecal	10/17/2004	4/25/2006	14	14	MPN/100ml	AD	AD	NA	NA
Sulphate	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Temperature	5/14/2009	10/15/2009	22	22	˚C	AD	AD	26.7	BP WARM Above 27 °C (80 °F)
Thorium Dissolved	1/25/2005	2/21/2006	14	4	µg/L	1	1	NA	NA
Thorium Total	1/25/2005	2/21/2006	14	2	µg/L	1	1	NA	NA
Total Coliform	1/17/2002	1/8/2009	99	99	MPN/100ml	AD	AD	NA	NA
Total Dissolved Solids	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Total Organic Carbon	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Total Phenols	10/17/2004	4/25/2006	14	1	µg/L	100	100	4600000	CTR HH Organism
Total Suspended Solids	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA
Turbidity	10/17/2004	4/25/2006	14	14	NTU	AD	AD	NA	NA
Volatile Suspended Solids	10/17/2004	4/25/2006	14	14	mg/L	AD	AD	NA	NA

NA – No Available adopted water quality objective
HBC – Hardness Based Criteria, as defined by CTR
AD - All values reported detected, no detection limit provided

Attachment 3. Water Quality Data Analysis Summary Tables for Constituents that have Exceeded Water Quality Objectives

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Ballona Creek Estuary – Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
Silver Dissolved	Wet	8/01	4/08	16	6	µg/L	0.2	5	0.03	2	0.22	0.06	1	6%	No	NS	NS	NS	1.9	CTR Saltwater Acute
	Dry	4/01	5/10	87	16	µg/L	0.018	5	0.03	0.138	<20% Detect		0	0%	No	16	0	0%	1.9	CTR Saltwater Acute
Silver Total	Wet	8/01	4/08	16	6	µg/L	0.2	5	0.03	18	1.23	0.09	1	6%	No	NS	NS	NS	2.24	CTR Saltwater Acute
	Dry	4/01	5/10	87	17	µg/L	0.018	5	0.026	0.823	<20% Detect		0	0%	No	16	0	0%	2.24	CTR Saltwater Acute
Zinc Dissolved	Wet	8/01	4/08	16	15	µg/L	10	10	0.2	110	32.7	21.2	2	13%	Yes	NS	NS	NS	90	CTR Saltwater Acute
	Dry	4/01	5/10	86	69	µg/L	2	17.2	0.2	62	11.7	8.5	0	0%	No	16	0	0%	81	CTR Saltwater Chronic
Zinc Total	Wet	8/01	4/08	16	16	µg/L	AD	AD	6.27	245	59.0	42.3	3	19%	Yes	NS	NS	NS	95.1	CTR Saltwater Acute
	Dry	4/01	5/10	87	75	µg/L	2	17.2	0.2	113	18.6	13.6	2	2%	No	16	0	0%	85.6	CTR Saltwater Chronic
Enterococcus	Wet	8/01	3/13	72	70	MPN/100ml	10	10	10	24000	6069	2000	63	88%	Yes	37	36	97%	35	BP REC1 30 Day 5 sample average
	Dry	4/01	8/13	828	645	MPN/100ml	10	100	10	14000	562	66	497	60%	Yes	579	413	71%	35	
Total Coliform	Wet	8/01	3/13	72	72	MPN/100ml	AD	AD	410	240000	134845	155000	72	100%	Yes	29	29	100%	70	BP SHELL 30-Day Median
	Dry	4/01	8/13	828	814	MPN/100ml	67	100	100	240000	54971	13356	814	98%	Yes	515	502	99%	70	BP SHELL 30-Day Median
Dibenzo(a,h)-anthracene	Wet	NS	NS	NS	NS	µg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	CTR HH Organism
	Dry	2/09	5/10	16	2	µg/L	0.02	0.02	0.15	0.36	<20% Detect		2	13%	Yes	16	2	13%	0.05	CTR HH Organism
Indeno(1,2,3-cd)pyrene	Wet	NS	NS	NS	NS	µg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	CTR HH Organism
	Dry	2/09	5/10	16	3	µg/L	0.02	0.02	0.02	0.45	<20% Detect		2	13%	Yes	16	2	13%	0.05	CTR HH Organism
Mercury Total	Wet	8/01	2/06	10	5	µg/L	0.022	0.3	0.028	0.09	0.04	0.03	2	20%	Yes	NS	NS	NS	0.05	CTR HH Organism
	Dry	4/01	1/06	48	25	µg/L	0.02	0.3	0.023	2.67	0.11	0.03	11	23%	Yes	NS	NS	NS	0.05	CTR HH Organism
Copper Dissolved	Wet	11/01	4/08	15	11	µg/L	1.5	10	0.04	29	9.67	3.73	9	60%	Yes	NS	NS	NS	4.8	CTR Saltwater Acute
	Dry	4/01	5/10	84	59	µg/L	1	20	0.44	159	8.18	3.51	40	48%	Yes	16	1	7%	3.1	CTR Saltwater Chronic
Copper Total	Wet	11/01	4/08	16	12	µg/L	1.5	10	0.04	47	15.22	5.36	11	69%	Yes	NS	NS	NS	5.8	CTR Saltwater Acute
	Dry	4/01	5/10	86	68	µg/L	1.5	10	0.3	168	8.40	3.52	45	52%	Yes	16	1	6%	3.7	CTR Saltwater Chronic
Lead Dissolved	Wet	8/01	4/08	16	11	µg/L	1	10	0.055	11	2.23	0.73	0	0%	No	NS	NS	NS	210	CTR Saltwater Acute
	Dry	4/01	5/10	85	58	µg/L	1	26	0.053	41.6	4.66	0.90	15	18%	Yes	16	0	0%	8.1	CTR Saltwater Chronic
Lead Total	Wet	8/01	4/08	16	13	µg/L	1	5	0.055	100	15.7	2.47	0	0%	No	NS	NS	NS	220.8	CTR Saltwater Acute
	Dry	4/01	5/10	87	63	µg/L	1	26	0.055	52.6	5.76	1.49	18	21%	Yes	16	0	0%	8.5	CTR Saltwater Chronic
Nickel Dissolved	Wet	8/01	4/08	16	13	µg/L	10	20	0.1	20.1	6.15	3.80	0	0%	No	NS	NS	NS	74	CTR Saltwater Acute
	Dry	4/01	8/08	68	52	µg/L	0.24	20	0.26	35.7	6.76	4.84	15	22%	Yes	NS	NS	NS	8.2	CTR Saltwater Chronic
Nickel Total	Wet	8/01	4/08	16	14	µg/L	10	20	0.1	15.7	7.55	5.14	0	0%	No	NS	NS	NS	74.8	CTR Saltwater Acute
	Dry	4/01	8/08	70	58	µg/L	0.5	20	0.1	39	7.49	5.16	18	26%	Yes	NS	NS	NS	8.3	CTR Saltwater Chronic

Ballona Creek Reach 1 – Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
Cadmium Total	Wet	8/01	12/10	20	13	µg/L	0.01	1	0.01	7.1	1.98	0.17	1	5%	No	3	0	0%	HBC	CTR Freshwater Acute
	Dry	4/01	9/10	79	40	µg/L	0.01	1	0.01	3.92	0.25	0.06	0	0%	No	5	0	0%	HBC	CTR Freshwater Chronic
Copper Dissolved	Wet	8/01	5/13	40	39	µg/L	10	10	3.84	61	12.4	ND	26	65%	Yes	23	20	87%	HBC	CTR Freshwater Acute
													16	40%	Yes		10	43%	HBC	2013 TMDL Amendment
	Dry	4/01	9/13	105	99	µg/L	1.5	20	2.83	45	7.41	6.44	1	1%	No	33	0	0%	HBC	CTR Freshwater Chronic
													1	1%	No		0	0%	HBC	2013 TMDL Amendment
Copper Total	Wet	8/01	5/13	40	39	µg/L	10	10	4.29	356	68.2	44.6	29	73%	Yes	23	23	100%	HBC	CTR Freshwater Acute
													31	78%	Yes		22	96%	HBC	2013 TMDL Amendment
	Dry	4/01	9/13	106	103	µg/L	10	10	3.67	182	15.6	ND	9	8%	Yes	32	0	0%	HBC	CTR Freshwater Chronic
													9	8%	Yes		0	0%	HBC	2013 TMDL Amendment
Lead Dissolved	Wet	8/01	5/13	39	35	µg/L	1	10	0.055	69	2.90	0.925	1	3%	No	23	0	0%	HBC	CTR Freshwater Acute
													1	3%	No		0	0%	HBC	2013 TMDL Amendment
	Dry	4/01	9/13	107	63	µg/L	0.06	26	0.055	6	0.775	0.294	0	0%	No	33	0	0%	HBC	CTR Freshwater Chronic
													0	0%	No		0	0%	HBC	2013 TMDL Amendment
Lead Total	Wet	8/01	5/13	40	39	µg/L	10	10	0.055	175	33.4	23.7	12	30%	Yes	23	10	43%	HBC	CTR Freshwater Acute
													3	8%	No		3	13%	HBC	2013 TMDL Amendment
	Dry	4/01	9/13	106	81	µg/L	1	26	0.11	158	5.05	1.48	3	3%	No	32	0	0%	HBC	CTR Freshwater Chronic
													3	3%	No		0	0%	HBC	2013 TMDL Amendment
Selenium Total	Wet	8/01	12/10	40	37	µg/L	0.11	1	0.2	3.2	0.92	0.63	0	0%	No	23	0	0%	NA	NA
	Dry	5/01	9/13	104	100	µg/L	0.2	30	0.6	5.7	1.97	1.82	1	1%	No	33	0	0%	5	CTR Freshwater Chronic
Silver Dissolved	Wet	8/01	12/10	20	11	µg/L	0.2	5	0.02	6	0.52	0.11	2	10%	Yes	3	0	0%	HBC	CTR Freshwater Acute
	Dry	4/01	9/10	79	26	µg/L	0.02	5	0.03	3.7	0.20	0.05	0	0%	No	5	0	0%	HBC	CTR Freshwater Acute
Silver Total	Wet	8/01	12/10	20	11	µg/L	0.2	5	0.03	17	1.40	0.21	2	10%	Yes	3	0	0%	HBC	CTR Freshwater Acute
	Dry	4/01	9/10	79	32	µg/L	0.06	5	0.02	5.8	0.34	0.09	0	0%	No	5	0	0%	HBC	CTR Freshwater Acute
Zinc Total	Wet	8/01	5/13	40	40	µg/L	AD	AD	13.5	1760	293	205	27	68%	Yes	23	23	100%	HBC	CTR Freshwater Acute
													25	63%	Yes		21	91%	HBC	2013 TMDL Amendment
	Dry	4/01	9/13	106	101	µg/L	2	17.2	6.22	1420	52.5	26.2	2	2%	No	32	0	0%	HBC	CTR Freshwater Chronic
													2	2%	No		0	0%	HBC	2013 TMDL Amendment
E. coli	Wet	8/01	11/08	31	26	MPN/100ml	100	100	200	34000	5457	1200	26	84%	Yes	NS	NS	NS	126	BP REC1 30-Day Average
	Dry	4/01	1/09	248	200	MPN/100ml	100	1000	100	36000	1340	479	184	74%	Yes	1	0	0%	126	BP REC1 30-Day Average
Mercury Total	Wet	8/01	2/06	10	5	µg/L	0.022	0.3	0.023	0.09	0.045	0.035	3	30%	Yes	NS	NS	NS	0.05	CTR HH Organism
	Dry	4/01	1/06	48	25	µg/L	0.02	0.3	0.025	2.35	0.101	0.030	13	27%	Yes	NS	NS	NS	0.05	CTR HH Organism

NA – No Available adopted water quality objective
HBC – Hardness Based Criteria, as defined by CTR
NS – Not Sampled

Ballona Creek Reach 2 – Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
3,4 Benzo-fluoranthene	Wet	10/04	10/13	59	1	µg/L	0.1	3.33	0.26	0.26	<20% Detect		1	2%	No	39	1	100%	0.049	CTR HH Organism
	Dry	11/04	6/13	21	0	µg/L	0.1	3.33	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.049	CTR HH Organism
4,4'-DDE	Wet	11/02	10/13	55	1	µg/L	0.001	0.1	0.004	0.004	<20% Detect		1	2%	No	39	1	100%	0.00059	CTR HH Organism
	Dry	10/02	6/13	20	0	µg/L	0.004	0.1	NA	NA	<20% Detect		0	0%	No	13	0	0%	0.00059	CTR HH Organism
Ammonia-N	Wet	10/00	6/13	62	62	mg/L	AD	AD	0.1	2.64	0.595	0.388	0%	0%	No	20	0	0%	HBC	BP 1-hour Acute where salmonid fish are not present
	Dry	10/00	6/13	27	27	mg/L	AD	AD	0.0833	0.78	0.206	0.120	4%	4%	No	15	1	7%	HBC	BP 30-day Chronic early life stage fish present
Benzo(a)-anthracene	Wet	10/04	10/13	25	2	µg/L	0.1	0.14	0.14	0.14	<20% Detect		2	8%	Yes	20	2	100%	0.049	CTR HH Organism
	Dry	11/04	11/04	1	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	0.049	CTR HH Organism
Benzo(a)pyrene	Wet	11/02	10/13	66	1	µg/L	0.1	2	0.18	0.18	<20% Detect		1	2%	No	39	1	100%	0.049	CTR HH Organism
	Dry	10/02	6/13	25	0	µg/L	0.1	2	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.049	CTR HH Organism
Bis(2-Ethylhexyl) phthalate	Wet	11/02	1/13	46	3	µg/L	1	5	8.27	28.5	<20% Detect		3	7%	No	19	1	5%	5.9	CTR HH Organism
	Dry	10/02	6/13	26	2	µg/L	1	5	13.7	29.9	<20% Detect		2	8%	No	14	0	0%	5.9	CTR HH Organism
Cadmium Total	Wet	10/00	1/13	103	59	µg/L	0.08	1	0.01	6.4	0.567	0.228	2%	3%	No	26	0	0%	HBC	CTR Freshwater Acute
	Dry	10/00	6/13	196	88	µg/L	0.01	1	0.01	7.33	0.291	0.052	0%	0%	No	36	0	0%	HBC	CTR Freshwater Chronic
Chrysene	Wet	11/02	10/13	66	1	µg/L	0.1	5	0.32	0.32	<20% Detect		1	2%	No	39	1	100%	0.049	CTR HH Organism
	Dry	10/02	6/13	25	0	µg/L	0.1	5	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.049	CTR HH Organism
Copper Dissolved	Wet	10/00	5/13	97	82	µg/L	0.5	10	0.045	59.3	13.3	9.94	67	69%	Yes	64	48	75%	HBC	CTR Freshwater Acute
													53	55%	Yes		32	50%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	177	153	µg/L	0.5	10	0.6	55.1	7.65	6.52	3	2%	No	109	1	2%	HBC	CTR Freshwater Chronic
													3	2%	No		1	2%	HBC	2013 TMDL Amendment
Copper Total	Wet	10/00	5/13	141	137	µg/L	0.5	10	5.19	504	57.5	35.1	100	71%	Yes	64	60	94%	HBC	CTR Freshwater Acute
													111	79%	Yes		61	95%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	267	257	µg/L	0.5	10	2.04	358	16.1	11.2	12	4%	No	107	4	4%	HBC	CTR Freshwater Chronic
													12	4%	No		2	2%	HBC	2013 TMDL Amendment
Lead Dissolved	Wet	10/00	5/13	141	106	µg/L	0.2	10	0.055	61	4.18	1.30	2	1%	No	64	0	0%	HBC	CTR Freshwater Acute
													3	2%	No		1	2%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	266	148	µg/L	0.06	26	0.055	77	1.03	0.261	2	1%	No	108	1	1%	HBC	CTR Freshwater Chronic
													2	1%	No		1	1%	HBC	2013 TMDL Amendment
Lead Total	Wet	10/00	5/13	141	127	µg/L	0.2	10	0.055	871	34.2	12.4	15	11%	Yes	64	7	11%	HBC	CTR Freshwater Acute
													9	6%	No		5	8%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	267	199	µg/L	0.11	26	0.06	195	4.15	1.33	7	3%	No	107	2	2%	HBC	CTR Freshwater Chronic
													7	3%	No		2	2%	HBC	2013 TMDL Amendment
Indeno(1,2,3-cd)pyrene	Wet	11/02	10/13	66	10	µg/L	0.017	0.1	0.02	0.15	<20% Detect		1	2%	No	39	1	3%	0.049	CTR HH Organism
	Dry	10/02	6/13	25	0	µg/L	0.017	0.1	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.049	CTR HH Organism

Ballona Creek Reach 2 – Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
Selenium Total	Wet	10/00	5/13	139	97	µg/L	0.11	5	0.2	15.2	1.26	0.792	4	3%	No	63	0	0%	5	BC Metals TMDL
	Dry	10/00	9/13	263	250	µg/L	0.2	30	0.3	8.11	2.11	1.93	3	1%	No	108	1	1%	5	CTR Freshwater Chronic
Silver Dissolved	Wet	10/00	1/13	101	21	µg/L	0.1	5	0.03	34.9	0.430	0.055	1	1%	No	25	0	0%	HBC	CTR Freshwater Acute
	Dry	10/00	6/13	193	51	µg/L	0.02	5	0.03	1	0.077	0.044	0	0%	No	34	0	0%	HBC	CTR Freshwater Acute
Silver Total	Wet	10/00	1/13	103	46	µg/L	0.1	5	0.04	35.4	0.714	0.160	2	2%	No	26	0	0%	HBC	CTR Freshwater Acute
	Dry	10/00	6/13	195	62	µg/L	0.06	5	0.02	4.65	0.144	0.064	0	0%	No	35	0	0%	HBC	CTR Freshwater Acute
Zinc Dissolved	Wet	10/00	5/13	140	132	µg/L	1	50	2.39	770	66.0	40.9	27	19%	Yes	64	19	30%	HBC	CTR Freshwater Acute
													19	14%	Yes		15	23%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	268	246	µg/L	1	50	1.91	196	13.8	10.8	0	0%	No	108	0	0%	HBC	CTR Freshwater Chronic
													0	0%	No		0	0%	HBC	2013 TMDL Amendment
Zinc Total	Wet	10/00	5/13	141	136	µg/L	1	50	7.56	2200	266	144	88	62%	Yes	64	61	95%	HBC	CTR Freshwater Acute
													91	65%	Yes		60	94%	HBC	2013 TMDL Amendment
	Dry	10/00	9/13	267	253	µg/L	2	50	4.37	2010	44.9	25.9	2	1%	No	107	1	1%	HBC	CTR Freshwater Chronic
													2	1%	No		0	0%	HBC	2013 TMDL Amendment
alpha-chlordane	Wet	11/02	10/13	57	1	µg/L	0.001	0.05	0.004	0.004	<20% Detect		1	2%	No	39	1	100%	0.00059	CTR HH Organism
	Dry	10/02	6/13	22	0	µg/L	0.033	0.1	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.00059	CTR HH Organism
gamma-chlordane	Wet	11/02	10/13	57	1	µg/L	0.001	0.05	0.003	0.003	<20% Detect		1	2%	No	39	1	100%	0.00059	CTR HH Organism
	Dry	10/02	6/13	22	0	µg/L	0.033	0.1	NA	NA	<20% Detect		0	0%	No	14	0	0%	0.00059	CTR HH Organism
Diazinon	Wet	10/00	1/13	61	9	µg/L	0.003	0.01	0.023	0.217	<20% Detect		2	3%	No	19	0	0%	0.17	USEPA Freshwater Acute
	Dry	10/00	6/13	26	2	µg/L	0.003	0.01	0.07	0.078	<20% Detect		0	0%	No	14	0	0%	0.17	USEPA Freshwater Chronic
Oxygen Dissolved	Wet	11/02	1/13	43	43	mg/L	AD	AD	1.3	21.7	9.89	9.79	2	5%	No	19	0	0%	5	BP Single sample
	Dry	10/02	4/13	26	26	mg/L	AD	AD	9.16	22.3	14.6	14.0	0	0%	No	15	0	0%	5	BP Single sample
Cyanide Total	Wet	10/00	1/13	56	25	mg/L	5	10	5	362	12.7	1.69	4	7%	No	19	1	5%	22	CTR Freshwater Acute
	Dry	10/02	4/13	26	2	mg/L	5	10	5	7	<20% Detect		1	4%	No	15	0	0%	5.2	CTR Freshwater Chronic
E. coli	Wet	8/01	3/13	96	86	MPN/100ml	100	1000	100	36000	7901	3150	71	74%	Yes	34	34	100%	126	BP REC1 30-Day Average
	Dry	4/01	8/13	889	798	MPN/100ml	67	1000	67	44000	1131	458	699	79%	Yes	394	318	81%	126	BP REC1 30-Day Average
Mercury Total	Wet	10/00	1/13	82	8	µg/L	0.022	1	0.054	0.498	<20% Detect		8	10%	Yes	19	0	0%	0.051	CTR HH Organism
	Dry	10/00	6/13	124	40	µg/L	0.02	1	0.02	3.59	0.091	0.018	27	22%	Yes	16	2	100%	0.051	CTR HH Organism
pH	Wet	10/00	1/13	63	63	pH Units	AD	AD	6.07	8.84	7.3	7.21	6	10%	No	20	3	15%	6.5-8.5	BP Minimum/Maximum
	Dry	10/00	6/13	29	29	pH Units	AD	AD	6.58	9.04	8.09	8.23	7	24%	Yes	17	5	29%	6.5-8.5	BP Maximum

HBC – Hardness Based Criteria, as defined by CTR
NS – Not Sampled
AD - All values reported detected, no detection limit provided

Centinela Creek – Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
4,4'-DDT	Wet	10/04	10/13	27	1	µg/L	0.001	0.1	0.139	0.139	<20% Detect		1	4%	No	16	1	100%	0.0006	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	0.0006	CTR HH Organism
Benzo(a) anthracene	Wet	10/04	10/13	22	1	µg/L	0.1	0.14	0.14	0.14	<20% Detect		1	5%	No	16	1	100%	0.049	CTR HH Organism
	Dry	11/04	11/04	1	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	0.049	CTR HH Organism
Benzo(k) fluoranthene	Wet	10/04	10/13	27	1	µg/L	0.1	0.11	0.11	0.11	<20% Detect		1	4%	No	16	1	100%	0.049	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	0.049	CTR HH Organism
Bis(2-Ethylhexyl) phthalate	Wet	10/04	2/06	11	1	µg/L	1	1	31.3	31.3	<20% Detect		1	9%	No	NS	NS	NS	5.9	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	1	1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	5.9	CTR HH Organism
Cadmium Total	Wet	10/04	5/13	38	33	µg/L	0.3	1	0.01	4.04	0.696	0.280	5%	6%	No	16	0	0%	HBC	CTR Freshwater Acute
	Dry	11/04	1/09	40	28	µg/L	0.3	1	0.01	1.4	0.269	0.086	0%	0%	No	1	0	0%	HBC	CTR Freshwater Chronic
Chrysene	Wet	10/04	10/13	27	1	µg/L	0.1	0.12	0.3	0.3	<20% Detect		1	4%	No	16	1	100%	0.049	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	No	NS	NS	NS	0.049	CTR HH Organism
Copper Dissolved	Wet	10/04	5/13	39	39	µg/L	AD	AD	3.82	43.6	13.3	11.5	24	62%	Yes	17	17	100%	HBC	CTR Freshwater Acute
													22	56%	Yes		10	59%	HBC	2013 TMDL Amendment
	Dry	11/04	1/09	40	40	µg/L	AD	AD	3.17	105	18.6	11.9	2	5%	No	1	0	0%	HBC	CTR Freshwater Chronic
													2	5%	No		0	0%	HBC	2013 TMDL Amendment
Copper Total	Wet	10/04	5/13	39	39	µg/L	AD	AD	5.7	449	69.6	31.7	24	74%	Yes	17	17	100%	HBC	CTR Freshwater Acute
													22	92%	Yes		16	94%	HBC	2013 TMDL Amendment
	Dry	11/04	1/09	40	40	µg/L	AD	AD	5	57	23.427	19.5	8	20%	Yes	1	0	0%	HBC	CTR Freshwater Chronic
													8	20%	Yes		0	0%	HBC	2013 TMDL Amendment
Silver Total	Wet	10/04	5/13	38	25	µg/L	0.2	1	0.01	1.32	0.188	0.081	2	5%	No	16	2	13%	HBC	CTR Freshwater Acute
	Dry	11/04	1/09	40	20	µg/L	0.06	1	0.03	3.25	0.172	0.067	0	0%	No	1	0	0%	HBC	CTR Freshwater Acute
Lead Total	Wet	10/04	5/13	39	39	µg/L	AD	AD	0.055	198	26.5	14	15	38%	Yes	17	9	53%	HBC	CTR Freshwater Acute
													3	8%	Yes		1	6%	HBC	2013 TMDL Amendment
	Dry	11/04	1/09	40	36	µg/L	1	1.1	0.5	33.4	5.29	2.8	3	8%	Yes	1	1	100%	HBC	CTR Freshwater Chronic
													3	8%	Yes		1	100%	HBC	2013 TMDL Amendment
Zinc Dissolved	Wet	10/04	5/13	39	39	µg/L	AD	AD	4.33	264	48.7	38	18	46%	Yes	17	14	82%	HBC	CTR Freshwater Acute
													4	10%	Yes		2	12%	HBC	2013 TMDL Amendment
	Dry	11/04	1/09	40	40	µg/L	AD	AD	5.39	44	20.6	19.9	0	0%	No	1	0	0%	HBC	CTR Freshwater Chronic
													0	0%	No		0	0%	HBC	2013 TMDL Amendment
Zinc Total	Wet	10/04	5/13	37	37	µg/L	AD	AD	18.4	1890	265	172	25	68%	Yes	16	16	100%	HBC	CTR Freshwater Acute
													21	57%	Yes		12	75%	HBC	2013 TMDL Amendment
	Dry	11/04	1/09	40	40	µg/L	AD	AD	15	201	60.3	42.9	0	0%	No	1	0	0%	HBC	CTR Freshwater Chronic
													0	0%	No		0	0%	HBC	2013 TMDL Amendment
Indeno(1,2,3-cd) pyrene	Wet	10/04	10/13	27	7	µg/L	0.02	0.1	0.02	0.09	0.022	0.016	1	4%	No	16	1	6%	0.049	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	0%	NS	NS	NS	0.049	CTR HH Organism
Selenium Total	Wet	10/04	12/10	23	16	µg/L	0.2	5	0.24	3.6	0.919	0.665	0	0%	No	2	0	0%	5	BC Metals TMDL
	Dry	11/04	1/09	40	38	µg/L	0.1	0.2	0.2	10.7	1	0.648	1	3%	No	1	0	0%	5	CTR Freshwater Chronic
E. coli	Wet	2/03	11/08	14	14	MPN/100ml	AD	AD	1200	30000	7807	5900	14	100%	Yes	NS	NS	NS	126	BP REC1 30-Day Average
	Dry	1/02	1/09	71	71	MPN/100ml	AD	AD	200	100000	4314	1700	71	100%	Yes	1	1	100%	126	BP REC1 30-Day Average
4,4'-DDE	Wet	10/04	10/13	27	3	µg/L	0.001	0.1	0.002	0.003	<20% Detect		3	100%	11%	16	3	100%	0.0006	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	0.1	0.1	NA	NA	<20% Detect		0	0%	0%	NS	NS	NS	0.0006	CTR HH Organism
pH	Wet	10/04	2/06	11	11	pH Units	AD	AD	6.45	8.24	7.27	7.14	2	18%	No	NS	NS	NS	6.5-8.5	BP Minimum/Maximum
	Dry	11/04	4/06	3	3	pH Units	AD	AD	7.85	8.84	8.32	8.28	1	33%	No	NS	NS	NS	6.5-8.5	BP Maximum

NA - No Available adopted water quality objective
HBC - Hardness Based Criteria, as defined by CTR
NS – Not Sampled
AD - All values reported detected, no detection limit provided

HBC - Hardness Based Criteria, as defined by CTR

NS – Not Sampled
AD - All values reported detected, no detection limit provided

Sepulveda Channel - Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
Bis(2-Ethylhexyl) phthalate	Wet	10/04	2/06	11	1	µg/L	1	1	25.6	25.6	<20% Detect		1	9.1%	No	NS	NS	NS	5.9	CTR HH Organism
	Dry	11/04	4/06	3	0	µg/L	1	1	NA	NA	<20% Detect		0	0.0%	No	NS	NS	NS	5.9	CTR HH Organism
Copper Dissolved	Wet	10/04	5/13	47	47	µg/L	AD	AD	2.04	54.3	14.1	11.4	24	51.1%	Yes	25	22	88%	HBC	CTR Freshwater Acute
													25	53.2%	Yes		17	68%	HBC	2013 TMDL Amendment
	Dry	11/04	9/13	84	84	µg/L	AD	AD	2.24	40.3	10.2	8.10	4	4.8%	No	46	2	4%	HBC	CTR Freshwater Chronic
													4	4.8%	No		2	4%	HBC	2013 TMDL Amendment
Copper Total	Wet	10/04	5/13	47	47	µg/L	AD	AD	7.69	324	70.6	34.3	33	70.2%	Yes	25	25	100%	HBC	CTR Freshwater Acute
													45	95.7%	Yes		25	100%	HBC	2013 TMDL Amendment
	Dry	11/04	9/13	83	83	µg/L	AD	AD	2.44	189	19.2	12.2	8	9.6%	Yes	45	3	7%	HBC	CTR Freshwater Chronic
													8	9.6%	Yes		2	4%	HBC	2013 TMDL Amendment
Lead Total	Wet	10/04	5/13	47	47	µg/L	AD	AD	0.055	116	26.8	14.6	9	19.1%	Yes	25	7	28%	HBC	CTR Freshwater Acute
													3	6.4%	No		2	8%	HBC	2013 TMDL Amendment
	Dry	11/04	9/13	83	78	µg/L	0.11	1.1	0.055	53.5	2.68	1.2	1	1.3%	No	45	0	0%	HBC	CTR Freshwater Chronic
													1	1.3%	No		0	0%	HBC	2013 TMDL Amendment
Zinc Dissolved	Wet	10/04	5/13	47	47	µg/L	AD	AD	6	439	63.2	42	14	29.8%	Yes	25	13	52%	HBC	CTR Freshwater Acute
													8	17.0%	Yes		6	24%	HBC	2013 TMDL Amendment
	Dry	11/04	9/13	84	84	µg/L	AD	AD	2.63	30	10.9	10	0	0.0%	No	46	0	0%	HBC	CTR Freshwater Chronic
													0	0.0%	No		0	0%	HBC	2013 TMDL Amendment
Zinc Total	Wet	10/04	5/13	47	47	µg/L	AD	AD	13	2610	357	185	31	66.0%	Yes	25	25	100%	HBC	CTR Freshwater Acute
													30	63.8%	Yes		23	92%	HBC	2013 TMDL Amendment
	Dry	11/04	9/13	83	83	µg/L	AD	AD	3.72	712	51.6	29	1	1.2%	No	45	0	0%	HBC	CTR Freshwater Chronic
													1	1.2%	No		0	0%	HBC	2013 TMDL Amendment
Diazinon	Wet	10/04	2/06	11	4	µg/L	0.01	0.01	0.03	0.19	0.029	0.007	1	9.1%	No	NS	NS	NS	0.17	USEPA Freshwater Acute
	Dry	11/04	4/06	3	0	µg/L	0.01	0.01	NA	NA	<20% Detect		0	0%	0.0%	NS	NS	NS	0.17	USEPA Freshwater Chronic
Selenium Total	Wet	10/04	5/13	47	42	µg/L	5	5	0.14	8.7	1.33	0.6	3	7.1%	No	25	0	0%	5	BC Metals TMDL
	Dry	11/04	9/13	84	84	µg/L	AD	AD	0.44	5.81	1.55	1.26	1	1.2%	No	46	0	0%	5	CTR Freshwater Chronic
Cyanide Total	Wet	10/04	2/06	11	5	mg/L	10	10	5	46	10.3	7.34	1	9.1%	No	NS	NS	NS	22	CTR Freshwater Acute
	Dry	11/04	4/06	3	0	mg/L	10	10	NA	NA	<20% Detect		0	0%	0.0%	NS	NS	NS	5.2-23	CTR Freshwater Chronic
E. coli	Wet	2/03	3/13	28	28	MPN/100ml	AD	AD	410	44000	6910	3400	28	100.0%	Yes	14	14	100%	126	BP REC1 30-Day Average
	Dry	1/02	8/13	266	259	MPN/100ml	100	100	100	98000	2318	1100	253	95.1%	Yes	196	187	95%	126	BP REC1 30-Day Average
pH	Wet	10/04	2/06	11	11	pH Units	AD	AD	6.79	8.26	7.47	7.66	0	0.0%	No	NS	NS	NS	6.5-8.5	BP Minimum/Maximum
	Dry	11/04	10/09	25	25	pH Units	AD	AD	6.81	9.38	8.77	8.95	20	80.0%	Yes	22	0	0%	6.5-8.5	BP Maximum

HBC - Hardness Based Criteria, as defined by CTR
NS – Not Sampled
AD - All values reported detected, no detection limit provided

Del Rey Lagoon - Constituents that have been detected and have exceeded relevant water quality objective

Constituent	W/D	Date Range of Available Data		N	N Detects	Units	Detection Limits		Detected Values		Average	Median	N Exceed	% Exceed	Meets Listing Criteria	In Past 5 Years			WQO	Source of Lowest Water Quality Objective (WQO) Utilized
							Min	Max	Min	Max						N Sampled	N Exceed	% Exceed		
Enterococcus	Wet	2/03	10/12	25	24	MPN/100ml	10	10	10	10000	1602	190	19	76%	Yes	12	10	83%	35	BP REC1 Marine 30-Day Minimum 5 samples
	Dry	1/02	8/13	232	179	MPN/100ml	10	10	10	24000	327	20	92	40%	Yes	170	69	41%	35	
Total Coliform	Wet	2/03	10/12	25	23	MPN/100ml	100	100	500	240000	44000	13000	21	84%	Yes	12	12	83%	1000	
	Dry	1/02	8/13	232	216	MPN/100ml	67	100	67	240000	9463	1698	138	60%	Yes	170	86	51%	1000	

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Attachment 4. Sediment Quality Data Analysis Summary Tables

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Ballona Creek Sediment Data Summary

Constituent	Date Range of Available Data		N	N detect	% Detect	Min DL	Max DL	Min Detect	Max Detect	Mean	Median	Units	N > WQO	% Exceed	Target	Target Source
Cadmium Total	9/07	10/12	42	42	100%	0.009	0.132	0.132	2.03	0.67	0.55	ug/g	4	10%	1.2	TMDL Target - Direct Effect
Copper Total	9/07	10/12	42	42	100%	0.0038	0.18	5.21	164	22.4	12.8	ug/g	6	14%	34	TMDL Target - Direct Effect
Lead Total	9/07	10/12	42	42	100%	0.1	0.19	1.47	162	22.4	15.8	ug/g	5	12%	46.7	TMDL Target - Direct Effect
Silver Total	9/07	10/12	42	23	55%	0.016	0.05	0.037	1.74	0.25	0.063	ug/g	4	10%	1	TMDL Target - Direct Effect
Zinc Total	9/07	10/12	42	42	100%	0.21	1	23	513	101	69.8	ug/g	5	12%	150	TMDL Target - Direct Effect
Summed Chlordanes	9/07	10/12	42	3	7%	0.005	0.0083	0.0064	10.5	NA	NA	ug/g	3	7%	0.0013	TMDL Target - Indirect Effect
Summed DDT	9/07	10/12	42	26	62%	0.001	0.0086	0.0011	0.0835	0.01	0.003	ug/g	24	57%	0.0019	TMDL Target - Indirect Effect
Summed PCBs - Aroclors	9/07	10/12	42	1	2%	0.005	0.0083	0.1948	0.1948	NA	NA	ug/g	1	2%	0.0032	TMDL Target - Indirect Effect
Summed PCBs - Cogeners	9/07	10/12	22	0	0%	0.005	0.001					ug/g	0	0%	0.0032	TMDL Target - Indirect Effect
Total PAHs	9/07	10/12	42	0	0%	0.0017	0.0017					ug/g	0	0%	4.022	TMDL Target - Direct Effect

Ballona Creek Suspended Sediment Data Summary

Constituent	Date Range of Available Data		N	N detect	% Detect	Min DL	Max DL	Min Detect	Max Detect	Mean	Median	Units	N > WQO	% Exceed	Target	Target Source
Cadmium Total	2011	2013	4	4	100%	1	0.03	0.03	2.89	1.97	2.06	ug/g	3	75%	1.2	TMDL Target - Direct Effect
Copper Total	2011	2013	4	4	100%	1	0.04	0.04	193	119	108	ug/g	4	100%	34	TMDL Target - Direct Effect
Lead Total	2011	2013	4	4	100%	0.5	0.19	0.19	102	51.0	40.3	ug/g	1	25%	46.7	TMDL Target - Direct Effect
Silver Total	2011	2013	4	2	50%	1	0.05	0.05	0.63	NA	NA	ug/g	0	0%	1	TMDL Target - Direct Effect
Zinc Total	2011	2013	4	4	100%	2	0.61	0.61	844	505	424	ug/g	4	100%	150	TMDL Target - Direct Effect
Summed Chlordanes	2011	2013	3	3	100%	5	0.011	0.011	0.034	0.026	0.033	ug/g	3	100%	0.0013	TMDL Target - Indirect Effect
Summed DDT	2011	2013	4	4	100%	1	0.016	0.016	0.069	0.036	0.029	ug/g	4	100%	0.0019	TMDL Target - Indirect Effect
Summed PCBs - Cogeners	2011	2013	1	1	100%	0.005	0.017	0.017	0.017	NA	NA	ug/g	1	100%	0.0032	TMDL Target - Indirect Effect
Total PAHs	2011	2013	3	2	67%	0.0017	0.0017	0.003	0.153	NA	NA	ug/g	0	0%	4.022	TMDL Target - Direct Effect

Centinela Creek Suspended Sediment Data Summary

Constituent	Date Range of Available Data	N	N detect	% Detect	Min DL	Max DL	Min Detect	Max Detect	Units	N > WQO	% Exceed	Target	Target Source
Cadmium Total	2012-13 Storm Year	1	1	100%	1	1	1.28	1.28	ug/g	1	100%	1.2	TMDL Target - Direct Effect
Copper Total		1	1	100%	1	1	69.2	69.2	ug/g	1	100%	34	TMDL Target - Direct Effect
Lead Total		1	1	100%	0.5	0.5	26.2	26.2	ug/g	0	0%	46.7	TMDL Target - Direct Effect
Silver Total		1	1	100%	1	1	0.38	0.38	ug/g	0	0%	1	TMDL Target - Direct Effect
Zinc Total		1	1	100%	2	2	289	289	ug/g	1	100%	150	TMDL Target - Direct Effect
Summed Chlordanes		1	1	100%	5	5	0.017	0.017	ug/g	1	100%	0.0013	TMDL Target - Indirect Effect
Summed DDT		1	1	100%	1	1	0.024	0.024	ug/g	1	100%	0.0019	TMDL Target - Indirect Effect
Summed PCBs - Cogeners		1	1	100%	0.005	0.005	0.022	0.022	ug/g	1	100%	0.0032	TMDL Target - Indirect Effect
Total PAHs		1	0	0%	0.0017	0.0017			ug/g	0	0%	4.022	TMDL Target - Direct Effect

Appendix 2.B
Supporting Information for the Discharge Analysis

Per Part VI.C.5.a.i (pg 58) of the Permit, each EWMP shall include a characterization of stormwater and non-stormwater discharges from the MS4. A characterization was conducted on stormwater and non-stormwater discharges from the MS4 associated with constituents identified in a TMDL, a 303(d) listing, or through the receiving water data analysis described above. The following sources of discharge characterization data were reviewed:

- TMDL Staff Reports for TMDLs identified in Table 1.
- Data collected during a June 2012 bacteria snap shot event conducted along Ballona Creek and Sepulveda Channel to document the locations and bacteriological water quality of dry weather discharges.
- Data collected as part of the 2007 Southern California Coastal Water Research Project (SCCWRP) Technical Report 510 titled "Sources, patterns and mechanisms of storm water pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA."
- Land Use data collected as part of previous MS4 Permit monitoring and presented in the 2000 report titled "Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report."

Utilizing the sources above, several tables of summary information were generated. *E. coli* concentration and loading summary statistics for dry weather discharge data collected in the Ballona Creek watershed are presented in Table 2. Tables 3 and 4 present the available average concentration of TMDL, 303(d) listed, and other constituents of interest in stormwater runoff from various land uses collected as part of County of Los Angeles stormwater program between 1996 and 2000 and SCCWRP Technical Report 510 collected between 2000 and 2005, respectively. Note that the land use data are not specific to the watershed per se; however, they are considered generally representative. Complete summary statistics for these two sources, including all measured constituents, are presented in Attachment 1.

Table 1. TMDLs Applicable to the Ballona Creek Watershed

TMDL	Regional Board Resolution Number(s)	Effective Date and/or EPA Approval Date
Ballona Creek Trash (BC Trash)	2004-023	08/11/2005
Ballona Creek Estuary Toxic Pollutants (BC Toxics TMDL)	2005-008	01/11/2006
	2013-XXX	Not Yet Effective
Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria (BC Bacteria TMDL)	2006-011	04/27/2007
	2012-008	Not Yet Effective
Ballona Creek Metals (BC Metals TMDL)	2007-015	10/29/2008
	2013-XXX	Not Yet Effective
Santa Monica Bay Nearshore and Offshore Debris (Santa Monica Bay [SMB] Trash TMDL)	2010-010	03/20/2012
Santa Monica Bay DDTs and PCBs (SMB Toxics)	NA (USEPA TMDL)	03/26/2012
Ballona Creek Wetlands TMDL for Sediment and Invasive Exotic Vegetation (Wetlands TMDL)		03/26/2012

Table 2. *E. coli* Characteristics in Dry Weather Storm Drain Discharges in Ballona Creek from June 2012 Snapshot Survey

Statistic	Flow Rate (cfs)	*E. coli* Concentration (MPN/100mL)	*E. coli* Loading Rate (10^9 MPN/day)
Count	34	34	34
Median	0.0086	310	0.13
Minimum	0.0002	10	0.0002
Maximum	5.89	14,000	162

Table 3. Summary of Mean Concentrations of Constituents in Stormwater Runoff for Relevant Constituents by Land Use Categories Sampled by Los Angeles County Department of Public Works and Presented in the 2000 report titled *"Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report*

Constituents	Units	Comm	Vacant	High Density Single Family Residential	Transportation	Light Industrial	Educational	Multifamily Residential	Mixed Residential
Ammonia	mg/L	1.26	0.13	0.41	0.29	0.59	0.33	0.47	0.67
Cyanide		SID	SID	SID	SID	SID	SID	SID	SID
Total Suspended Solids		66	186	95	78	240	95	46	63
Dissolved Cadmium	µg/L	SID	SID	SID	SID	SID	SID	SID	SID
Total Cadmium		0.73	SID	SID	1.1	SID	SID	SID	SID
Dissolved Copper		14	SID	8.5	33	20	13	6.9	12
Total Copper		39	15	15	56	32	24	12	19
Dissolved Lead		SID	SID	SID	SID	SID	SID	SID	SID
Total Lead		18	SID	10	10	17	4.9	5.8	11
Dissolved Mercury		SID	SID	SID	SID	SID	SID	SID	SID
Total Mercury		SID	SID	SID	SID	SID	SID	SID	SID
Dissolved Nickel		SID	SID	SID	3.9	5	SID	SID	SID
Total Nickel		15	SID	SID	6	9.8	4.7	SID	SID
Dissolved Silver		SID	SID	SID	SID	SID	SID	SID	SID
Total Silver		SID	SID	SID	SID	SID	SID	SID	SID
Dissolved Zinc		152	SID	44	192	407	66	83	133
Total Zinc		241	46	79	291	639	138	146	203
Total Selenium		SID	SID	SID	SID	SID	SID	SID	SID
Bis(2-ethylhexyl) phthalate		SID	SID	SID	SID	SID	SID	SID	SID
Benzo(a)pyrene		SID	SID	SID	SID	SID	SID	SID	SID
Chrysene		SID	SID	SID	SID	SID	SID	SID	0.62
Diazinon		SID	SID	SID	SID	SID	SID	SID	SID
Dibenz(a,h)anthracene		SID	SID	SID	SID	SID	SID	SID	SID
Indeno (1,2,3-cd)pyrene		SID	SID	SID	SID	SID	SID	SID	SID
OC Pesticides & PCBs		SID	SID	SID	SID	SID	SID	SID	SID
Fecal Coliform	MPN/ 100mL	528750	1397	933333	328750	338220	SID	SID	SID
Fecal Enterococcus		86250	679	610000	32000	98200	SID	SID	SID
Total Coliform		1140000	9187	1366667	692500	454000	SID	SID	SID

SID = Statistically Invalid Data, not enough data above detection limit collected.

Table 4. Summary of Mean Concentrations of Constituents in Stormwater Runoff for Relevant Constituents by Land Use Categories Sampled by the Southern California Coastal Water Research Project (SCCWRP) as Part of Technical Report 510 titled "*Sources, patterns and mechanisms of stormwater pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA.*"

Constituents	Units	High Density Residential	Low Density Residential	Commercial	Industrial	Recreation	Transportation
Ammonia as N	mg/L	0.56	0.33	1.07	0.76	1.07	0.69
Total Suspended Solids		46.56	95.16	56.87	89.60	361.29	25.29
Benzo(a)pyrene	µg/L	0.160	0.051	0.141	0.063	0.031	0.028
Benzo(b)fluoranthene		0.233	0.042	0.115	0.070	0.064	0.036
Benzo(k)fluoranthene		0.143	0.042	0.135	0.045	0.020	0.027
Cadmium		0.68	0.61	1.15	1.80	0.63	0.55
Copper		24.43	32.34	41.70	72.41	32.85	20.03
Chrysene		0.206	0.060	0.141	0.135	0.066	0.054
Diazinon		0.136	0.153	SID	SID	SID	SID
Dibenz(a,h)anthracene		0.061	0.036	0.069	0.106	0.019	S.I.D
Indeno(1,2,3-c,d)pyrene		0.146	0.102	0.164	0.132	0.032	0.025
Lead		17.16	7.38	23.32	24.48	13.29	4.56
Mercury		1.01	SID	SID	SID	SID	SID
Nickel		5.68	5.75	12.29	14.92	16.19	6.31
Selenium		0.55	SID	SID	SID	SID	SID
Silver		3.08	1.63	1.30	1.04	2.27	0.20
Zinc		173	88.3	372	597	128	162
Chlordane, alpha-		0.05	SID	SID	SID	SID	SID
Chlordane, gamma-		0.04	SID	SID	SID	SID	SID
DDD(o,p')		SID	SID	SID	SID	SID	SID
DDD(p,p')		SID	SID	SID	SID	SID	SID
DDE(o,p')		SID	SID	SID	SID	SID	SID
DDE(p,p')		0.15	0.07	SID	SID	SID	SID
DDT(o,p')		SID	SID	SID	SID	SID	SID
DDT(p,p')		SID	0.00	SID	SID	SID	SID
PCB AROCLOR 1016		SID	SID	SID	SID	SID	SID
PCB AROCLOR 1221		SID	SID	SID	SID	SID	SID
PCB AROCLOR 1232		SID	SID	SID	SID	SID	SID
PCB AROCLOR 1242		SID	SID	SID	SID	SID	SID

Constituents	Units	High Density Residential	Low Density Residential	Commercial	Industrial	Recreation	Transportation
PCB AROCLOR 1248		SID	SID	SID	SID	SID	SID
PCB AROCLOR 1254		SID	SID	SID	SID	SID	SID
PCB AROCLOR 1260		SID	SID	SID	SID	SID	SID
E. coli	MPN/ 100mL	5615	SID	SID	SID	SID	SID
Enterococcus		24086	11963	115880	26074	110115	9022
Fecal Coliforms		12651	16968	17704	4214	387629	3091
Total Coliforms		329379	115960	528034	185664	1206826	157852

SID = Statistically Invalid Data, not enough data above detection limit collected

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Attachment 1. Summary Statistics for Land Use Runoff Water Quality Data

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Summary of Stormwater Runoff by Land Use Categories Sampled by the Southern California Coastal Water Research Project (SCCWRP) as Part of Technical Report 510 titled "Sources, patterns and mechanisms of storm water pollutant loading from watersheds and land uses of the greater Los Angeles area, California, USA."

		High Density Residential							Low Density Residential						
Parameter Code	Result Units	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthene	ug/L	42	8	19%	0.04	0.03	0.09	0.02	27	6	22%	0.02	0.01	0.04	0.01
Acenaphthylene	ug/L	42	11	26%	0.02	0.02	0.04	0.01	27	4	15%	0.01	0.01	0.03	0.01
Aldrin	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Aluminum	ug/L	21	21	100%	720.04	237.00	2940.00	108.00	NA	NA	NA	NA	NA	NA	NA
Ammonia as N	mg/L	62	57	92%	0.56	0.49	1.34	0.09	37	29	78%	0.33	0.34	0.57	0.07
Anthracene	ug/L	42	22	52%	0.06	0.03	0.20	0.01	27	10	37%	0.02	0.02	0.05	0.00
Antimony	ug/L	21	12	57%	0.94	0.83	1.48	0.63	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	66	62	94%	1.79	1.40	3.27	0.93	37	30	81%	2.75	2.25	3.82	1.55
Barium	ug/L	21	21	100%	64.61	11.50	140.00	7.35	NA	NA	NA	NA	NA	NA	NA
Benz(a)anthracene	ug/L	42	30	71%	0.15	0.06	0.57	0.01	27	15	56%	0.03	0.01	0.12	0.00
Benzo(a)pyrene	ug/L	42	30	71%	0.16	0.08	0.56	0.01	27	13	48%	0.05	0.02	0.19	0.01
Benzo(b)fluoranthene	ug/L	42	32	76%	0.23	0.13	0.72	0.01	27	18	67%	0.04	0.02	0.14	0.01
Benzo(e)pyrene	ug/L	42	31	74%	0.18	0.11	0.65	0.02	27	16	59%	0.06	0.02	0.27	0.01
Benzo(g,h,i)perylene	ug/L	42	22	52%	0.27	0.22	0.70	0.03	27	15	56%	0.07	0.02	0.28	0.01
Benzo(k)fluoranthene	ug/L	42	30	71%	0.14	0.08	0.53	0.02	27	17	63%	0.04	0.01	0.15	0.00
Beryllium	ug/L	21	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biphenyl	ug/L	42	20	48%	0.03	0.02	0.05	0.01	27	8	30%	0.03	0.01	0.12	0.01
Bolstar	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	66	27	41%	0.68	0.50	1.51	0.20	37	14	38%	0.61	0.40	1.49	0.20
Chlordane, alpha-	ug/L	33	2	6%	0.05	0.05	NA	NA	16	0	0%	NA	NA	NA	NA
Chlordane, gamma-	ug/L	33	2	6%	0.04	0.04	NA	NA	16	0	0%	NA	NA	NA	NA
Chlorpyrifos	ug/L	26	0	0%	NA	NA	NA	NA	7	0	0%	NA	NA	NA	NA
Chromium	ug/L	66	56	85%	5.17	3.51	14.55	1.40	37	24	65%	8.27	5.00	19.48	2.31
Chrysene	ug/L	42	39	93%	0.21	0.06	0.78	0.01	27	21	78%	0.06	0.03	0.15	0.01
Cobalt	ug/L	21	8	38%	1.90	1.58	4.12	0.54	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	66	66	100%	24.43	15.85	60.07	5.35	37	37	100%	32.34	20.00	77.26	8.82
DDD(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDD(p,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDE(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDE(p,p')	ug/L	33	4	12%	0.15	0.16	0.18	0.10	16	1	6%	0.07	0.07	NA	NA
DDT(o,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
DDT(p,p')	ug/L	33	0	0%	NA	NA	NA	NA	16	1	6%	0.00	0.00	NA	NA
Demeton-S	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diazinon	ug/L	26	7	27%	0.14	0.14	0.17	0.10	7	4	57%	0.15	0.16	0.24	0.06
Dibenz(a,h)anthracene	ug/L	42	16	38%	0.06	0.06	0.13	0.01	27	5	19%	0.04	0.01	0.09	0.01
Dibenzothiophene	ug/L	19	10	53%	0.02	0.01	0.06	0.01	NA	NA	NA	NA	NA	NA	NA
Dichlorvos	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Dimethoate	ug/L	26	0	0%	NA	NA	NA	NA	6	1	17%	0.05	0.05	NA	NA
Dimethylnaphthalene, 2,6-	ug/L	42	13	31%	0.03	0.02	0.06	0.01	27	5	19%	0.02	0.02	0.05	0.01
Disulfoton	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E Coli	mpn/100mL	24	24	100%	5614.58	3210.00	23744.00	698.50	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Endosulfan II	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Endosulfan Sulfate	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA

Endrin	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Endrin Aldehyde	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Endrin Ketone	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Enterococcus	mpn/100mL	72	72	100%	24086.48	8527.00	43019.00	1107.30	42	42	100%	11962.52	6394.00	33414.60	3597.00
Ethoprop	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliforms	mpn/100mL	47	47	100%	12650.56	3654.00	33017.51	158.20	42	42	100%	16967.71	2120.00	29433.50	558.70
Fenchlorphos	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fensulfothion	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fenthion	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ug/L	42	42	100%	0.34	0.09	1.04	0.02	27	26	96%	0.09	0.04	0.28	0.02
Fluorene	ug/L	42	11	26%	0.03	0.03	0.08	0.01	27	8	30%	0.02	0.02	0.03	0.01
HCH, alpha	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
HCH, beta	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
HCH, delta	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
HCH, gamma	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Heptachlor	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Heptachlor Epoxide	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Hexachlorobenzene	ug/L	7	0	0%	NA	NA	NA	NA	10	2	20%	0.03	0.03	NA	NA
Indeno(1,2,3-c,d)pyrene	ug/L	42	24	57%	0.15	0.10	0.50	0.01	27	8	30%	0.10	0.04	0.40	0.01
Iron	ug/L	66	64	97%	1271.94	430.00	5269.00	120.00	37	37	100%	1996.38	1060.00	4562.00	332.00
Lead	ug/L	66	66	100%	17.16	6.85	64.63	1.60	37	37	100%	7.38	3.40	15.44	1.46
Malathion	ug/L	26	3	12%	0.12	0.11	0.15	0.10	7	4	57%	0.09	0.08	0.14	0.06
Manganese	ug/L	21	20	95%	49.85	17.05	166.15	5.01	NA	NA	NA	NA	NA	NA	NA
Mercury	ug/L	21	1	5%	1.01	1.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Merphos	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Methylnaphthalene, 1-	ug/L	42	19	45%	0.04	0.02	0.10	0.01	27	14	52%	0.01	0.01	0.03	0.00
Methylnaphthalene, 2-	ug/L	42	24	57%	0.04	0.03	0.11	0.01	27	14	52%	0.02	0.01	0.06	0.00
Methylphenanthrene, 1-	ug/L	42	19	45%	0.03	0.02	0.10	0.01	27	8	30%	0.03	0.01	0.08	0.01
Mevinphos	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mirex	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Molybdenum	ug/L	21	21	100%	1.25	1.13	2.30	0.72	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/L	42	19	45%	0.04	0.04	0.10	0.01	27	18	67%	0.02	0.01	0.06	0.01
Nickel	ug/L	66	51	77%	5.68	5.40	12.95	1.13	37	18	49%	5.75	5.65	8.58	3.03
Nitrate + Nitrite as N	mg/L	29	29	100%	0.52	0.45	1.12	0.07	22	22	100%	0.25	0.24	0.33	0.19
Nitrate as N	MG/L	38	35	92%	0.32	0.27	0.68	0.07	17	16	94%	0.13	0.11	0.24	0.07
Nitrite as N	mg/L	26	7	27%	0.36	0.06	1.38	0.04	7	2	29%	0.04	0.04	NA	NA
Nitrogen, Total Kjeldahl	mg/L	62	62	100%	2.36	1.70	6.00	0.70	37	37	100%	1.86	1.00	4.56	0.30
Nonachlor, trans-	ug/L	33	4	12%	0.05	0.05	0.06	0.03	16	0	0%	NA	NA	NA	NA
Oxychlordane	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion, methyl	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 018	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 028	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 031	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 033	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 037	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 044	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 049	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 052	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 066	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 070	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA

PCB 074	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 077	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 081	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 087	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 095	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 097	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 099	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 101	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 105	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 110	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 114	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 118	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 119	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 123	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 126	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 128	ug/L	7	0	0%	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 128/167	ug/L	26	0	0%	NA	NA	NA	NA	4	0	0%	NA	NA	NA	NA
PCB 132/168	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 138	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 141	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 149	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 151	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 153	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 156	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 157	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 158	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 167	ug/L	7	0	0%	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 169	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 170	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 177	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 180	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 183	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 187	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 189	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 194	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 200	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 201	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB 206	ug/L	33	0	0%	NA	NA	NA	NA	14	0	0%	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perylene	ug/L	42	17	40%	0.08	0.04	0.25	0.01	27	6	22%	0.02	0.02	0.04	0.01
Phenanthrene	ug/L	42	40	95%	0.27	0.08	0.57	0.02	27	27	100%	0.07	0.04	0.17	0.02
Phorate	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate as P	MG/L	40	32	80%	0.19	0.13	0.43	0.06	22	21	95%	0.09	0.09	0.11	0.06
Phosphorus as P	mg/l	35	17	49%	0.78	0.55	2.22	0.30	17	10	59%	0.71	0.64	0.99	0.57
Pyrene	ug/L	42	41	98%	0.33	0.08	0.98	0.02	27	27	100%	0.09	0.04	0.27	0.01

Selenium	ug/L	21	4	19%	0.55	0.54	0.62	0.50	NA	NA	NA	NA	NA	NA	NA
Silver	ug/L	66	16	24%	3.08	0.70	11.25	0.24	37	7	19%	1.63	1.20	3.75	0.25
Strontium	ug/L	21	21	100%	43.62	30.00	81.60	24.70	NA	NA	NA	NA	NA	NA	NA
Tetrachlorvinphos	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	ug/L	21	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	ug/L	21	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium	ug/L	21	21	100%	33.61	11.50	141.00	5.39	NA	NA	NA	NA	NA	NA	NA
Tokuthion	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	mpn/100mL	72	72	100%	329379	79305	1299700	10860	42	42	100%	115960	50660	594240	15815
Total Suspended Solids	mg/L	62	60	97%	46.56	18.00	162.05	3.96	38	38	100%	95.16	36.00	220.65	7.51
Toxaphene	ug/L	33	0	0%	NA	NA	NA	NA	16	0	0%	NA	NA	NA	NA
Trichloronate	ug/L	19	0	0%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trimethylnaphthalene, 1,6,7-	ug/L	19	11	58%	0.04	0.03	0.06	0.01	NA	NA	NA	NA	NA	NA	NA
Trimethylnapthalene, 2,3,5-	ug/L	23	3	13%	0.04	0.03	0.06	0.03	27	12	44%	0.04	0.03	0.08	0.01
Vanadium	ug/L	21	21	100%	4.56	2.65	11.60	2.05	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	66	66	100%	173.22	149.50	580.00	23.77	37	37	100%	88.27	66.00	155.40	31.20

		Commercial							Industrial						
ParameterCode	ResultUnits	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthene	ug/L	38	2	5%	0.03	0.03	NA	NA	39	4	10%	0.06	0.06	0.09	0.02
Acenaphthylene	ug/L	38	2	5%	0.03	0.03	NA	NA	39	14	36%	0.04	0.03	0.09	0.01
Aldrin	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Aluminum	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia as N	mg/L	47	44	94%	1.07	0.58	4.72	0.25	55	55	100%	0.76	0.45	2.15	0.23
Anthracene	ug/L	39	14	36%	0.03	0.02	0.07	0.01	39	20	51%	0.03	0.02	0.11	0.00
Antimony	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	47	34	72%	2.14	1.80	5.18	1.00	55	50	91%	2.91	2.05	4.80	1.05
Barium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(a)anthracene	ug/L	39	23	59%	0.06	0.01	0.25	0.00	39	28	72%	0.05	0.01	0.26	0.01
Benzo(a)pyrene	ug/L	38	14	37%	0.14	0.10	0.46	0.01	39	16	41%	0.06	0.03	0.21	0.01
Benzo(b)fluoranthene	ug/L	38	19	50%	0.11	0.06	0.40	0.01	39	18	46%	0.07	0.02	0.26	0.01
Benzo(e)pyrene	ug/L	39	21	54%	0.14	0.04	0.52	0.01	39	18	46%	0.08	0.03	0.28	0.01
Benzo(g,h,i)perylene	ug/L	38	21	55%	0.19	0.08	0.78	0.02	39	21	54%	0.11	0.05	0.29	0.02
Benzo(k)fluoranthene	ug/L	38	16	42%	0.14	0.11	0.43	0.01	39	18	46%	0.04	0.02	0.21	0.01
Beryllium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biphenyl	ug/L	38	15	39%	0.06	0.04	0.15	0.02	39	16	41%	0.04	0.04	0.08	0.00
Bolstar	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	47	29	62%	1.15	0.90	3.92	0.24	55	49	89%	1.80	2.10	4.50	0.30
Chlordane, alpha-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Chlordane, gamma-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Chlorpyrifos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	47	26	55%	6.40	3.50	26.00	1.92	55	55	100%	6.54	5.15	14.30	2.27
Chrysene	ug/L	39	28	72%	0.14	0.05	0.51	0.01	39	33	85%	0.13	0.07	0.57	0.02
Cobalt	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	47	47	100%	41.70	18.00	165.20	7.46	55	55	100%	72.41	40.50	243.00	7.90
DDD(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDD(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDE(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDE(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
DDT(o,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA

DDT(p,p')	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Demeton-S	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diazinon	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	ug/L	38	5	13%	0.07	0.04	0.15	0.02	39	4	10%	0.11	0.11	0.18	0.03
Dibenzothiophene	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorvos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Dimethoate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylnaphthalene, 2,6-	ug/L	38	10	26%	0.20	0.05	0.70	0.03	39	9	23%	0.05	0.04	0.12	0.02
Disulfoton	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E Coli	mpn/100mL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Endosulfan II	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Endosulfan Sulfate	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Endrin	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Endrin Aldehyde	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Endrin Ketone	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Enterococcus	mpn/100mL	51	51	100%	115880.26	8600.00	479150.00	59.80	66	65	98%	26073.52	5200.00	74420.00	736.00
Ethoprop	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliforms	mpn/100mL	51	44	86%	17703.84	5298.50	94920.00	12.35	66	65	98%	4213.98	1733.00	15500.00	321.60
Fenchlorphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fensulfothion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fenthion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ug/L	45	40	89%	0.13	0.03	0.50	0.01	39	34	87%	0.17	0.07	0.62	0.02
Fluorene	ug/L	38	7	18%	0.09	0.06	0.18	0.03	39	9	23%	0.04	0.03	0.12	0.01
HCH, alpha	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
HCH, beta	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
HCH, delta	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
HCH, gamma	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Heptachlor	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Heptachlor Epoxide	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Hexachlorobenzene	ug/L	6	0	0%	NA	NA	NA	NA	9	0	0%	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	ug/L	38	12	32%	0.16	0.11	0.54	0.02	39	3	8%	0.13	0.16	0.17	0.08
Iron	ug/L	47	47	100%	1316.38	390.00	7682.00	70.00	55	55	100%	2586.55	1320.00	8044.00	401.00
Lead	ug/L	47	47	100%	23.32	4.20	158.90	0.90	55	55	100%	24.48	19.00	62.43	6.91
Malathion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Merphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Methylnaphthalene, 1-	ug/L	38	11	29%	0.10	0.03	0.33	0.01	39	19	49%	0.04	0.03	0.08	0.01
Methylnaphthalene, 2-	ug/L	38	14	37%	0.13	0.05	0.53	0.01	39	19	49%	0.06	0.05	0.14	0.02
Methylphenanthrene, 1-	ug/L	38	11	29%	0.04	0.04	0.07	0.01	39	28	72%	0.06	0.04	0.16	0.01
Mevinphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mirex	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Molybdenum	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/L	38	6	16%	0.07	0.04	0.18	0.01	39	19	49%	0.07	0.05	0.15	0.03
Nickel	ug/L	47	29	62%	12.29	9.50	39.00	3.22	55	52	95%	14.92	16.00	31.35	3.44
Nitrate + Nitrite as N	mg/L	33	32	97%	0.35	0.24	0.80	0.05	50	49	98%	0.32	0.29	0.84	0.04
Nitrate as N	MG/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Nitrogen, Total Kjeldahl	mg/L	46	46	100%	2.88	1.71	7.92	0.53	55	55	100%	4.32	1.95	13.49	0.51
Nonachlor, trans-	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Oxychlordane	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion, methyl	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 018	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 028	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 031	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.09	0.09	NA	NA
PCB 033	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.06	0.06	NA	NA
PCB 037	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA
PCB 044	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.09	0.09	NA	NA
PCB 049	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 052	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 066	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.05	0.05	NA	NA
PCB 070	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 074	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA
PCB 077	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 081	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 087	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.03	0.03	NA	NA
PCB 095	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.04	0.04	NA	NA
PCB 097	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.07	0.07	NA	NA
PCB 099	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.02	0.02	NA	NA
PCB 101	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.06	0.06	NA	NA
PCB 105	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 110	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 114	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 118	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.07	0.07	NA	NA
PCB 119	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 123	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 126	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 128	ug/L	6	0	0%	NA	NA	NA	NA	9	0	0%	NA	NA	NA	NA
PCB 128/167	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB 132/168	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.01	0.01	NA	NA
PCB 138	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.08	0.08	NA	NA
PCB 141	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 149	ug/L	6	0	0%	NA	NA	NA	NA	19	1	5%	0.05	0.05	NA	NA
PCB 151	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 153	ug/L	6	0	0%	NA	NA	NA	NA	19	2	11%	0.03	0.03	NA	NA
PCB 156	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 157	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 158	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 167	ug/L	6	0	0%	NA	NA	NA	NA	9	0	0%	NA	NA	NA	NA
PCB 169	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 170	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 177	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 180	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 183	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 187	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 189	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 194	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 200	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB 201	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA

PCB 206	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	NA	NA	NA	NA	NA	NA	NA	10	0	0%	NA	NA	NA	NA
Perylene	ug/L	39	13	33%	0.06	0.03	0.20	0.01	39	11	28%	0.04	0.03	0.08	0.01
Phenanthrene	ug/L	41	32	78%	0.14	0.04	0.57	0.01	39	29	74%	0.21	0.10	0.75	0.02
Phorate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate as P	MG/L	20	20	100%	0.08	0.08	0.14	0.05	27	27	100%	0.12	0.09	0.21	0.06
Phosphorus as P	mg/l	27	27	100%	0.99	0.50	2.77	0.22	28	28	100%	3.36	0.77	11.57	0.24
Pyrene	ug/L	42	37	88%	0.18	0.04	0.68	0.01	39	35	90%	0.20	0.10	0.68	0.02
Selenium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	ug/L	47	15	32%	1.30	1.00	3.21	0.20	55	7	13%	1.04	0.70	2.99	0.20
Strontium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachlorvinphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tokuthion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	mpn/100mL	51	51	100%	528034	88932	2419200	3558	66	65	98%	185664	88200	876540	4021
Total Suspended Solids	mg/L	47	46	98%	56.87	26.50	275.75	9.00	57	57	100%	89.60	43.00	248.60	12.80
Toxaphene	ug/L	6	0	0%	NA	NA	NA	NA	19	0	0%	NA	NA	NA	NA
Trichloronate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trimethylnaphthalene, 1,6,7-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trimethylnapthalene, 2,3,5-	ug/L	38	3	8%	0.22	0.20	0.32	0.15	39	7	18%	0.05	0.03	0.12	0.02
Vanadium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	47	47	100%	371.98	188.00	1268.00	63.30	55	55	100%	597.47	493.50	1279.00	204.40

		Recreation							Transportation						
ParameterCode	ResultUnits	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile	No. of Samples	No. of Detects	Percent Detects	Mean of Detects	Median of Detects	Upper 95th Percentile	Lower 95th Percentile
Acenaphthene	ug/L	11	1	9%	0.01	0.01	NA	NA	20	1	5%	0.08	0.08	NA	NA
Acenaphthylene	ug/L	11	2	18%	0.01	0.01	NA	NA	20	0	0%	NA	NA	NA	NA
Aldrin	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia as N	mg/L	20	20	100%	1.07	1.06	1.47	0.71	20	20	100%	0.69	0.49	1.02	0.32
Anthracene	ug/L	11	8	73%	0.01	0.01	0.03	0.01	19	7	37%	0.02	0.01	0.05	0.00
Antimony	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	ug/L	20	20	100%	4.44	4.65	5.61	2.86	20	3	15%	3.03	1.20	6.33	1.02
Barium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(a)anthracene	ug/L	11	2	18%	0.09	0.09	NA	NA	20	12	60%	0.02	0.02	0.04	0.01
Benzo(a)pyrene	ug/L	11	11	100%	0.03	0.02	0.10	0.01	20	11	55%	0.03	0.02	0.07	0.01
Benzo(b)fluoranthene	ug/L	11	11	100%	0.06	0.04	0.19	0.02	20	11	55%	0.04	0.02	0.09	0.01
Benzo(e)pyrene	ug/L	11	11	100%	0.04	0.02	0.10	0.01	20	12	60%	0.03	0.02	0.05	0.01
Benzo(g,h,i)perylene	ug/L	11	6	55%	0.03	0.02	0.05	0.01	20	12	60%	0.05	0.04	0.10	0.02
Benzo(k)fluoranthene	ug/L	11	11	100%	0.02	0.01	0.06	0.01	20	10	50%	0.03	0.02	0.05	0.01
Beryllium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biphenyl	ug/L	11	1	9%	0.01	0.01	NA	NA	20	3	15%	0.02	0.02	0.03	0.01

Bolstar	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	ug/L	20	3	15%	0.63	0.60	0.78	0.51	20	10	50%	0.55	0.25	1.76	0.20
Chlordane, alpha-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane, gamma-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorpyrifos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	ug/L	20	20	100%	15.60	13.50	27.25	8.76	20	13	65%	6.42	2.40	24.60	1.18
Chrysene	ug/L	11	11	100%	0.07	0.04	0.18	0.03	20	16	80%	0.05	0.04	0.15	0.01
Cobalt	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	ug/L	20	20	100%	32.85	32.00	43.75	22.00	20	20	100%	20.03	10.50	37.00	5.96
DDD(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDD(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT(o,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT(p,p')	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Demeton-S	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diazinon	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	ug/L	11	1	9%	0.02	0.02	NA	NA	20	0	0%	NA	NA	NA	NA
Dibenzothiophene	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorvos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethoate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylnaphthalene, 2,6-	ug/L	11	0	0%	NA	NA	NA	NA	20	1	5%	0.05	0.05	NA	NA
Disulfoton	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E Coli	mpn/100mL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Enterococcus	mpn/100mL	24	24	100%	110114.50	54850.00	511055.00	15360.60	23	22	96%	9022.32	6107.00	23975.55	2051.45
Ethoprop	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliforms	mpn/100mL	24	24	100%	387629.33	448150.00	920250.00	813.30	23	23	100%	3091.17	1000.00	14525.40	21.00
Fenchlorphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fensulfothion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fenthion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ug/L	11	11	100%	0.11	0.08	0.25	0.06	20	20	100%	0.06	0.05	0.13	0.02
Fluorene	ug/L	11	5	45%	0.01	0.01	0.01	0.01	20	5	25%	0.03	0.03	0.04	0.02
HCH, alpha	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HCH, beta	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HCH, delta	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HCH, gamma	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	ug/L	11	7	64%	0.03	0.02	0.08	0.01	20	4	20%	0.02	0.02	0.04	0.01
Iron	ug/L	20	20	100%	12666.00	11200.00	20580.00	6651.50	20	17	85%	377.65	310.00	980.00	38.00
Lead	ug/L	20	20	100%	13.29	11.65	21.95	7.81	20	20	100%	4.56	3.25	8.23	1.59
Malathion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Merphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylnaphthalene, 1-	ug/L	11	0	0%	NA	NA	NA	NA	20	1	5%	0.18	0.18	NA	NA
Methylnaphthalene, 2-	ug/L	11	2	18%	0.01	0.01	NA	NA	20	1	5%	0.31	0.31	NA	NA
Methylphenanthrene, 1-	ug/L	11	6	55%	0.01	0.01	0.02	0.01	20	8	40%	0.03	0.02	0.07	0.01
Mevinphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mirex	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ug/L	11	0	0%	NA	NA	NA	NA	20	2	10%	0.29	0.29	NA	NA
Nickel	ug/L	20	20	100%	16.19	15.00	25.15	10.94	20	10	50%	6.31	3.25	19.71	2.23
Nitrate + Nitrite as N	mg/L	20	20	100%	1.05	1.00	2.09	0.06	21	18	86%	0.25	0.12	0.64	0.02
Nitrate as N	MG/L	23	23	100%	0.99	0.98	1.74	0.02	NA	NA	NA	NA	NA	NA	NA
Nitrite as N	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	20	20	100%	7.11	7.30	9.98	2.37	20	20	100%	2.27	1.20	3.48	0.58
Nonachlor, trans-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oxychlordane	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion, methyl	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 018	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 028	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 031	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 033	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 037	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 044	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 049	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 052	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 066	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 070	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 074	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 077	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 081	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 087	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 095	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 097	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 099	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 101	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 105	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 110	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 114	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 118	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 119	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 123	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 126	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 128	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 128/167	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 132/168	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 138	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 141	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 149	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 151	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 153	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

PCB 156	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 157	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 158	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 167	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 169	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 170	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 177	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 180	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 183	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 187	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 189	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 194	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 200	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 201	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 206	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1016	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1221	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1232	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1242	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1248	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1254	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB AROCLOR 1260	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perylene	ug/L	11	6	55%	0.02	0.01	0.03	0.01	20	4	20%	0.02	0.02	0.04	0.01
Phenanthrene	ug/L	11	11	100%	0.05	0.03	0.10	0.02	20	19	95%	0.07	0.05	0.18	0.02
Phorate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphate as P	MG/L	44	44	100%	2.45	0.66	6.84	0.02	10	10	100%	0.03	0.03	0.05	0.02
Phosphorus as P	mg/l	NA	NA	NA	NA	NA	NA	NA	10	10	100%	0.71	0.53	1.78	0.31
Pyrene	ug/L	11	11	100%	0.09	0.06	0.22	0.05	20	20	100%	0.07	0.07	0.20	0.02
Selenium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	ug/L	20	6	30%	2.27	1.80	4.52	0.83	20	2	10%	0.20	0.20	NA	NA
Strontium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachlorvinphos	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tokuthion	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Coliforms	mpn/100mL	24	24	100%	1206826	701550	1705900	11188	23	23	100%	157852	25000	685060	4377
Total Suspended Solids	mg/L	17	17	100%	361.29	300.00	1078.80	131.20	20	17	85%	25.29	18.00	69.60	8.40
Toxaphene	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloronate	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trimethylnaphthalene, 1,6,7-	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trimethylnapthalene, 2,3,5-	ug/L	11	0	0%	NA	NA	NA	NA	20	2	10%	0.03	0.03	NA	NA
Vanadium	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	ug/L	20	20	100%	128.45	125.00	181.55	77.60	20	20	100%	162.30	93.50	311.50	57.45

Notes

NA = Not enough data above detection limit collected to develop summary statistics.

Summary of Stormwater Runoff by Land Use Categories Sampled by Los Angeles County Department of Public Works and Presented in the 2000 report titled "Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report

Constituents	Data Included Since[a]	DL	Units	Commercial						Vacant					
				No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Cyanide	96	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	15	15	0	S.I.D.	S.I.D.	S.I.D.
TPH	94	1	mg/l	8	2	75	3.1	2.9	0.63	21	19	10	S.I.D.	S.I.D.	S.I.D.
Oil and Grease	94	1	mg/l	8	1	88	3.3	2.9	0.51	21	17	19	S.I.D.	S.I.D.	S.I.D.
Total Phenols	94	0.1	mg/l	8	8	0	S.I.D.	S.I.D.	S.I.D.	21	21	0	S.I.D.	S.I.D.	S.I.D.
Total Coliform	94	20	MPN/100ml	8	0	100	1,140,000	1,250,000	0.71	21	1	95	9,187	2,200	1.25
Fecal Coliform	94	20	MPN/100ml	8	0	100	528,750	90,000	1.35	21	2	90	1,397	500	2.6
Ratio Fecal Coliform/Total Coliform	94			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	0	100	52%	64%	0.79
Fecal Streptococcus	94	20	MPN/100ml	8	0	100	212,875	150,000	1.37	21	1	95	2,254	800	1.57
Fecal Enterococcus	94	20	MPN/100ml	8	0	100	86,250	40,000	1.18	21	1	95	679	500	0.98
Ammonia	94	0.1	mg/l	33	7	79	1.26	0.3	2.11	41	27	34	0.13	0.05	2.48
Calcium	96	1	mg/l	30	0	100	19	11	0.86	39	0	100	50	50	0.09
Magnesium	96	1	mg/l	30	0	100	6.8	3.9	0.92	39	0	100	15	16	0.26
Potassium	94	1	mg/l	36	0	100	4	2.8	0.81	45	0	100	2.4	2.4	0.22
Sodium	96	1	mg/l	33	0	100	37	19	1.03	45	0	100	13	14	0.2
Bicarbonate	94	2	mg/l	33	0	100	48	21	0.93	42	0	100	175	176	0.15
Carbonate	94	2	mg/l	33	33	0	S.I.D.	S.I.D.	S.I.D.	42	36	14	S.I.D.	S.I.D.	S.I.D.
Chloride	94	2	mg/l	33	0	100	50	15.8	1.28	43	0	100	6.6	6.5	0.26
Fluoride	94	0.1	mg/l	33	18	45	0.13	0.05	0.81	43	0	100	0.37	0.36	0.21
Nitrate	94	0.1	mg/l	33	1	97	2.6	2	0.63	43	0	100	5.2	4.6	0.56
Sulfate	94	0.1	mg/l	33	0	100	35	11	1.18	43	0	100	17	15	0.4
Alkalinity	94	4	mg/l	33	0	100	48	21	0.93	42	0	100	169	174	0.13
Hardness	96	2	mg/l	30	0	100	76	42	0.87	39	0	100	185	190	0.11
COD	97	5	mg/l	24	0	100	98	89	0.8	34	15	56	17	11	1.35
pH	94	0-14		33	0	100	7	6.8	0.07	42	0	100	8.1	8.1	0.03
Specific Conductance	94	1	umhos/cm	31	0	100	356	167	0.99	38	0	100	386	390	0.11
Total Dissolved Solids	96	2	mg/l	29	0	100	226	106	0.93	36	0	100	237	240	0.09
Turbidity	94	0.1	NTU	33	0	100	31	24	0.67	41	0	100	69	5.6	2.3
Total Suspended Solids	96	2	mg/l	29	0	100	66	53	0.65	39	1	97	186	18	3.27
Volatile Suspended Solids	94	1	mg/l/hr	31	0	100	32	29	0.54	41	7	83	36	12	2.48
MBAS	97	0.05	mg/l	22	11	50	0.18	0.04	1.52	30	30	0	S.I.D.	S.I.D.	S.I.D.
Total Organic Carbon	94	1	mg/l	35	0	100	10	7.3	0.74	43	0	100	5.3	3.6	0.84
BOD	94	2	mg/l	26	1	96	27	24	0.58	39	4	90	12	5	1.01
Dissolved Phosphorus	94	0.05	mg/l	33	1	97	0.3	0.19	0.86	37	21	43	0.11	0.03	3.38
Total Phosphorus	94	0.05	mg/l	32	1	97	0.39	0.28	0.77	39	16	59	0.16	0.05	2.63
NH3-N	94	0.1	mg/l	33	8	76	1.04	0.25	2.11	41	30	27	0.11	0.05	2.41
Nitrate-N	96	0.1	mg/l	31	7	77	0.48	0.43	0.82	40	1	98	1.05	0.94	0.53
Nitrite-N	94	0.1	mg/l	34	7	79	0.16	0.07	1.74	43	30	30	0.05	0.05	0.2
TKN	96	0.1	mg/l	32	0	100	3.4	2.2	0.94	40	0	100	0.79	0.68	0.6

Dissolved Aluminum	96	100	ug/L	33	24	27	241	50	3.19	42	29	31	190	50	2.39
Total Aluminum	96	100	ug/L	33	8	76	4055	295	4.87	42	13	69	1681	234	5.25
Dissolved Antimony	97	5	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Antimony	97	5	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Arsenic	97	5	ug/L	24	23	4	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	97	5	ug/L	24	22	8	S.I.D.	S.I.D.	S.I.D.	34	32	6	S.I.D.	S.I.D.	S.I.D.
Dissolved Barium	97	10	ug/L	24	2	92	39	33	0.81	34	2	94	57	58	0.41
Total Barium	97	10	ug/L	24	2	92	114	41	2.64	34	2	94	83	62	1.59
Dissolved Beryllium	97	1	ug/L	17	17	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.
Total Beryllium	97	1	ug/L	24	23	4	S.I.D.	S.I.D.	S.I.D.	34	33	3	S.I.D.	S.I.D.	S.I.D.
Dissolved Boron	97	100	ug/L	24	3	88	198	188	0.49	32	14	56	121	116	0.65
Total Boron	97	100	ug/L	24	1	96	261	254	0.41	32	8	75	178	170	0.59
Dissolved Cadmium	97	1	ug/L	24	21	13	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Cadmium	97	1	ug/L	24	19	21	0.73	0.5	0.71	34	34	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium	97	5	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Chromium	97	5	ug/L	24	18	25	27	2.5	4.18	34	33	3	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium +6	94	10	ug/L	33	33	0	S.I.D.	S.I.D.	S.I.D.	41	41	0	S.I.D.	S.I.D.	S.I.D.
Total Chromium +6	94	10	ug/L	33	33	0	S.I.D.	S.I.D.	S.I.D.	41	41	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	97	5	ug/L	24	3	88	14	11	0.84	34	31	9	S.I.D.	S.I.D.	S.I.D.
Total Copper	97	5	ug/L	24	0	100	39	22	1.57	34	15	56	15	5.5	3.14
Dissolved Iron	94	100	ug/L	39	17	56	382	106	2.81	45	35	22	202	50	3.27
Total Iron	94	100	ug/L	40	2	95	5319	587	5.24	45	14	69	3003	233	5.23
Dissolved Lead	97	5	ug/L	24	20	17	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Lead	97	5	ug/L	24	15	38	18	2.5	2.8	34	31	9	S.I.D.	S.I.D.	S.I.D.
Dissolved Manganese	98	100	ug/L	14	14	0	S.I.D.	S.I.D.	S.I.D.	18	18	0	S.I.D.	S.I.D.	S.I.D.
Total Manganese	98	100	ug/L	14	13	7	S.I.D.	S.I.D.	S.I.D.	18	14	22	67	50	0.48
Dissolved Mercury	94	1	ug/L	37	35	5	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Total Mercury	94	1	ug/L	37	35	5	S.I.D.	S.I.D.	S.I.D.	43	42	2	S.I.D.	S.I.D.	S.I.D.
Dissolved Nickel	97	5	ug/L	24	21	13	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Nickel	97	5	ug/L	24	16	33	15	2.5	3.69	34	29	15	S.I.D.	S.I.D.	S.I.D.
Dissolved Selenium	94	5	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	94	5	ug/L	40	35	13	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Dissolved Silver	97	1	ug/L	24	23	4	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Silver	97	1	ug/L	24	22	8	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Thallium	97	5	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Thallium	97	5	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Zinc	94	50	ug/L	40	4	90	152	130	0.66	45	43	4	S.I.D.	S.I.D.	S.I.D.
Total Zinc	94	50	ug/L	40	0	100	241	192	0.71	45	33	27	46	25	1.67
Bis(2-ethylhexyl)phthalate	99	1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Antracene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.

Benzo(a)pyrene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Chrysene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Fluoranthene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Fluorene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	99	0.1	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Naphthalene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Pyrene	99	0.05	ug/L	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
All other SVOCs	94	0.05-5.0	ug/L	23	23	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	94	0.05-1.0	ug/L	19	19	0	S.I.D.	S.I.D.	S.I.D.	38	38	0	S.I.D.	S.I.D.	S.I.D.
Carbofuran	96	5	ug/L	28	28	0	S.I.D.	S.I.D.	S.I.D.	38	38	0	S.I.D.	S.I.D.	S.I.D.
Glyphosate	98	25	ug/L	14	14	0	S.I.D.	S.I.D.	S.I.D.	18	18	0	S.I.D.	S.I.D.	S.I.D.
Diazinon	96	0.01	ug/L	24	21	13	S.I.D.	S.I.D.	S.I.D.	36	36	0	S.I.D.	S.I.D.	S.I.D.
Chlorpyrifos	96	0.05	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	36	36	0	S.I.D.	S.I.D.	S.I.D.
Thiobencarb	96	1	ug/L	24	24	0	S.I.D.	S.I.D.	S.I.D.	36	36	0	S.I.D.	S.I.D.	S.I.D.
All other N- and P- Pesticides	94	1.0-2.0	ug/L	28	28	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
2,4-D	96	10	ug/L	17	17	0	S.I.D.	S.I.D.	S.I.D.	35	35	0	S.I.D.	S.I.D.	S.I.D.
2,4,5-TP	96	1	ug/L	17	17	0	S.I.D.	S.I.D.	S.I.D.	35	35	0	S.I.D.	S.I.D.	S.I.D.
Bentazon	96	2	ug/L	17	17	0	S.I.D.	S.I.D.	S.I.D.	35	35	0	S.I.D.	S.I.D.	S.I.D.

Constituents	Data Included Since[a]	DL	Units	Transportation						Light Industrial					
				No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Cyanide	96	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
TPH	94	1	mg/l	4	0	100	3.1	2.8	0.47	5	1	80	1.7	1.4	0.68
Oil and Grease	94	1	mg/l	4	0	100	3.1	2.8	0.47	5	1	80	1.7	1.4	0.68
Total Phenols	94	0.1	mg/l	4	4	0	S.I.D.	S.I.D.	S.I.D.	5	5	0	S.I.D.	S.I.D.	S.I.D.
Total Coliform	94	20	MPN/100ml	4	0	100	692,500	600,000	0.82	5	0	100	454,000	160,000	1.42
Fecal Coliform	94	20	MPN/100ml	4	0	100	328,750	205,000	1.22	5	0	100	338,220	30,000	2.09
Ratio Fecal Coliform/Total Coliform	94			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Streptococcus	94	20	MPN/100ml	4	0	100	176,000	195,000	0.68	5	0	100	253,000	160,000	1.46
Fecal Enterococcus	94	20	MPN/100ml	4	0	100	32,000	32,000	0.65	5	0	100	98,200	130,000	0.73
Ammonia	94	0.1	mg/l	62	16	74	0.29	0.16	1.52	47	7	85	0.59	0.32	1.35
Calcium	96	1	mg/l	61	0	100	8.4	7.7	0.46	40	0	100	12	8.8	1.01
Magnesium	96	1	mg/l	61	4	93	1.6	1.5	0.48	40	0	100	2.3	1.9	1.13
Potassium	94	1	mg/l	63	2	97	2.1	1.7	0.56	50	1	98	2.7	2.2	0.59
Sodium	96	1	mg/l	62	0	100	8.3	6.4	0.81	47	0	100	14	12	0.69
Bicarbonate	94	2	mg/l	63	0	100	20	18	0.57	47	0	100	26	20	0.92
Carbonate	94	2	mg/l	63	63	0	S.I.D.	S.I.D.	S.I.D.	47	47	0	S.I.D.	S.I.D.	S.I.D.
Chloride	94	2	mg/l	64	3	95	5.6	4.4	0.82	47	0	100	12	8.6	0.8
Fluoride	94	0.1	mg/l	64	41	36	0.1	0.05	0.97	47	22	53	0.13	0.11	0.94

Nitrate	94	0.1	mg/l	64	2	97	2.9	1.8	1.27	47	0	100	4.1	2.4	1.09
Sulfate	94	0.1	mg/l	64	0	100	9.5	6.4	1.07	47	0	100	12.6	9.2	1.02
Alkalinity	94	4	mg/l	63	0	100	20	16	0.55	47	0	100	25	19	0.94
Hardness	96	2	mg/l	61	0	100	27	24	0.46	40	0	100	39	30	1.02
COD	97	5	mg/l	52	7	87	50	33	0.99	36	4	89	80	51	0.92
pH	94	0-14		63	0	100	6.7	6.6	0.05	47	0	100	6.8	6.8	0.06
Specific Conductance	94	1	umhos/cm	63	0	100	99	84	0.66	43	0	100	147	119	0.77
Total Dissolved Solids	96	2	mg/l	61	0	100	62	54	0.69	40	0	100	95	77	0.8
Turbidity	94	0.1	NTU	64	0	100	31	22	1.25	47	0	100	76	55	1.59
Total Suspended Solids	96	2	mg/l	61	0	100	78	50	1.3	41	0	100	240	129	1.36
Volatile Suspended Solids	94	1	mg/l/hr	63	1	98	31	20	1.22	43	0	100	57	46	0.79
MBAS	97	0.05	mg/l	51	30	41	2.6	0.025	6.95	32	10	69	0.13	0.11	0.9
Total Organic Carbon	94	1	mg/l	63	0	100	8.7	6.8	0.71	47	0	100	11.9	9.8	0.77
BOD	94	2	mg/l	54	0	100	21	19	0.8	37	0	100	20	17	0.67
Dissolved Phosphorus	94	0.05	mg/l	59	3	95	0.34	0.28	0.79	46	4	91	0.27	0.2	1.01
Total Phosphorus	94	0.05	mg/l	59	1	98	0.44	0.32	0.84	45	2	96	0.41	0.3	0.92
NH3-N	94	0.1	mg/l	62	19	69	0.24	0.14	1.51	48	9	81	0.48	0.26	1.36
Nitrate-N	96	0.1	mg/l	61	15	75	0.7	0.4	1.68	43	2	95	0.87	0.52	1.32
Nitrite-N	94	0.1	mg/l	64	10	84	0.09	0.06	0.72	47	9	81	0.09	0.06	0.73
TKN	96	0.1	mg/l	61	0	100	1.9	1.3	0.93	45	0	100	3	2.3	0.72
Dissolved Aluminum	96	100	ug/L	62	29	53	159	107	1.18	47	23	51	460	117	1.96
Total Aluminum	96	100	ug/L	63	10	84	672	354	1.65	47	7	85	1824	470	2.37
Dissolved Antimony	97	5	ug/L	54	53	2	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Total Antimony	97	5	ug/L	54	53	2	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Arsenic	97	5	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	97	5	ug/L	54	52	4	S.I.D.	S.I.D.	S.I.D.	37	34	8	S.I.D.	S.I.D.	S.I.D.
Dissolved Barium	97	10	ug/L	54	15	72	19	17	0.75	37	6	84	34	26	0.81
Total Barium	97	10	ug/L	54	9	83	34	27	0.88	37	4	89	68	36	1.38
Dissolved Beryllium	97	1	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	34	34	0	S.I.D.	S.I.D.	S.I.D.
Total Beryllium	97	1	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Boron	97	100	ug/L	54	16	70	146	132	0.55	37	18	51	122	102	0.71
Total Boron	97	100	ug/L	54	5	91	219	214	0.5	36	10	72	187	181	0.63
Dissolved Cadmium	97	1	ug/L	54	50	7	S.I.D.	S.I.D.	S.I.D.	37	34	8	S.I.D.	S.I.D.	S.I.D.
Total Cadmium	97	1	ug/L	54	32	41	1.1	0.5	1.04	37	30	19	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium	97	5	ug/L	54	51	6	S.I.D.	S.I.D.	S.I.D.	37	33	11	S.I.D.	S.I.D.	S.I.D.
Total Chromium	97	5	ug/L	54	40	26	4.8	2.5	1.15	37	25	32	6.8	2.5	1.6
Dissolved Chromium +6	94	10	ug/L	63	63	0	S.I.D.	S.I.D.	S.I.D.	47	47	0	S.I.D.	S.I.D.	S.I.D.
Total Chromium +6	94	10	ug/L	63	63	0	S.I.D.	S.I.D.	S.I.D.	47	47	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	97	5	ug/L	54	0	100	33	27	0.63	37	5	86	20	14	1.07
Total Copper	97	5	ug/L	54	0	100	56	39	1.15	37	0	100	32	21	1.03
Dissolved Iron	94	100	ug/L	65	34	48	200	50	1.9	51	25	51	698	104	2.99
Total Iron	94	100	ug/L	65	2	97	1188	512	1.74	51	5	90	6504	600	4.26
Dissolved Lead	97	5	ug/L	54	48	11	S.I.D.	S.I.D.	S.I.D.	37	32	14	S.I.D.	S.I.D.	S.I.D.

Total Lead	97	5	ug/L	54	29	46	10	2.5	1.57	37	18	51	17	5.1	1.88
Dissolved Manganese	98	100	ug/L	27	25	7	S.I.D.	S.I.D.	S.I.D.	26	23	12	S.I.D.	S.I.D.	S.I.D.
Total Manganese	98	100	ug/L	27	25	7	S.I.D.	S.I.D.	S.I.D.	26	23	12	S.I.D.	S.I.D.	S.I.D.
Dissolved Mercury	94	1	ug/L	63	63	0	S.I.D.	S.I.D.	S.I.D.	48	48	0	S.I.D.	S.I.D.	S.I.D.
Total Mercury	94	1	ug/L	63	62	2	S.I.D.	S.I.D.	S.I.D.	48	45	6	S.I.D.	S.I.D.	S.I.D.
Dissolved Nickel	97	5	ug/L	54	41	24	3.9	2.5	0.93	37	23	38	5	2.5	0.9
Total Nickel	97	5	ug/L	54	29	46	6	2.5	1.07	37	15	59	9.8	6	1.47
Dissolved Selenium	94	5	ug/L	65	65	0	S.I.D.	S.I.D.	S.I.D.	51	51	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	94	5	ug/L	65	61	6	S.I.D.	S.I.D.	S.I.D.	51	48	6	S.I.D.	S.I.D.	S.I.D.
Dissolved Silver	97	1	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Total Silver	97	1	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Thallium	97	5	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Total Thallium	97	5	ug/L	54	54	0	S.I.D.	S.I.D.	S.I.D.	37	37	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Zinc	94	50	ug/L	65	5	92	192	152	0.74	51	3	94	407	303	1.18
Total Zinc	94	50	ug/L	65	0	100	291	218	0.99	51	0	100	639	366	1.53
Bis(2-ethylhexyl)phthalate	99	1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Antracene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)pyrene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Chrysene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Fluoranthene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Fluorene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	99	0.1	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Naphthalene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Pyrene	99	0.05	ug/L	1	1	0	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
All other SVOCs	94	0.05-5.0	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	24	24	0	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	94	0.05-1.0	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	20	20	0	S.I.D.	S.I.D.	S.I.D.
Carbofuran	96	5	ug/L	60	60	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Glyphosate	98	25	ug/L	27	25	7	S.I.D.	S.I.D.	S.I.D.	26	26	0	S.I.D.	S.I.D.	S.I.D.
Diazinon	96	0.01	ug/L	57	56	2	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Chlorpyrifos	96	0.05	ug/L	57	57	0	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Thiobencarb	96	1	ug/L	57	57	0	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
All other N- and P- Pesticides	94	1.0-2.0	ug/L	58	58	0	S.I.D.	S.I.D.	S.I.D.	43	43	0	S.I.D.	S.I.D.	S.I.D.
2,4-D	96	10	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.
2,4,5-TP	96	1	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.
Bentazon	96	2	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.

				Multifamily Residential						Mixed Residential					
Constituents	Data Included Since[a]	DL	Units	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Cyanide	96	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
TPH	94	1	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Oil and Grease	94	1	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Total Phenols	94	0.1	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	1	0	S.I.D.	S.I.D.	S.I.D.
Total Coliform	94	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Fecal Coliform	94	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Ratio Fecal Coliform/Total Coliform	94			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Streptococcus	94	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	1	0	100	S.I.D.	S.I.D.	S.I.D.
Fecal Enterococcus	94	20	MPN/100ml	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ammonia	94	0.1	mg/l	38	9	76	0.47	0.29	1.44	42	4	90	0.67	0.39	1.13
Calcium	96	1	mg/l	35	0	100	19.3	8	1.2	39	1	97	7.5	6.4	0.7
Magnesium	96	1	mg/l	35	9	74	3.3	1.9	1.24	39	7	82	1.7	1.5	0.82
Potassium	94	1	mg/l	44	4	91	2.3	2.1	0.65	45	6	87	2.2	2.1	0.89
Sodium	96	1	mg/l	44	1	98	10	5.4	1.2	45	2	96	6.5	4.8	1.31
Bicarbonate	94	2	mg/l	39	0	100	39	17	1.19	40	0	100	17	14	0.82
Carbonate	94	2	mg/l	39	39	0	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Chloride	94	2	mg/l	37	8	78	13	3	1.49	38	10	74	3.5	2.7	0.93
Fluoride	94	0.1	mg/l	37	20	46	0.16	0.05	1.07	38	25	34	0.11	0.05	0.98
Nitrate	94	0.1	mg/l	37	1	97	5.3	3.6	0.87	38	3	92	6.8	2.3	3.74
Sulfate	94	0.1	mg/l	37	0	100	15	4.1	1.52	38	0	100	7.4	5	0.94
Alkalinity	94	4	mg/l	39	0	100	37	17	1.18	40	0	100	16	14	0.73
Hardness	96	2	mg/l	35	0	100	55	26	1.11	39	1	97	25	20	0.75
COD	97	5	mg/l	43	6	86	60	26	2.02	45	8	82	64	34	1.27
pH	94	0-14		39	0	100	6.9	6.6	0.1	40	0	100	6.5	6.4	0.05
Specific Conductance	94	1	umhos/cm	33	0	100	169	61	1.18	40	1	98	85	58	0.85
Total Dissolved Solids	96	2	mg/l	33	0	100	105	42	1.19	40	1	98	53	37	0.88
Turbidity	94	0.1	NTU	39	0	100	23	10	1.55	40	0	100	21	15	1.06
Total Suspended Solids	96	2	mg/l	36	1	97	46	24	1.41	38	0	100	63	40	1.19
Volatile Suspended Solids	94	1	mg/l/hr	36	2	94	19	13	1.01	37	2	95	35	25	1.33
MBAS	97	0.05	mg/l	36	26	28	0.049	0.025	1.13	39	25	36	0.068	0.025	1.86
Total Organic Carbon	94	1	mg/l	37	0	100	6.9	6	0.85	43	0	100	8.8	6.8	0.74
BOD	94	2	mg/l	31	2	94	11	9	0.91	34	0	100	18	14	0.9
Dissolved Phosphorus	94	0.05	mg/l	30	1	97	0.16	0.1	1.04	39	2	95	0.2	0.14	0.87
Total Phosphorus	94	0.05	mg/l	30	1	97	0.19	0.14	1	39	1	97	0.26	0.18	0.99
NH3-N	94	0.1	mg/l	38	9	76	0.39	0.24	1.43	42	5	88	0.56	0.33	1.13
Nitrate-N	96	0.1	mg/l	37	12	68	1.1	0.8	1.01	38	13	66	0.55	0.44	0.91
Nitrite-N	94	0.1	mg/l	37	10	73	0.1	0.05	1.65	38	7	82	0.12	0.06	1.47
TKN	96	0.1	mg/l	41	0	100	2	1.5	1.11	43	1	98	2.5	1.7	0.95
Dissolved Aluminum	96	100	ug/L	45	33	27	115	50	1.58	44	33	25	182	50	2.72
Total Aluminum	96	100	ug/L	45	5	89	387	300	0.91	45	6	87	513	271	1.89
Dissolved Antimony	97	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.

Total Antimony	97	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Dissolved Arsenic	97	5	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	97	5	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Barium	97	10	ug/L	45	18	60	20	14	0.92	45	19	58	18	14	1.11
Total Barium	97	10	ug/L	45	13	71	25	20	0.81	45	12	73	29	22	1.45
Dissolved Beryllium	97	1	ug/L	31	31	0	S.I.D.	S.I.D.	S.I.D.	31	31	0	S.I.D.	S.I.D.	S.I.D.
Total Beryllium	97	1	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Boron	97	100	ug/L	42	12	71	148	128	0.65	44	21	52	114	111	0.66
Total Boron	97	100	ug/L	43	7	84	202	168	0.58	44	11	75	164	161	0.58
Dissolved Cadmium	97	1	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	43	4	S.I.D.	S.I.D.	S.I.D.
Total Cadmium	97	1	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	43	4	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium	97	5	ug/L	45	43	4	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Total Chromium	97	5	ug/L	45	39	13	S.I.D.	S.I.D.	S.I.D.	45	42	7	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium +6	94	10	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Chromium +6	94	10	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	97	5	ug/L	45	20	56	6.9	5	0.91	45	17	62	12	8	1.42
Total Copper	97	5	ug/L	45	4	91	12	12	0.54	45	1	98	19	13	1.29
Dissolved Iron	94	100	ug/L	45	33	27	194	50	2.4	45	33	27	353	50	3.45
Total Iron	94	100	ug/L	45	9	80	791	350	2.14	45	10	78	1475	400	2.67
Dissolved Lead	97	5	ug/L	45	41	9	S.I.D.	S.I.D.	S.I.D.	45	40	11	S.I.D.	S.I.D.	S.I.D.
Total Lead	97	5	ug/L	45	31	31	5.8	2.5	1.48	45	23	49	11	2.5	2.6
Dissolved Manganese	98	100	ug/L	21	21	0	S.I.D.	S.I.D.	S.I.D.	20	18	10	S.I.D.	S.I.D.	S.I.D.
Total Manganese	98	100	ug/L	21	20	5	S.I.D.	S.I.D.	S.I.D.	20	18	10	S.I.D.	S.I.D.	S.I.D.
Dissolved Mercury	94	1	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	44	44	0	S.I.D.	S.I.D.	S.I.D.
Total Mercury	94	1	ug/L	40	40	0	S.I.D.	S.I.D.	S.I.D.	44	44	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Nickel	97	5	ug/L	45	44	2	S.I.D.	S.I.D.	S.I.D.	45	42	7	S.I.D.	S.I.D.	S.I.D.
Total Nickel	97	5	ug/L	45	39	13	S.I.D.	S.I.D.	S.I.D.	45	42	7	S.I.D.	S.I.D.	S.I.D.
Dissolved Selenium	94	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	94	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	44	2	S.I.D.	S.I.D.	S.I.D.
Dissolved Silver	97	1	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Silver	97	1	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Thallium	97	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Total Thallium	97	5	ug/L	45	45	0	S.I.D.	S.I.D.	S.I.D.	45	45	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Zinc	94	50	ug/L	45	21	53	83	53	1.53	45	9	80	133	89	1.33
Total Zinc	94	50	ug/L	45	5	89	146	89	1.37	45	1	98	203	125	1.35
Bis(2-ethylhexyl)phthalate	99	1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Acenaphthene	99	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	99	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Antracene	99	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	4	43	0.38	0.05	1.7
Benzo(a)pyrene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	6	14	S.I.D.	S.I.D.	S.I.D.

Chrysene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	2	71	0.62	0.3	1.32
Dibenz(a,h)anthracene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Fluoranthene	99	0.1	ug/L	6	4	33	0.17	0.05	1.54	7	2	71	0.29	0.27	1
Fluorene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	99	0.1	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Naphthalene	99	0.05	ug/L	6	6	0	S.I.D.	S.I.D.	S.I.D.	7	7	0	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	99	0.05	ug/L	6	4	33	0.21	0.025	2.08	7	2	71	0.5	0.24	1.43
Pyrene	99	0.05	ug/L	6	4	33	0.2	0.025	1.95	7	2	71	0.35	0.3	1.03
All other SVOCs	94	0.05-5.0	ug/L	30	30	0	S.I.D.	S.I.D.	S.I.D.	33	33	0	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	94	0.05-1.0	ug/L	36	36	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Carbofuran	96	5	ug/L	43	43	0	S.I.D.	S.I.D.	S.I.D.	44	44	0	S.I.D.	S.I.D.	S.I.D.
Glyphosate	98	25	ug/L	21	20	5	S.I.D.	S.I.D.	S.I.D.	20	20	0	S.I.D.	S.I.D.	S.I.D.
Diazinon	96	0.01	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	39	33	15	S.I.D.	S.I.D.	S.I.D.
Chlorpyrifos	96	0.05	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Thiobencarb	96	1	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
All other N- and P- Pesticides	94	1.0-2.0	ug/L	37	37	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
2,4-D	96	10	ug/L	33	33	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
2,4,5-TP	96	1	ug/L	33	33	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Bentazon	96	2	ug/L	33	33	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.

Constituents	Data Included Sincea	DL	Units	High Density Single Family Residential						Educational					
				No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV	No. of Samples	No. of Non-detects	Percent Detects	Mean	Median	CV
Cyanide	96	0.01	mg/l	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
TPH	94	1	mg/l	3	0	100	1.3	1.2	0.23	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Oil and Grease	94	1	mg/l	3	0	100	1.3	1.2	0.23	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Total Phenols	94	0.1	mg/l	3	3	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Total Coliform	94	20	MPN/100ml	3	0	100	1,366,667	1,600,000	0.3	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Coliform	94	20	MPN/100ml	3	0	100	933,333	900,000	0.7	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ratio Fecal Coliform/Total Coliform	94			0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Streptococcus	94	20	MPN/100ml	3	0	100	1,233,333	1,600,000	0.51	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fecal Enterococcus	94	20	MPN/100ml	3	0	100	610,000	140,000	1.41	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Ammonia	94	0.1	mg/l	34	6	82	0.41	0.3	1.05	40	12	70	0.33	0.18	1.62
Calcium	96	1	mg/l	32	1	97	6.7	5.8	0.55	39	0	100	16	10	0.71
Magnesium	96	1	mg/l	32	8	75	1.5	1.2	0.66	39	8	79	3.2	2.4	0.96
Potassium	94	1	mg/l	38	0	100	3.6	2.9	0.66	41	0	100	3.4	2.7	0.49
Sodium	96	1	mg/l	36	0	100	6.2	5	0.81	41	0	100	26	8	2.21
Bicarbonate	94	2	mg/l	35	0	100	21	13	1.04	40	0	100	39	28	0.76
Carbonate	94	2	mg/l	35	35	0	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Chloride	94	2	mg/l	33	2	94	5	4.2	0.69	40	4	90	34	4.6	2.89
Fluoride	94	0.1	mg/l	33	27	18	S.I.D.	S.I.D.	S.I.D.	40	24	40	0.14	0.05	1.21
Nitrate	94	0.1	mg/l	33	1	97	3.9	2.1	1.38	40	2	95	2.6	2.2	0.73
Sulfate	94	0.1	mg/l	33	0	100	6.9	3.8	1.05	40	0	100	17.3	9.3	1.23
Alkalinity	94	4	mg/l	35	0	100	20	13	0.91	40	0	100	36	26	0.72

Hardness	96	2	mg/l	31	0	100	23	20	0.53	39	0	100	52	40	0.79
COD	97	5	mg/l	32	5	84	89	39	1.87	40	10	75	37	34	0.85
pH	94	0-14		35	0	100	6.5	6.5	0.06	40	0	100	7	6.9	0.07
Specific Conductance	94	1	umhos/cm	33	0	100	90	61	0.77	39	0	100	243	111	1.41
Total Dissolved Solids	96	2	mg/l	32	0	100	58	38	0.8	39	0	100	147	68	1.35
Turbidity	94	0.1	NTU	34	0	100	34	19	1.17	41	0	100	64	36	1.14
Total Suspended Solids	96	2	mg/l	30	0	100	95	61	1.16	39	0	100	95	61	1.05
Volatile Suspended Solids	94	1	mg/l/hr	31	0	100	48	31	0.91	39	0	100	23	21	0.69
MBAS	97	0.05	mg/l	29	26	10	S.I.D.	S.I.D.	S.I.D.	38	33	13	S.I.D.	S.I.D.	S.I.D.
Total Organic Carbon	94	1	mg/l	38	0	100	9.8	7.1	0.76	42	0	100	7.5	6.5	0.5
BOD	94	2	mg/l	27	0	100	16	15	0.68	34	0	100	13	12	0.68
Dissolved Phosphorus	94	0.05	mg/l	32	0	100	0.29	0.25	0.57	37	1	97	0.27	0.2	0.86
Total Phosphorus	94	0.05	mg/l	32	0	100	0.39	0.32	0.77	37	0	100	0.31	0.23	0.65
NH3-N	94	0.1	mg/l	34	7	79	0.34	0.25	1.04	40	12	70	0.28	0.15	1.58
Nitrate-N	96	0.1	mg/l	32	11	66	0.86	0.46	1.51	39	12	69	0.51	0.48	0.86
Nitrite-N	94	0.1	mg/l	33	12	64	0.1	0.05	1.01	39	13	67	0.09	0.05	1.41
TKN	96	0.1	mg/l	35	0	100	2.9	2	1.04	39	0	100	1.6	1.3	0.73
Dissolved Aluminum	96	100	mg/l	36	26	28	105	50	1.03	42	11	74	397	248	1.21
Total Aluminum	96	100	mg/l	36	6	83	599	287	1.08	42	2	95	881	720	0.83
Dissolved Antimony	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Total Antimony	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Arsenic	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	39	7	S.I.D.	S.I.D.	S.I.D.
Total Arsenic	97	5	mg/l	32	29	9	S.I.D.	S.I.D.	S.I.D.	42	39	7	S.I.D.	S.I.D.	S.I.D.
Dissolved Barium	97	10	mg/l	32	17	47	14	5	0.92	42	6	86	28	26	0.72
Total Barium	97	10	mg/l	32	11	66	21	21	0.72	42	6	86	37	33	0.74
Dissolved Beryllium	97	1	mg/l	19	19	0	S.I.D.	S.I.D.	S.I.D.	29	29	0	S.I.D.	S.I.D.	S.I.D.
Total Beryllium	97	1	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Boron	97	100	mg/l	32	12	63	126	125	0.58	42	5	88	189	153	0.65
Total Boron	97	100	mg/l	32	5	84	181	171	0.52	42	4	90	254	227	0.58
Dissolved Cadmium	97	1	mg/l	32	31	3	S.I.D.	S.I.D.	S.I.D.	42	40	5	S.I.D.	S.I.D.	S.I.D.
Total Cadmium	97	1	mg/l	32	30	6	S.I.D.	S.I.D.	S.I.D.	42	34	19	S.I.D.	S.I.D.	S.I.D.
Dissolved Chromium	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	41	2	S.I.D.	S.I.D.	S.I.D.
Total Chromium	97	5	mg/l	32	29	9	S.I.D.	S.I.D.	S.I.D.	42	33	21	3.6	2.5	0.74
Dissolved Chromium +6	94	10	mg/l	36	36	0	S.I.D.	S.I.D.	S.I.D.	43	43	0	S.I.D.	S.I.D.	S.I.D.
Total Chromium +6	94	10	mg/l	36	36	0	S.I.D.	S.I.D.	S.I.D.	43	43	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Copper	97	5	mg/l	32	15	53	8.5	6.7	0.95	42	8	81	13	9.9	0.94
Total Copper	97	5	mg/l	32	2	94	15	11	0.57	42	0	100	24	15	1.49
Dissolved Iron	94	100	mg/l	38	27	29	123	50	1.2	42	15	64	454	190	2.3
Total Iron	94	100	mg/l	38	7	82	1117	546	1.36	42	4	90	2705	625	3.32
Dissolved Lead	97	5	mg/l	32	28	13	S.I.D.	S.I.D.	S.I.D.	42	40	5	S.I.D.	S.I.D.	S.I.D.
Total Lead	97	5	mg/l	32	14	56	10	5.4	1.03	42	30	29	4.9	2.5	1.09
Dissolved Manganese	98	100	mg/l	11	10	9	S.I.D.	S.I.D.	S.I.D.	17	17	0	S.I.D.	S.I.D.	S.I.D.
Total Manganese	98	100	mg/l	11	10	9	S.I.D.	S.I.D.	S.I.D.	17	17	0	S.I.D.	S.I.D.	S.I.D.

Dissolved Mercury	94	1	mg/l	35	35	0	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Total Mercury	94	1	mg/l	35	34	3	S.I.D.	S.I.D.	S.I.D.	40	40	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Nickel	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	38	10	S.I.D.	S.I.D.	S.I.D.
Total Nickel	97	5	mg/l	32	27	16	S.I.D.	S.I.D.	S.I.D.	42	26	38	4.7	2.5	0.69
Dissolved Selenium	94	5	mg/l	38	38	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Total Selenium	94	5	mg/l	38	38	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Silver	97	1	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Total Silver	97	1	mg/l	32	31	3	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Thallium	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Total Thallium	97	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	42	42	0	S.I.D.	S.I.D.	S.I.D.
Dissolved Zinc	94	50	mg/l	38	30	21	44	25	1.42	42	19	55	66	56	0.83
Total Zinc	94	50	mg/l	38	13	66	79	66	0.75	42	5	88	138	98	1.73
Bis(2-ethylhexyl)phthalate	99	1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Acenaphthene	99	0.05	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Acenaphthylene	99	0.05	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Antracene	99	0.05	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(a)anthracene	99	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.24	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(a)pyrene	99	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(b)fluoranthene	99	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.29	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Benzo(k)fluoranthene	99	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.18	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Chrysene	99	0.1	mg/l	5	4	20	S.I.D.	S.I.D.	1.18	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Dibenz(a,h)anthracene	99	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fluoranthene	99	0.1	mg/l	5	3	40	0.53	0.05	1.67	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Fluorene	99	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Indeno (1,2,3-cd)pyrene	99	0.1	mg/l	5	5	0	S.I.D.	S.I.D.	S.I.D.	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Naphthalene	99	0.05	mg/l	5	3	40	0.04	0.025	0.59	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Phenanthrene	99	0.05	mg/l	5	3	40	0.13	0.025	1.66	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
Pyrene	99	0.05	mg/l	5	1	80	0.83	0.37	1.44	0	0	S.I.D.	S.I.D.	S.I.D.	S.I.D.
All other SVOCs	94	0.05-5.0	mg/l	26	26	0	S.I.D.	S.I.D.	S.I.D.	23	23	0	S.I.D.	S.I.D.	S.I.D.
Organochlorine Pesticides & PCBs	94	0.05-1.0	mg/l	31	31	0	S.I.D.	S.I.D.	S.I.D.	22	22	0	S.I.D.	S.I.D.	S.I.D.
Carbofuran	96	5	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	43	43	0	S.I.D.	S.I.D.	S.I.D.
Glyphosate	98	25	mg/l	11	11	0	S.I.D.	S.I.D.	S.I.D.	17	15	12	S.I.D.	S.I.D.	S.I.D.
Diazinon	96	0.01	mg/l	30	28	7	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Chlorpyrifos	96	0.05	mg/l	30	30	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
Thiobencarb	96	1	mg/l	30	30	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
All other N- and P- Pesticieds	94	1.0-2.0	mg/l	32	32	0	S.I.D.	S.I.D.	S.I.D.	39	39	0	S.I.D.	S.I.D.	S.I.D.
2,4-D	96	10	mg/l	27	27	0	S.I.D.	S.I.D.	S.I.D.	24	24	0	S.I.D.	S.I.D.	S.I.D.
2,4,5-TP	96	1	mg/l	27	27	0	S.I.D.	S.I.D.	S.I.D.	24	24	0	S.I.D.	S.I.D.	S.I.D.
Bentazon	96	2	mg/l	27	27	0	S.I.D.	S.I.D.	S.I.D.	24	24	0	S.I.D.	S.I.D.	S.I.D.

Notes
CV = Coeffiecient of variation
DL = Detection Limit
S.I.D. = Statistically Invalid Data, not enough data above detection limit collected
a) Detection limits have changed throughout the monitoring process. Only data matching the current detection limit is displayed in this table. The Data Included Since field indicates the first year of the storm season with the current detection limit

Appendix 2.C
Common Sources of Key Pollutants of Concern in the Ballona Creek WMA

Bacteria

Total Coliform, Fecal Coliform, Enterococcus spp. and Escherichia coli

Sources contributing to the bacterial indicators total coliform, fecal coliform, enterococcus and *E. coli* are discussed in the source assessment included in the Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL. Bacteria loads associated with point sources, including MS4 and Caltrans Stormwater Permits, minor and general NPDES permits (Table 2 above) are largely unknown due to lack of monitoring for bacteria; however the main contributor of flow and associated bacteria loading is the stormwater conveyance system. Storm drains discharging to Ballona Creek flow during wet and dry weather; in dry weather these flows and associated bacteria loading result from over-irrigation, car washing, restaurant washout and other activities. Non-point sources include inputs to Ballona Estuary from Del Rey Lagoon, which may be due wildlife (LARWQCB 2006).

Shellfish Harvesting Advisory

The Ballona Creek Estuary is listed as impaired based on an existing shellfish harvesting advisory. The latest Integrated Report from the SWRCB that provides information on the basis for 303(d) impairment listings does not address this particular impairment (SWRCB, 2010). Therefore, it is only listed as impaired because it is an advisory. Shellfish harvesting advisories are largely the effects of coliform in the watershed (LARWQCB, 2007). Higher amounts of impervious surfaces associated with urban landscapes result in increased magnitude and frequency of surface runoff during both wet and dry weather conditions. Bacterial contamination is generated throughout the watershed and then transported through the storm drain system regulated under the MS4 permit. Relatively high bacteria concentrations were observed through both Ballona Creek and the storm drains draining to the creek (SCCWRP, 2004).

Storm drain system discharges may have elevated levels of bacterial indicators from sanitary sewer leaks and spills, illicit connections of sanitary lines to the storm drain system, runoff from homeless encampments, pet waste, organic debris from vegetation, food waste, and illegal discharges from recreational vehicle holding tanks, among others. (LARWQCB, 2006). The bacteria indicators used to assess water quality are not specific to human sewage; therefore, fecal matter from animals and birds can also be a source of elevated bacteria levels, and vegetation and food waste can be a source of elevated levels of total coliform bacteria, in particular (LARWQCB, 2006).

In addition to flow from Ballona Creek, the Ballona Estuary also receives flow from the Del Rey Lagoon and Ballona Wetlands through connecting tide gates. Flows from Del Rey Lagoon are considered non-point sources of bacterial contamination. This waterbody may be considered for a natural source exclusion if it's contributing bacteria loads are determined to be from wildlife in the area, as opposed to anthropogenic sources. A source identification study for the lagoon will need to be conducted in order to apply the natural source exclusion (LARWQCB, 2006). Other non-point sources in Ballona Creek and Estuary include natural sources from birds, waterfowl and other wildlife. Data do not currently exist to quantify the extent of the impact of wildlife on bacteria water quality in the Estuary (LARWQCB, 2006)

Because shellfish harvesting advisory has been identified as an effect of coliform in the watershed, the same sources identified for contributing to bacterial indicator densities can also be tied to the shellfish harvesting advisory. While the basis for shellfish harvesting advisories is to protect shellfish harvesting

(SHELL) beneficial use, and the bacteria TMDLs in the Ballona Creek watershed are established to protect recreational (REC) beneficial use, both impairments are tied to elevated levels of coliform. Therefore, it can be concluded that the shellfish harvesting advisory in the Ballona Creek Estuary is likely linked to MS4 discharges.

Current and Historical Organics

Urban storm water has been recognized as a substantial source of organic pollutants such as PAHs, PCBs and organochlorine compounds (Suffet and Stenstrom, 1997). This is also reflected in routine storm water monitoring performed by LACDPW under the MS4 permit (LACDPW, 2002).

The major contributor of associated organochlorine compounds, pesticides, PCBs and PAHs loading to Ballona Creek and Estuary is believed to be wet-weather runoff discharged from the storm water conveyance system (USEPA and CA RWQCB, 2005). In the highly urbanized Ballona Creek watershed, the contribution of stormwater runoff and storm-borne sediment loads from these areas drain to the MS4 system.

The loadings of DDT, PCBs and chlordane reflect historic uses. Although the uses of these compounds are banned, these legacy pollutants continue to remain elevated in sediments. DDT and PCB loadings appear to have declined over the last 30 years (Stein et al., 2003).

Pesticides (DDT, DDE and DDD)

DDT is an organochlorine insecticide that was widely used on agricultural crops and to control disease-carrying insects. In California, DDT was used primarily for agricultural activities. The use of DDT was banned in the United States in 1972, except for public health emergencies involving insect diseases and control of body lice. Although DDT is no longer used, it persists in the environment, adhering strongly to soil particles. Total DDT consists of two isomers (p,p-DDT and o,p-DDT) and several degradation products (p,p-DDE, o,p-DDE, p,p-DDD, and o,p-DDD) (USEPA 2012b).

In the previous study by Young et al. (1973), the annual wet weather loads for DDTs from Ballona Creek were around 18 kg during 1971-1972 water year, which was a particularly wet year. In the 1987-88 period, wet weather loadings for DDT during a comparable size storm year were around 8 kg (Stein et al., 2003). There were no detectable concentrations of DDT in stormwater samples from 1994 to 2005 (LADPW, 2005). However, the detection limits for DDT used by the Los Angeles County lab are two orders of magnitude greater than the Communities of Practice (COP)'s human health objective.

More recently, Curren et al. (2011) evaluated the contribution of subwatersheds to chlorinated pesticide loading during wet weather flow. Fifteen storm drains from Ballona Creek subwatershed were sampled during three storms during the 2005 - 2006 winter rainy season. The suspended solids were analyzed for chlorinated pesticides. Curren et al. (2011) found DDT concentrations in Ballona Creek stormwater during the 2005-2006 season that ranged from non-detect to 0.4 ng/l. This indicates that DDT concentrations in stormwater may exceed the human health criteria. The total DDT loadings based on the average concentrations from these three storms sampled by Curren et al. (2011) were estimated to be 6.2 g.

PCBs

Polychlorinated biphenyls (PCBs) are mixtures of up to 209 individual chlorinated compounds (known as congeners). PCBs were used in a wide variety of applications, including dielectric fluids in transformers and capacitors, heat transfer fluids, and lubricants. In 1976, the manufacture of PCBs was prohibited because of evidence that they build up in the environment and can cause harmful health effects.

PCBs are typically associated with more urban areas. In addition, PCBs were commonly used in a number of household products (e.g., fluorescent light fixtures, paints, waxes, caulking). Although there is little information available to estimate the potential loads from rural areas, rural areas are unlikely to be a major source of PCBs (USEPA, 2012).

Potential pollutants from construction sites include sediment, which may contain historic PCBs from construction materials and the heavy equipment used on construction sites. In addition, in the highly urbanized Ballona Creek watershed re-development of former industrial sites has a higher potential to discharge sediments laden with pollutants such as PCBs. During wet weather, runoff from construction sites has the potential to contribute metals loadings to the creek (USEPA and CA RWRCB, 2005).

In the 1971-1972 water year, the annual wet weather loads for PCBs from Ballona Creek were around 15 kg (Young et al., 1973). In the 1987-88 water year, the wet weather loadings for PCBs were around 7 kg. LADPW has not indicated detectable levels of PCBs in stormwater from Ballona Creek since the mid-1990s. However, detection levels for PCBs measured as arochlors were 65 ng/l, which are more than three orders of magnitude greater than the COP human health objective. In 1995-1996 water year, Suffet and Stenstrom (1997) measured PCB congeners and found elevated concentrations of total PCBs (calculated as the sum of the 18 congeners) ranging between 15,100 ng/l to 390,000 ng/l in stormwater runoff to Ballona Creek.

More recently, Curren et al. (2011) found concentrations of total PCBs that were much lower, ranging from 0.74 ng/l to 16.07 ng/l in the 2005-06 rainy season. These most recent values are all higher than the COP objective. The estimate of PCB loads based on the average concentrations from the three storms sampled by Curren et al. (2011) was 32.9 g. However, a disproportionate mass of PCB loading came from a site which had no obvious sources.

The continued presence of high PCBs in sediments from Ballona Creek also suggest land-based inputs to the storm drain system, although there is limited information to assess the impact of hundreds of individual industrial or construction stormwater projects (USEPA, 2012).

Atmospheric deposition may be a potential nonpoint source of PCBs. There may also be potential losses of PCBs that may occur as a result of volatilization. Sabin et al. (2011) provide limited information on net-gas exchange during dry weather from sites near Ballona Creek Estuary. Volatilization may be an important loss term process for PCBs. However, the rates of volatilization are a function of concentrations in both the air and water which can vary greatly over time and space.

PAHs

Polynuclear aromatic hydrocarbons (PAHs) are a group of over 200 different chemicals. They are found in nature in coal and crude oil and in emissions from combustion of fossil fuels, forest fires and volcanoes. Most PAHs entering the environment are formed unintentionally during burning (coal, oil, wood, gasoline, garbage, tobacco and other organic material) or in certain industrial processes. Important sources of PAHs in surface waters include deposition of airborne PAHs, municipal waste water discharge, urban storm water runoff particularly from roads, runoff from coal storage areas, effluents from wood treatment plants and other industries, oil spills, and petroleum pressing (ATSDR, 1995).

The loadings of PAHs are attributable to ongoing activities in the watershed. Atmospheric deposition may be a potential nonpoint source of metals and PAHs to the watershed, through either direct or indirect deposition. PAHs are released to the atmosphere through natural and synthetic sources of emissions. The largest sources of PAHs to the atmosphere are from synthetic sources, including wood burning in homes; automobile and truck emissions; and hazardous waste sites and former manufactured-gas sites (USEPA and CA RWRCB, 2005).

It is believed that the primary source of PAHs to Ballona Creek and Estuary is urban storm water runoff. Indirect atmospheric deposition reflects the process by which metals and PAHs deposited on the land surface may be washed off during storm events and delivered through storm water runoff to Ballona Creek. Most airborne PAHs are deposited on the land (e.g., through precipitation or indirect atmospheric deposition) and are transported to Ballona Creek through storm water runoff (USEPA and CA RWQCB, 2005).

Chlordane

Chlordane was used as a pesticide to control insects on agricultural crops, residential lawns and gardens, and in buildings, particularly for termite control. In 1988, all chlordane uses, except for fire ant control, were voluntarily cancelled in the US. So the majority of environmental loadings of chlordane were required to cease as of 1988 with the end of authorized commercial use. However, stocks held by homeowners could be a continuing source, as would be the erosion and transport of existing soils previously contaminated by chlordane and related compounds (MDE, 1999).

Chlordane is not an expected substance in point source discharges. If it were to occur in municipal discharges, it would be through intermittent, illicit, and generally untraceable sources (MDE, 1999).

Although it is no longer used in the US, chlordane persists in the environment, adhering strongly to soil particles. It is assumed that the only source of chlordane in the watershed is storm water runoff carrying historically deposited chlordane most likely attached to eroded sediment particles (USEPA and CA RWQCB, 2005).

Bis(2-ethylhexyl)Phthalate

Bis-2-ethylhexylpthalate is a plasticizer used in the manufacture of polyvinyl chloride (PVC). It is also is a common contaminant of sample containers, sampling apparatus, and analytical equipment. A Category 3 contaminant, its incidence of exceedance is low (one in 19 samples during the past 5 years during wet weather and none of the 14 samples in the past 5 years during dry weather). It attribution to MS4 discharges is not highly supported by these results and earlier detections can possibly be attributable to lab contamination. It is known to be a common contaminant of sample containers, sampling apparatus, and analytical equipment. For example, it has been identified as a common laboratory contaminant during groundwater monitoring data analysis (WI DNR, 2002).

Metals

There are wet and dry weather numeric targets for copper, lead, selenium, and zinc in the Ballona Creek watershed. Under the 2008 Metals TMDL, copper, lead, selenium, and zinc have separate dry weather and wet weather targets and allocations. Flow in Ballona Creek was used in the TMDL to determine when wet weather or dry weather targets and allocations applied. The Ballona Creek Toxics and Metals TMDLs were amended on December 5, 2013, with the recommendation that selenium be removed from the TMDL, and numeric targets adjusted for copper, lead, and zinc. The amendment also set sediment targets for cadmium, copper, lead, silver, and zinc in the Ballona Creek Estuary and WLAs for those constituents in the Ballona Creek watershed (LARWQCB, 2010b).

The sources and delivery of metals can vary depending on weather and flow conditions. Wet weather metal loads are typically greater than dry weather loads, with wet weather stormwater runoff shown to be the dominant source of annual metals loading (LACDPW, 2012a). Numerous researchers have documented that the most prevalent metals in urban storm water (i.e., copper, lead, zinc, and to a lesser degree cadmium) are consistently associated with suspended solids. Because metals are typically associated with fine particles in storm water runoff, they have the potential to accumulate in estuarine sediments where they may pose a risk of toxicity. On an annual basis, stormwater contributes about 91 percent of the copper loading and 92 percent of the lead loading to Ballona Creek, the majority of which is permitted through the Los Angeles County MS4 (in addition to the Caltrans stormwater permit, general construction stormwater permit, and general industrial stormwater permit) (LARWQCB, 2013b).

During dry weather, most of the metals loadings are in the dissolved form. Storm drains convey a large percentage of the metals loadings during dry weather because although their flows are typically low, concentrations of metals in urban runoff may be quite high. (LARWQCB, 2013b). While flows during dry weather are highly variable in both time and space, storm drain metals concentrations were generally higher than those observed in Ballona Creek itself, and peak concentrations were typically an order of magnitude greater in the storm drain than in the creek (SCCWRP, 2004). SCCWRP (2004) found that high concentrations of metals in the creek correspond to locations of storm drains associated with high concentrations.

Toxic Organic Chemicals

The fertilizers used for land and landscape maintenance of municipal areas are also a source of metals. Fertilizers, herbicides, and pesticides contain metals such as cadmium, copper, lead, and zinc. Heavy metals in municipal stormwater can also come from car debris, roof shingles, building materials, and plastics (LACDPW, 2012a).

Road Infrastructure

The "The use and wear of cars is the most prevalent source of roadway pollutants. A California study found that cars are the leading source of metal loads in stromwater, producing over 50 percent of the copper, cadmium, and zinc loads. Wear from brake pads, tires, and engine parts is a significant source of metal pollutants. For example, almost 50 percent of the copper loads in roadway stormwater originates from brake pads, and tire wear accounts for over 50 percent of the total cadmium and zinc loads delivered to the San Francisco Bay each year. Such conditions are expected to be similar for the Los Angeles region. Leaking oil, grease, and coolant also contribute metals and PAHs to the roadway loads." (LACDPW, 2012a). Table 1 shows common sources of contaminants in runoff from roads and highways.

Silver

According to the TMDL development for the Lower St. Johns River in Florida, silver compounds in soil are released into the environment by rain and may be carried long distances in air and water. Silver is stable and remains in the environment in one form or another until it is taken out again by people. Because silver is an element, it does not break down, but it can change its form by combining with other substances (USEPA, 2004). Silver has also been identified as a component in vehicle fuels (Lee, 1993).

There are limited studies and literature on the sources of silver in the watershed, but MS4 discharges cannot be eliminated as possible sources of silver. However, it should be noted that over the past five years, there have only been two exceedances of total silver in the watershed out of 70 samples (at Centinela Creek), and no exceedances for dissolved silver. Over the past ten years, there have been seven exceedances of total silver in the watershed out of 168 samples (4 percent), and four exceedances of dissolved silver out of 128 samples (3 percent). This low number of exceedances may indicate that silver is not a significant constituent of concern in the watershed.

Table 1. Common Sources of Roadway Pollutants

Source	Cadmium	Copper	Nickel	Lead	Zinc	PAHs	Nutrients	Synthetic Organic Chemicals
Gasoline	•	•		•	•			
Exhaust			•	•		•		•
Motor oil and grease			•	•	•	•		
Antifreeze	•	•		•	•	•		
Undercoating				•	•			
Brake linings		•	•	•	•			
Tires	•	•		•	•	•		
Asphalt	•	•	•		•	•		
Concrete		•	•		•			
Diesel oil	•			•	•			•
Engine wear			•	•	•			
Fertilizers, pesticides, and herbicides	•	•	•		•		•	•

Adapted from LACDPW (2012a)

Mercury

The adopted San Francisco Bay Basin Plan amendment identified sources of mercury in San Francisco Bay to include bed erosion (about 38 percent), the Central Valley watershed (about 36 percent), urban stormwater runoff (about 13 percent), the Guadalupe River watershed (about 8 percent), direct atmospheric deposition (about 2 percent), non-urban stormwater runoff (about 2 percent), and wastewater discharges (about 1.5 percent). There was also a potential that mercury may enter the Bay from Bay margin contaminated sites and abandoned mercury mines outside the Guadalupe watershed (SFBRWQCB, 2006).

The organic form of mercury (methylmercury) is toxic and bioavailable. Sources of methylmercury in Delta waters include tributary inputs from upstream watersheds and within-Delta sources such as methylmercury flux from wetland and in-channel sediments, municipal and industrial wastewater, agricultural drainage, and urban runoff (CVRWQCB, 2010). Various sources of mercury have been identified, including urban stormwater runoff, correlating to a linkage to MS4 discharges.

Mercury is also recognized to be a potential laboratory contaminant. Mercury is found in thermometers, manometers, vacuum pumps, switches, discharge tubes, dental amalgams, and as a component in chemical reactions. Because of its frequent use, it is not unusual for mercury to be spilled, or otherwise contaminate laboratory, storage, or office areas. Contamination of laboratory spaces from historic mercury spills is also common (University of Florida, 2012).

Nutrients

Ammonia

Within the adjacent Los Angeles River watershed, the TMDL for Nitrogen Compounds Source Assessment found that although POTWs are the largest source of nutrients (note Ballona Creek Watershed does not have any POTW discharges), the urban and residential stormwater runoff collected and discharged from MS4s presents loadings of nutrients that is considerable and represents a linkage to MS4 (LARWQCB 2003). The nutrient loading for stormwater runoff from the land uses draining to MS4s would occur during storm events, so the dry weather exceedences for ammonia within Ballona

Creek Reach 2 and Sepulveda Channel may be the result of permitted or unpermitted discharges to the MS4.

Trash

A numeric target of 0 (zero) trash in the water has been established by the Ballona Creek and Santa Monica Bay TMDLs. According to the TMDL Staff Reports, the major source of trash in Ballona Creek and Santa Monica Bay results from litter, which is intentionally or accidentally discarded in watershed drainage areas. "Transport mechanisms include: (1) storm drains: trash is deposited throughout the watershed and is carried to the various reaches of the river and its tributaries during and after significant rainstorms through storm drains, (2) wind action: trash can also blow into the waterways directly, and (3) direct disposal: direct dumping also occurs." (LARWQCB, 2004). The Santa Monica Bay TMDL also lists marine vessels and ships as an additional source. Several studies conclude that urban runoff is the dominant source of trash. Ballona Creek collects runoff from several partially urbanized canyons on the south slopes of the Santa Monica Mountains as well as from intensely urbanized areas of West Los Angeles, Culver City, Beverly Hills, Hollywood, and parts of Central Los Angeles. The correlation between trash and urban runoff through storm drains can be evidenced by the large amount of trash that accumulates at the base of storm drains (LARWQCB, 2004, LARWQCB, 2010).

Pollutant Class To Be Determined

The section includes water quality conditions that are not specific pollutants but indicate the presence of pollutants, or specific constituents where the linkage to a pollutant will be further investigated during EWMP development):

Cyanide

Cyanide was placed on the 303(d) list of impairments for Ballona Creek due to a sufficient number of exceedances of the CTR cyanide criteria for protection of aquatic life (SWRCB, 2010). The sources of cyanide are generally anthropogenic in nature, but can also include some natural non-point sources. Point sources of cyanide can include stormwater runoff from industrial facilities, e.g., metal plating and finishing operations may contain cyanide (LACDPW, 2005). In the Ballona Creek watershed, sand and gravel operations, oil and natural gas facilities, transportation, recycling and manufacturing facilities have been identified as industrial sources (LACDPW, 2006). These sources are regulated by California's statewide General Industrial Stormwater Permit or individual NPDES permits.

Non-point sources of cyanide may include pesticide use, which can be transported to storm drains during dry weather flow (e.g., over-irrigation) or wet weather flow. The largest likely source of cyanide in the watershed is air-borne deposition from motor vehicle emissions (LACDPW, 2005). The amount of cyanide that could be released to the environment from natural sources is comparatively low. Natural sources may include incomplete combustion from forest fires, decomposition of plant material and fungi. (LACDPW, 2005).

While some potential sources of cyanide may be attributed to industrial facilities, e.g., metal plating, finishing, and manufacturing operations, the MS4 cannot be eliminated as a significant linkage for cyanide impairment as the MS4 is the conduit for cyanide that comes from some of the most significant sources. The largest likely sources of cyanide in the watershed are linked to MS4 discharges, as both air-borne deposition from motor vehicle emissions and pesticide use are linked to surface runoff in the MS4 and from the MS4 to Ballona Creek.

The low level of cyanide exceedances may also be attributed to laboratory contaminant issues.

Dissolved Oxygen

Low dissolved oxygen concentration results when there is insufficient aeration of oxygen into water. Slow-moving, stagnant, and pooled water has little opportunity for aeration, resulting in low concentrations of dissolved oxygen. Biologically, oxygen is also removed from the water column during respiration by plants for cell production. The chemical removal of oxygen can occur as ammonia is oxidized to nitrite, and eventually nitrate, thereby removing available oxygen from the water column. The saturation of oxygen in water is lastly a function of temperature and salinity; water with lower temperature and salinity retains more dissolved oxygen, relative to higher temperature and salinity (CCRWQCB, 2006).

A characterization study conducted in Washington found that increased stream temperatures likely heavily influence lower dissolved oxygen levels (SWDE, 2013). An indicator of low dissolved oxygen is benthic algae cover. Benthic algae is a natural plant in most stream systems and is a vital component of the stream food web. Under natural conditions, algal density is kept at levels that do not adversely affect dissolved oxygen. Factors limiting algal growth include (but not limited to): 1) nutrients, 2) light, 3) substrate, 4) flowing water, and 5) temperature. The Central Coast Regional Board staff found that benthic algae cover responds proportionally to light, and to a lesser degree, nutrient availability (CCRWQCB, 2006). The direct impact of urban storm water runoff on dissolved oxygen conditions in receiving waters is not thought to be substantial. However, the secondary impacts on the dissolved oxygen balance in receiving waters due to nutrient enrichment, eutrophication, and resulting sediment oxygen demand may be important. Therefore, there is still an indirect linkage between the MS4 and low dissolved oxygen.

It should be noted that over the past five years, there have been zero exceedances of dissolved oxygen in the watershed out of 19 samples. Over the past ten years, there have been two exceedances in 43 samples. This indicates that dissolved oxygen may not be a significant constituent of concern in the watershed.

pH

The receiving water analysis for pH identified exceedances for both the Basin Plan minimum and maximum objectives. Wet weather samples exhibited exceedances for the both minimum/maximum WQOs, while dry weather samples only exhibited exceedances for maximum WQOs. A characterization study conducted in Washington found that increased low pH is likely a result of the combination of large wet-season precipitation events, the acidity of rainfall and shallow groundwater, and the poor buffering capacity of the stream and surrounding landscape (SWDE, 2013). Most pH impacts in urban waters are caused by runoff of rainwater with low pH levels (acid precipitation). In fact, urban areas tend to have more acidic rainfall than less developed areas (USEPA, 1999).

Higher levels of pH may be caused by the respiration of aquatic plants, e.g. benthic algae. Photosynthesis is accelerated during afternoon hours when peak solar radiation is present. Photosynthesis by algae uses water column carbon dioxide. The reduced carbon dioxide has a net effect of increasing pH. Central Coast Regional Board staff concluded that benthic algae is a source of biologic removal of dissolved oxygen in lower Chorro Creek during afternoon hours, and is a factor causing impairment of low dissolved oxygen and high pH (CCRWQCB, 2006). Higher levels of pH may be attributed to the MS4 by way of nutrient enrichment, which promotes algal growth.

Sediment and Exotic Vegetation

This TMDL for Ballona Creek Wetlands addresses the sediment and exotic vegetation impairments by setting targets to restore a diverse composition of healthy wetland habitats and to eliminate the presence of exotic vegetation that overwhelms the highly sensitive native habitats. The critical stressors causing impacts to the Ballona Creek Wetlands are excessive sediment on-site that has raised the mean elevation and buried critical habitat. Excess sediment has also created conditions to support highly invasive exotic vegetation that crowd out native species. Load allocations for legacy sediment were set at zero and approximately 3.1 million cubic yards of excess sediment have been identified to be removed from the sensitive habitat to restore beneficial uses (USEPA, 2012).

The potential for sediment loading into the Wetland is associated with the flow coming down the watershed. Sediment moves from the watershed down the drainage channels or MS4 system as a result of storms, wind and land based runoff. Major storms are responsible for significant transport and deposition of sediment into Ballona Creek and Ballona Wetland (USEPA, 2012).

Watershed modifications, including urbanization, influence downstream suspended sediment concentrations. The increased urban area reduces the amount of pervious cover that is subject to erosion. The Ballona Creek Watershed is extensively developed (over 80 percent of the watershed is developed). While urbanization increases the velocity of flow, which would typically cause scouring in natural channel and increase the sediment load, Ballona Creek is largely a lined channel so the natural bottom is not present to contribute additional sediment load. Sedimentation rates to the Ballona Creek Wetland are slow due to low sediment supply from the Ballona Creek Watershed (USEPA, 2012).

The largest source of impact to sedimentation is due to historical developmental activities that have led to a legacy of excess sediment loading in the wetland areas. Hydromodifications and discharges of dredged spoils and fill have caused significant changes in the size and function of the Ballona Creek Wetlands. Perhaps the largest modifications to the physical make-up of the wetland have been the construction of the Ballona Creek Flood Control channel, conversion of saltmarsh to agricultural areas in Area B, construction of Culver Boulevard through Area B, and the deposition of dredged and fill sediment on Area A during the construction of the Marina del Rey Harbor (USEPA, 2012)

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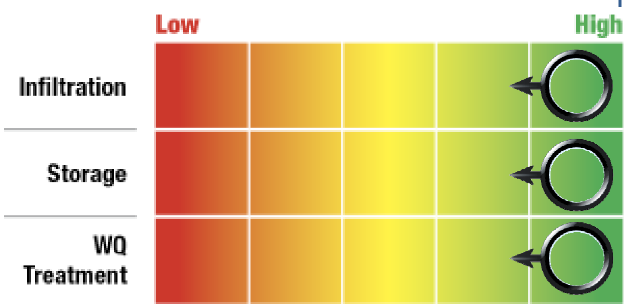
Appendix 3.A
Structural BMP Fact Sheets

Infiltration Facilities (Regional BMP)

Infiltration facilities are designed to decrease runoff volume through groundwater recharge and improve water quality through filtration and sorption. Facilities can incorporate engineered medias to improve percolation into native soils. Infiltration facilities can be open-surface basins or subsurface galleries.

BMP Performance Functions



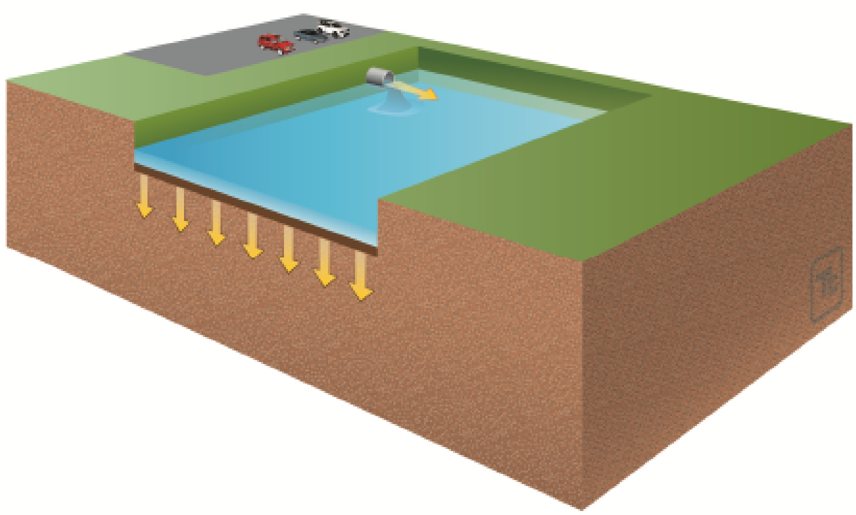
Design Variations

Several design variations include:

- ***Surface Infiltration Basins:*** depressions designed to infiltrate stormwater into the subgrade soils. Facilities can be vegetated to encourage evapotranspiration and aesthetics. Also known as spreading grounds.
- ***Subsurface Infiltration Galleries:*** underground storage systems designed to infiltrate stormwater into subgrade soils. Subsurface systems are used when limited area is available for BMP implementation.

Typical Design Components

Error! Not a valid bookmark self-reference.re 3.A-1 presents a typical design and highlights potential design variations:



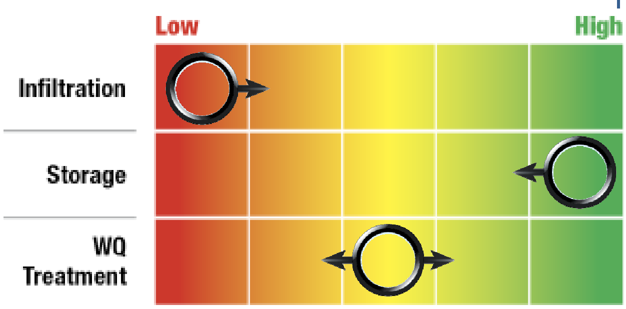
Typical regional infiltration facility schematic (arrows indicate water pathways).

Figure 3.A-1

Detention Facilities (Regional BMP)

Detention facilities are designed to detain runoff and improve water quality through pollutant settling. Facilities encourage settling by decreasing runoff flow rates and allowing ponding to occur. Detention facilities can be open-surface practices or subsurface galleries and can be dry during non-rainy seasons or wet year-round.

BMP Performance Functions



Design Variations

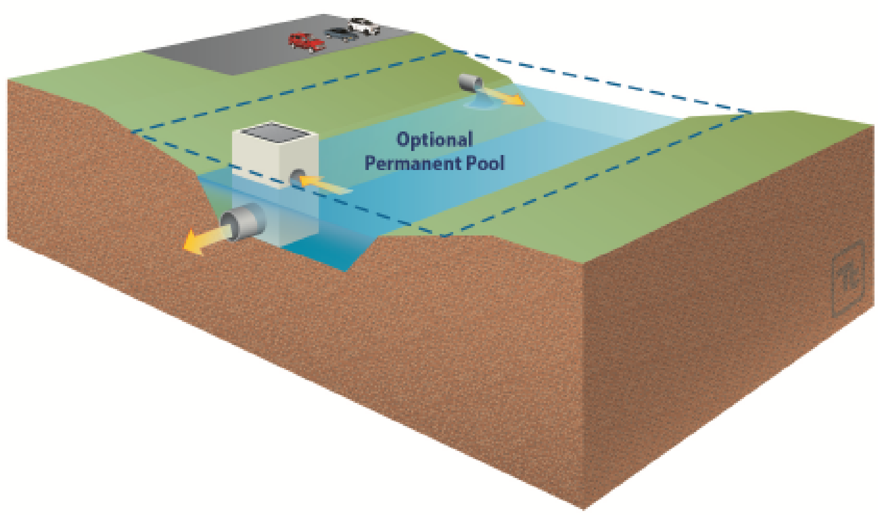
Several design variations include:

Surface Detention Basins: basins designed to detain stormwater runoff for a specified time to allow sedimentation of particle-bound pollutants. Surface systems can have permanent pools or fully drain between storms.

Subsurface Detention Galleries: underground storage systems designed to detain stormwater. Subsurface systems are used when limited area is available for BMP implementation.

Typical Design Components

Figure 3.A-2 presents a typical design and highlights potential design variations:



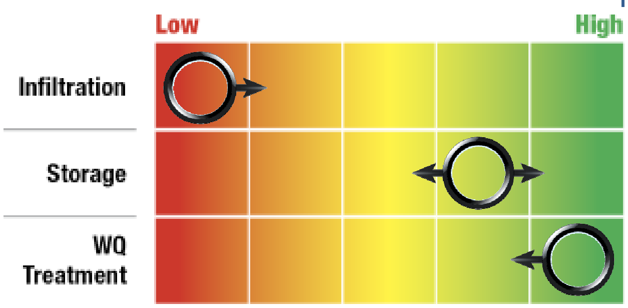
Typical regional detention facility schematic (arrows indicate water pathways).

Figure 3.A-2

Constructed Wetlands (Regional BMP)

Constructed wetlands are engineered, shallow-marsh systems designed to control and treat stormwater runoff. Particle-bound pollutants are removed through settling, and other pollutants are removed through biogeochemical activity. Constructed wetlands must always maintain a baseflow into the system, which can come from an intersected groundwater or an associated low-flow diversion utilizing dry-weather flows.

BMP Performance Functions



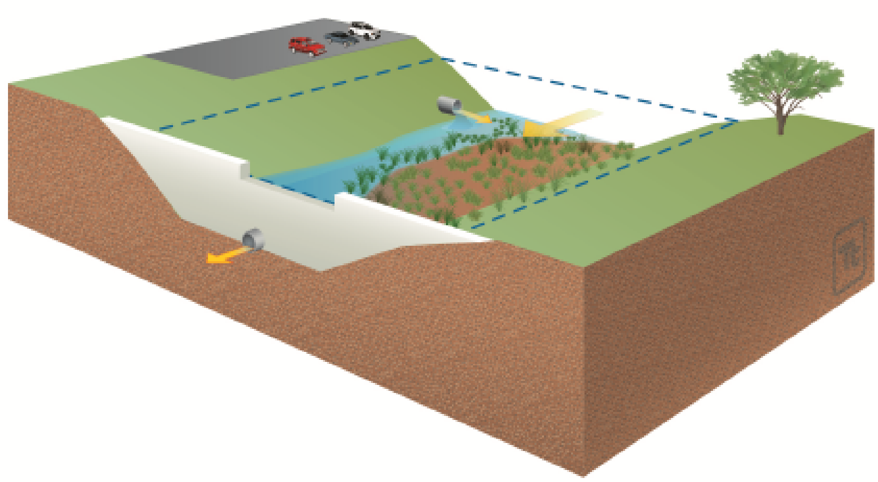
Design Variations

Several design variations include:

- ***Wetland Basins:*** basins with shallow permanent pools and a temporary shallow ponding zone. An outlet control structure typically regulates dewatering of the temporary storage volume.
- ***Flow-through/Linear Wetlands:*** wetlands that provide treatment as water passes through a long flow path. These wetlands are typically constructed parallel to existing channels such that water can be easily diverted.

Typical Design Components

Figure 3.A-3 presents a typical design and highlights potential design variations:



Typical regional constructed wetland schematic (arrows indicate water pathways).

Figure 3.A-3

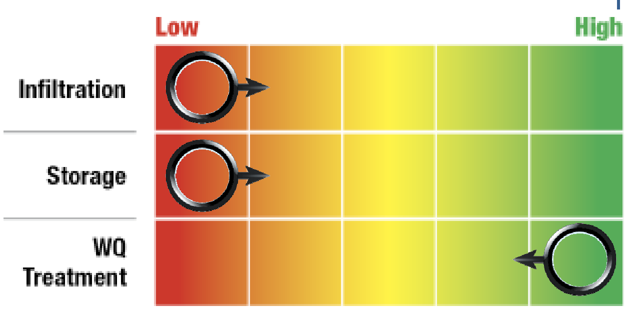
Treatment Facilities and Low Flow Diversions (Regional BMP)

Other regional water quality technology falls into the *treatment facilities* and *low flow diversions* subcategories. These systems typically divert flow from engineered channels to a treatment facility. Water is treated using physical, chemical, or radiological processes and is then returned to the original channel or discharged to the treatment plant outfall.

(source: City of Santa Monica)

and Inlet in a Storm Drain

BMP Performance Functions



Design Variations

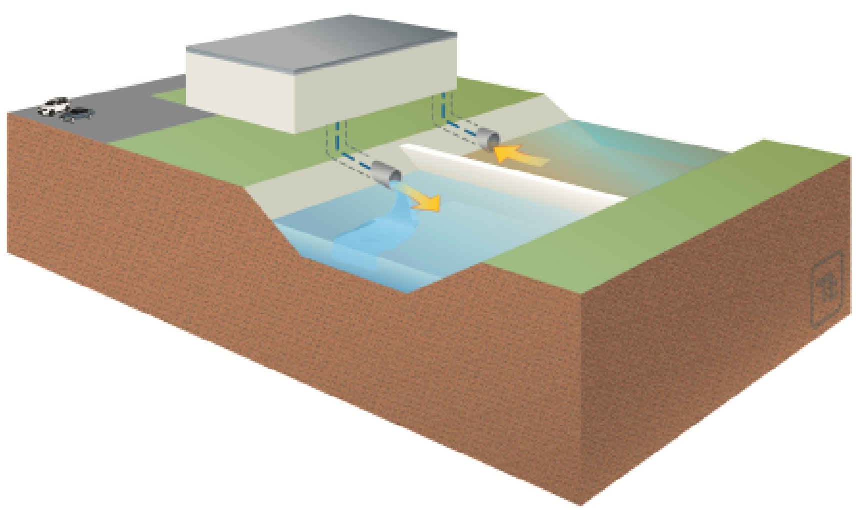
Design variations include:

Low Flow Diversion: a design flow rate (typically dry weather flow) is diverted from the storm drain to a sanitary sewer for treatment.

Treatment and Return: water is pumped or conveyed by gravity from a channel to a small-scale wastewater treatment facility where it is treated and discharged back into the original channel. Sometimes a portion of treated water can be diverted for reuse.

Typical Design Components

Figure 3.A-4 presents a typical design and highlights potential design variations:

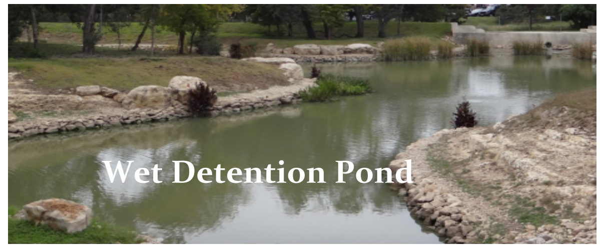


Typical regional treatment facility schematic (arrows indicate water pathways; for low flow diversions, water is simply diverted to the nearby sanitary sewer [not returned to channel]).

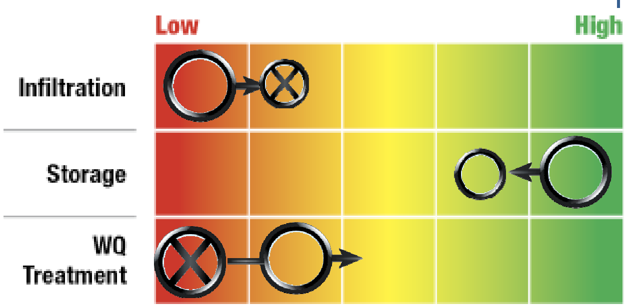
Figure 3.A-4

Site-Scale Detention (Distributed BMP)

Site-scale detention facilities are designed to detain runoff from an individual parcel and improve water quality through pollutant settling. Site-scale detention facilities can reduce peak flows and improve water quality by storing water in a basin before slowly draining the water through an orifice to the downstream waterway. Settling of sediment and sediment-bound pollutants is the primary pollutant removal mechanism.



BMP Performance Functions



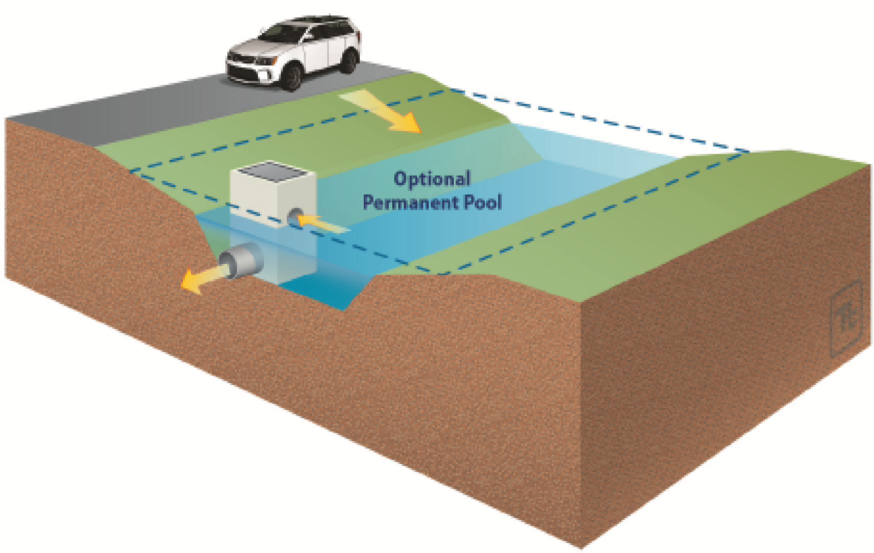
Design Variations

Several design variations include:

- ***Dry Detention Basins:*** Runoff ponds on the basin surface and fully drains between storm events. The drawdown orifice is located at the bottom of the basin.
- ***Wet Detention Pond:*** Runoff is captured in a temporary storage zone above a permanent pool. The drawdown orifice sets the depth of the permanent pool.
- ***Detention Chambers:*** Subsurface chambers or vaults designed to detain captured runoff.

Typical Design Components

Figure 3.A-5 presents a typical design and highlights potential design variations:

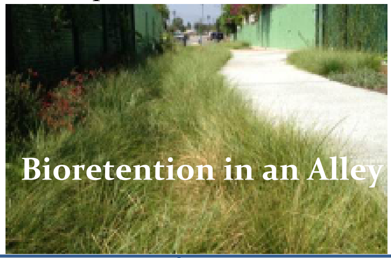


Typical distributed site-scale detention schematic (arrows indicate water pathways).

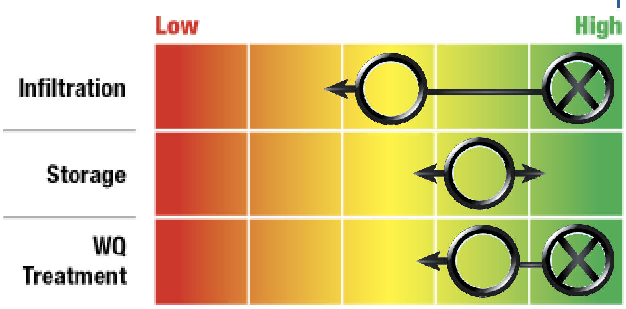
Figure 3.A-5

Bioretention and Biofiltration (Green Infrastructure BMP)

Bioretention and biofiltration are vegetated BMPs designed to capture and filter stormwater runoff through a soil layer. Following filtration, treated runoff infiltrates underlying soils (bioretention), or, if the subgrade has poor permeability, exits through an underdrain to the downstream conveyance network (biofiltration). Vegetation can enhance biological treatment processes.



BMP Performance Functions



= Bioretention = Biofiltration (unlined)

Design Variations

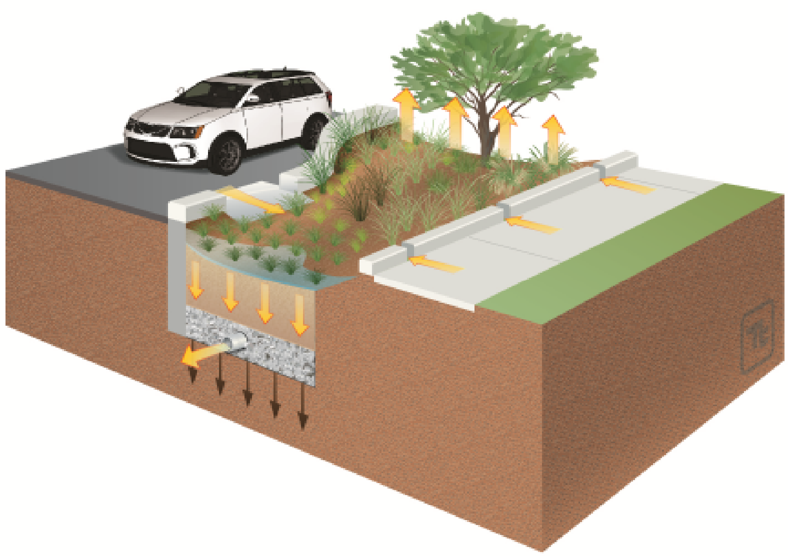
Several design variations include:

Bioretention: shallow, depressed, vegetated basins with permeable soil media. Runoff temporarily ponds on the surface before filtering through the soil. Bioretention does not include underdrains.

Biofiltration: bioretention areas with underdrains. Infiltraiton is considered incidental, although substantial infiltration can occur in some unlined systems.

Typical Design Components

Figure 3.A-6 presents a typical design and highlights potential design variations:



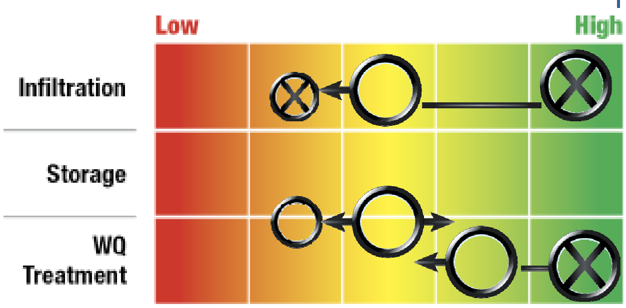
Typical distributed bioretention and biofiltration schematic showing underdrain option (arrows indicate water pathways).

Figure 3.A-6

Permeable Pavement (Green Infrastructure BMP)

Permeable pavement is a stable load-bearing surface that allows for stormwater infiltration. Beneath the permeable surface is a crushed-rock reservoir that provides structural support while allowing runoff to percolate to the underlying soils. Permeable pavement can be fully infiltrating or can have an underdrain like bioretention and biofiltration practices.

BMP Performance Functions



Design Variations

Several design variations include:

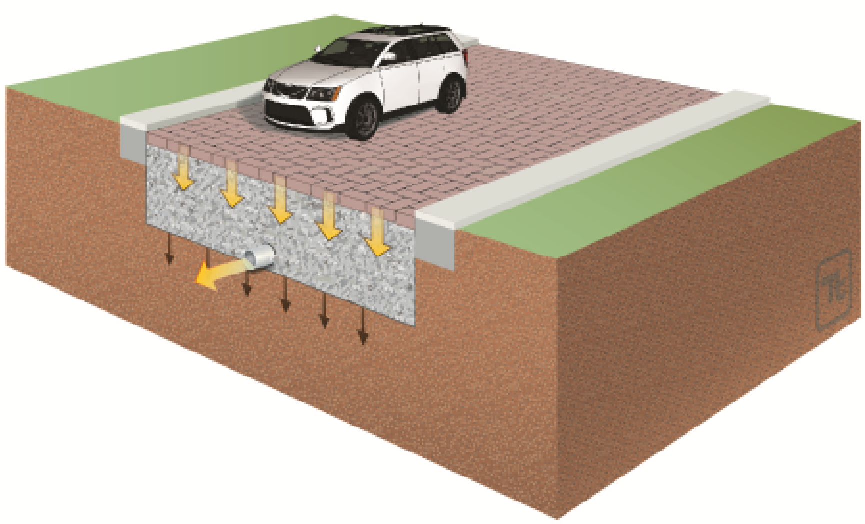
Pervious Concrete: fines are excluded from typical concrete aggregate to create permeable void space within the section.

Porous Asphalt: fines are excluded from typical hot-mix asphalt to create pores within the section.

Permeable Interlocking Concrete Pavers: Pavers that allow infiltration of rainwater through joints between the blocks

Typical Design Components

Figure 3.A-7 presents a typical design and highlights potential design variations:



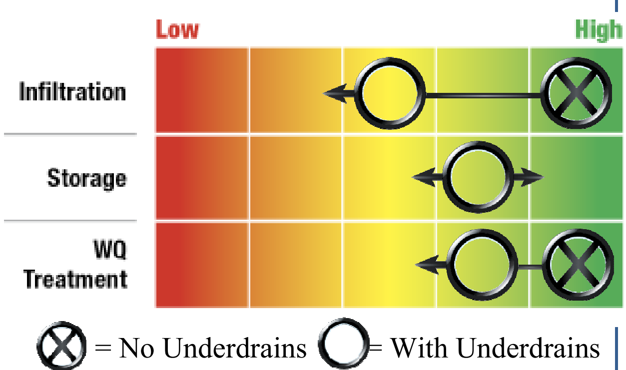
Typical distributed permeable pavement schematic showing underdrain option (arrows indicate water pathways).

Figure 3.A-7

Green Streets (Green Infrastructure BMP)

Green streets are systems of multiple BMPs arranged in a linear fashion within the street right-of-way (as opposed to a parcel-based implementation). Green streets are designed to reduce runoff and improve water quality for the runoff from the roadway and adjacent parcels. Bioretention, biofiltration, and permeable pavement BMPs are commonly used in conjunction and can be hydraulically connected using subsurface stone reservoirs.

BMP Performance Functions



Design Variations

Green streets can feature several design variations. Some common features include:

- ***Linear Bioretention/Biofiltration:*** BMPs can be incorporated as linear systems between the road and parcel to intercept runoff from both roadways and properties.
- ***CurbExtensions:*** bioretention/biofiltration BMPs "bumpouts" can intercept gutter flow.
- ***Permeable Parking Lanes:*** street parking can be designed with permeable pavement to intercept roadway runoff.

Typical Design Components

Figure 3.A.8 presents a typical design and highlights potential design variations:

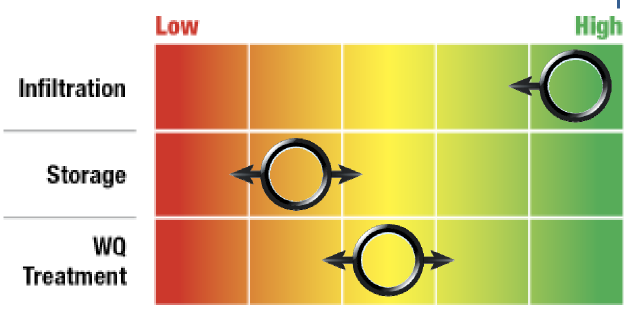
Typical distributed green street schematic (arrows indicate water pathways).

Figure 3.A-8

Infiltration BMPs (Green Infrastructure BMP)

Infiltration BMPs capture and infiltrate runoff into underlying soils. Runoff is typically stored in subsurface trenches or pits filled with engineered soil media, gravel, or concrete chambers. Some infiltration BMPs that inject water into subsurface reservoirs are considered class V injection wells and must be registered as such. Infiltration BMPs are unvegetated (see Bioretention for vegetated practices).

BMP Performance Functions



Design Variations

Several design variations include:

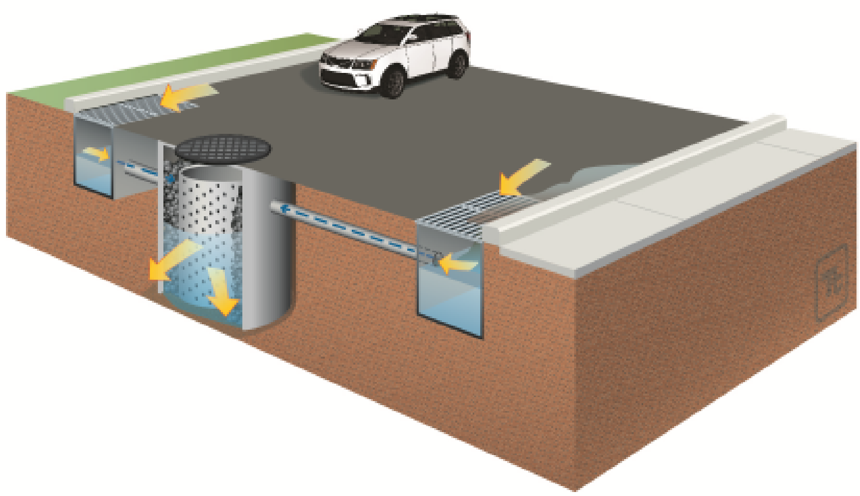
Infiltration Trench: a media-filled trench that captures runoff in the pore space of gravel or soil prior to infiltration.

Dry/Wet Well: a gravel-surrounded vault with perforated walls that receives runoff from a pipe and allows direct infiltration into the ground.

Rock Well: a gravel-filled pit that receives runoff from a pipe. This BMP is essentially a dry well without a concrete vault.

Typical Design Components

Figure 3.A-9 below presents a typical design and highlights potential design variations:



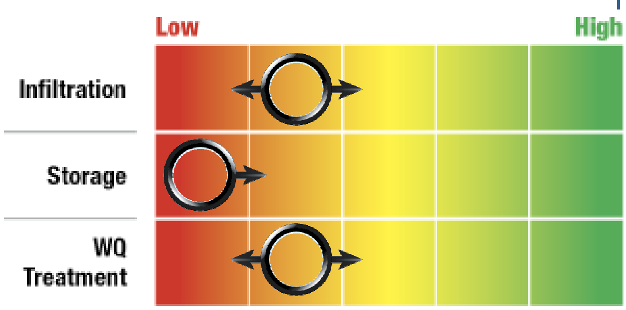
Typical distributed infiltration BMP schematic showing perforated concrete dry well variation (arrows indicate water pathways; for infiltration trenches, see Error! Reference source not found. **and omit vegetation).**

Figure 3.A-9

Bioswales (Green Infrastructure BMP)

Bioswales are practices that convey uniform sheet flow through vegetated, shallow depressions to remove sediment-associated pollutants by settling and straining. Infiltration and filtration through soil media are not key components of bioswales; rather, bioswales are typically implemented to act as pretreatment and used to transport runoff to an associated structural BMP.

BMP Performance Functions



Design Variations

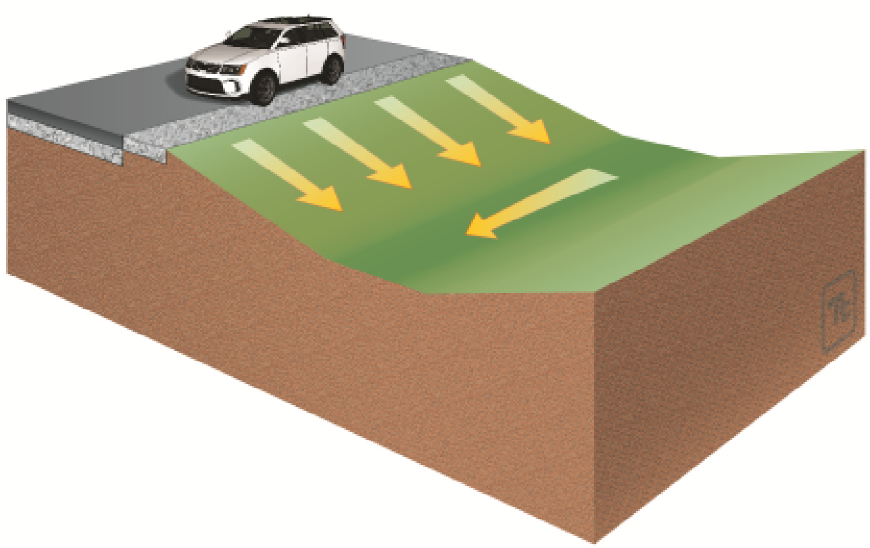
Several design variations include:

Vegetated Swale: linear, vegetated channels used to convey concentrated flow from the contributing area to a structural BMP. Check dams can be added in areas of steep slopes or to further decrease the flow rates and spread the runoff over a larger area.

Vegetative Filter Strip: broad-sloped, vegetated areas used to convey sheet flow from the contributing area to a structural BMP or other conveyance channel.

Typical Design Components

Figure 3.A-10 presents a typical design and highlights potential design variations:



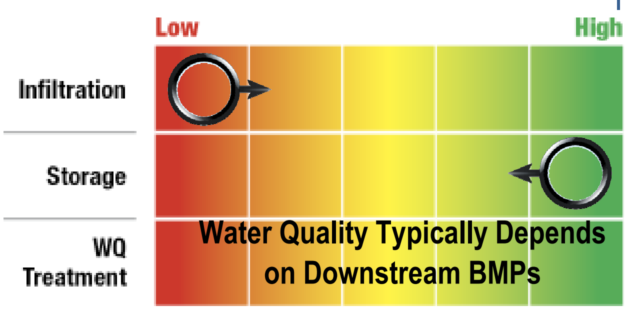
Typical distributed bioswale schematic (arrows indicate water pathways).

Figure 3.A-10

Rainfall Harvest (Green Infrastructure BMP)

The primary goal for rainfall harvest is improving water quality by intercepting rooftop runoff and lowering the overall impervious impact of a developed site. Runoff can be reduced through interception and evapotranspiration on green roofs or used for alternative uses with a cistern or rain barrel.

BMP Performance Functions



Design Variations

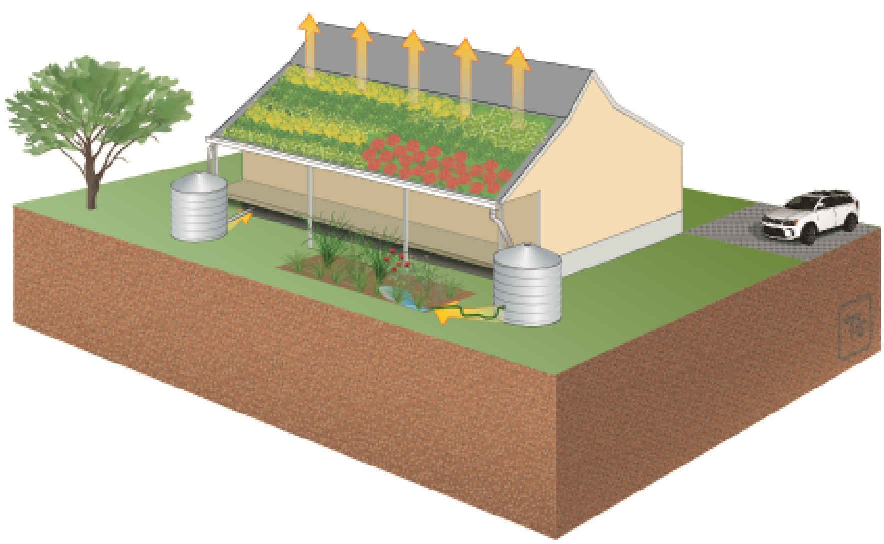
Several design variations include:

Green Roof: engineered, vegetated roof structures intended to intercept rainfall in a growing medium. Rooftop detention can be incorporated if structures allow.

Cisterns and Rain Barrels: storage tanks used to intercept and store rooftop runoff. Captured runoff can be reused to offset non-potable water uses such as irrigation and toilet flushing. Alternatively, stored water can be slowly released to a pervious surface.

Typical Design Components

Figure 3.A-11 presents a typical design and highlights potential design variations:



Typical distributed rainfall harvest schematic (arrows indicate water pathways).

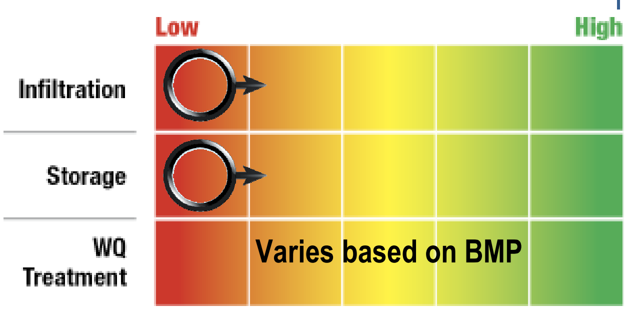
Figure 3.A-11

Flow-Through Treatment BMP (Distributed BMP)

Manufactured flow-through devices are commercial products that aim to provide stormwater treatment using patented, innovative technologies. Typical types of manufactured devices for stormwater management include cartridge filters, media filters, and high-flow biotreatment devices.

photo source: Jonathan Page, NCSU-B

BMP Performance Functions



Design Variations

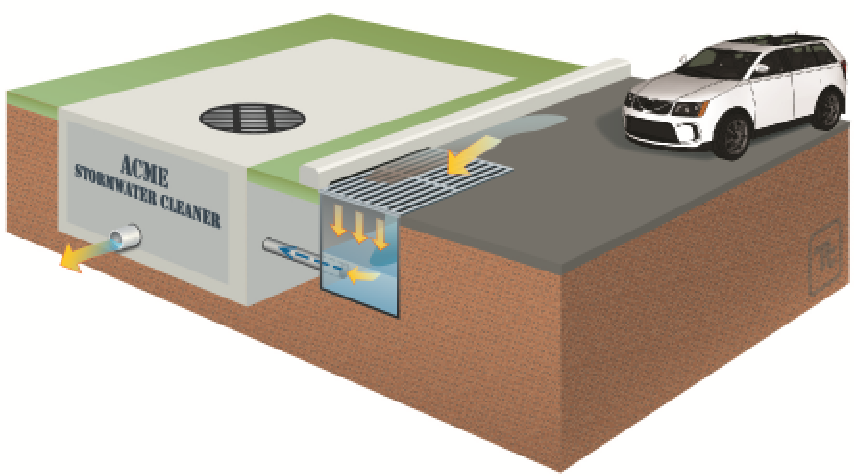
Several design variations include:

Media/Cartridge Filters: proprietary filtration devices used to remove pollutants.

High-Flow Biotreatment Device: modular, vault-type practices containing high-flow media. Typically incorporate vegetation.

Typical Design Components

Figure 3.A-12 presents a typical design and highlights potential design variations:



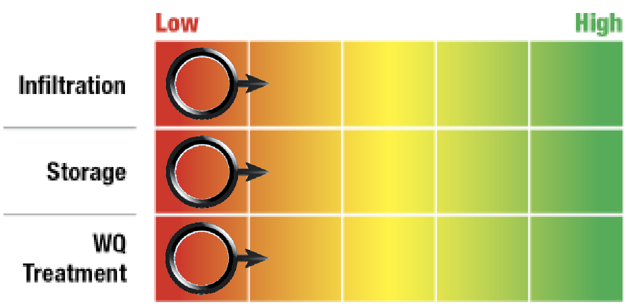
Typical distributed flow-through treatment BMP schematic (arrows indicate water pathways).

Figure 3.A-12

Source Control Structural BMPs (Distributed BMP)

Source control structural BMPs are commercial products designed to treat runoff in highly urbanized environments. Mechanical separation, or more complex physicochemical processes, provides separation of gross solids and other pollutants. Many models feature media or materials designed to sequester hydrocarbons and other pollutants.

BMP Performance Functions



Design Variations

Several design variations include:

- ***Hydrodynamic Separators:*** mechanical devices that use screens, baffles, and/or vortical flow to separate sediment and gross solids.
- ***Catch Basin Inserts:*** inserts that use nets, screens, fabric, and/or filtration media to gross solids, fine sediments, oils, and/or grease from runoff entering a catch basin.

Typical Design Components

Figure 3.A-13 presents a typical design and highlights potential design variations:

Typical distributed source control structural BMP (arrows indicate water pathways).

Figure 3.A-13

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Appendix 3.B
Existing and Planned Regional BMP's in the Ballona Creek WMA

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Ballona Creek EWMP- Preliminary List Project List

Low-Flow Treatment Facilities (Non-storm water)

Project Name	Drainage Area	Proposed BMPs	Council District/City	Project Status	Project Origin
North Outfall Treatment Facility	53,300 acres	Diversion, treatment & return to Ballona Creek	Culver City	Concept design. $2.5 M grant conditionally awarded	TMDL IP
~~Sepulveda Channel Daylighting~~	~~14,500 acres~~	~~Diversion, treatment & return to Sepulveda Channel (with Oval Street Parkway Retrofit)~~	~~CD 11~~	Scope of project has changed. See the next row	TMDL IP
Sepulveda Channel Low Flow Treatment Facility	14,500 acres	Diversion, treatment & return to Sepulveda Channel	CD 11	Concept Design Report	Replacement
~~Oval Streets Parkway Retrofit~~	~~100 acres~~	~~Infiltration and bioswales in parkways~~	~~CD 11~~	Project has been replaced	TMDL IP
National Blvd LFTF	~26,000 acres	Diversion, treatment, & return to Ballona Creek	Culver City	Concept Design Report	Bacti TSO
Westwood Neighborhood Greenway	2,400 acres	Diversion, treatment and return to County Drain (12x12 box channel)	CD 5	Concept Design Report	TMDL IP
Centinela Creek LFD	6,200 acres	Divert dry-weather flow to Hyperion	Culver City	Concept Design (?)	Culver City

Regional Projects (stormwater)

Project Name	Drainage Area	Proposed BMPs	Council District/City	Project Status	Project Origin
Centinela Park (Edward Vincent Park)	736 acres	Sub-Surface Flow Wetland	Inglewood	Early planning level	Stakeholder
La Cienega Park	374 acres	Sub-Surface Detention Basin	Beverly Hills	No progress	TMDL IP
Harvard Recreation Center	235 acres	Sub-Surface Detention Basin	CD 8	Draft concept report completed	TMDL IP
Rancho Cienega Sports Center	162 acres	Subsurface Detention Basin	CD 10	Concept design report.	TMDL IP
MacArthur Park	55 acres	Bio-retention Basin	CD 1	Draft concept report completed	TMDL IP
~~San Pedro Street & Vicinity~~	~~99 acres~~	~~Sub-Surface Detention Basin~~	~~CD 9~~	~~Project on hold. LAUSD Property~~	TMDL IP
Lemon Grove Recreational Center	63 acres	Extended Detention Basin	CD 13	No progress	TMDL IP
Van Ness Recreation Center	36 acres	Stormwater Drywell Infiltration System	CD 8	Draft concept report completed	TMDL IP
Vermont Square Park	41 acres	Infiltration wells, SS inf. Basins, curb modifications	CD 9	Draft concept in progress	Replacement
Vermont Ave Greenway	5 to 50 acres	Bio and infiltration swales	CD 10	Concept Design Report	Replacement
Mar Vista Rec Center Stormwater BMP Phase I & II	250 acres	subsurface detention and disinfection	CD 11	Completed	Prop O
Westside Park Rain Water Harvesting	~ 3,700 acres	Subsurface infiltration basin	CD 10	Completed	Prop O

Ballona Creek EWMP- Preliminary List Project List

Distributed Projects (stormwater)				
Project Name	**Drainage Area**	**Proposed BMPs**	**Council District/City**	**Project Status**
Baldwin to Ballona Trail: Jefferson Blvd & Fairfax Ave	28 acres	Vegetated swales, bioretention in parkways, permeable pavement	Culver City	Proposed in I-Plan
Ballona Greenway: Berryman Ave at Ballona Creek	23 acres	Vegetated swales, bioretention in parkways	CD 10	Proposed in I-Plan
Ballona Greenway: Milton Street at Ballona Creek	28 acres	Vegetated swales, bioretention in parkways, permeable pavement	CD 10	Proposed in I-Plan
Ballona Greenway: Washington Blvd at Ballona Creek	19 acres	Vegetated swales, bioretention in parkways	CD 10	Proposed in I-Plan
Ballona Greenway: Hauser Blvd at Ballona Creek	33 acres	Bioretention in parkways, green street medians	CD 10	Proposed in I-Plan
Occidental Blvd & 2nd St	31 acres	Bioretention in parkways	CD 13	Proposed in I-Plan
405 Fwy & Wilshire Blvd	18 acres	Vegetated swales, bioretention facilities	LA County/ Caltrans	Proposed in I-Plan
Ballona Greenway: Cochran to Fairfax	11 acres	Vegetated swales, bioretention in parkways, green street medians	CD 10	Proposed in I-Plan
Ballona Greenway: Fairfax Ave & Apple St	21 acres	Vegetated swales, bioretention in parkways, permeable pavement	CD 10	Proposed in I-Plan
Ballona Greenway: Fairfax Ave & 10 Fwy	52 acres	Permeable pavement, bioretention facilities	CD 10	Proposed in I-Plan
Ballona Greenway: Jefferson Blvd at Ballona Creek	38 acres	Bio-retention in parkways, permeable pavement, green street medians	Culver City	Proposed in I-Plan
Baldwin to Ballona Trail: Rodeo Rd & Jefferson Blvd	30 acres	Vegetated swales, bioretention in parkways, permeable pavement, green street medians	CD 10	Proposed in I-Plan
Ballona Greenway: Duquesne Ave at Ballona Creek	7 acres	Vegetated swales, bioretention in parkways, permeable pavement	Culver City	Proposed in I-Plan
Martin Luther King Jr. Dr. & Crenshaw Blvd	30 acres	Vegetated swales, permeable pavement, cisterns	CD 8	Proposed in I-Plan
Ballona Greenway: Ballona Creek near Sepulveda Blvd	37 acres	Vegetated swales, bioretention in parkways, permeable pavement	Culver City	Proposed in I-Plan
~~Mar Vista Oval St & Venice Blvd~~	~~28 acres~~	~~Bioretention in parkways~~	~~CD 11~~	~~Proposed in I-Plan~~
Ballona Greenway: Lindberg Park at Ballona Creek	32 acres	Bioretention in parkways, permeable pavement	Culver City	Proposed in I-Plan
405 Fwy & Sunset Blvd	34 acres	Vegetated swales, bioretention facilities	LA County/ Caltrans	Proposed in I-Plan
Venice Blvd: Wade St to Walgrove Ave	22 acres	Bioretention facilities	CD 11	Proposed in I-Plan
S Vermont Ave & W Pico Blvd	7 acres	Bioretention in parkways, permeable pavement	CD 1	Proposed in I-Plan
N Fairfax Ave & Rosewood Ave	36 acres	Bioretention in parkways, permeable pavement	CD 5	Proposed in I-Plan
~~S San Pedro St & E 30th St~~	~~17 acres~~	~~Bioretention in parkways , permeable pavement~~	~~CD 9~~	~~Proposed in I-Plan~~
110 Fwy & W 30th St	26 acres	Bioretention in parkways, permeable pavement, cisterns	CD 9	Proposed in I-Plan

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S Western Ave & Exposition Blvd	20 acres	Permeable pavement, cisterns	CD 8	Proposed in I-Plan
W Jefferson Blvd & Rodeo Dr	35 acres	Vegetated swales	Culver City/ Los Angeles	Proposed in I-Plan
W Beach Ave & W Hazel St	37 acres	Permeable pavement, bioretention facilities	City of Inglewood	Proposed in I-Plan
S La Cienega Blvd: W 58th Pl to W Fairview Blvd	32 acres	Bioretention facilities	LA County/ City of Inglewood	Proposed in I-Plan
St. Andrews Park	18 acres	Subsurface infiltration basin	CD 13	Draft concept
University Park Neighborhood Raingardens	~10 acres	Parkway swales and rain gardens	CD 9	Concept Report
Milton Street Park and Green Street	~ 2 acres	Parkway swales and rain gardens	Culver City	Completed
Del Rey Lagoon WQ Improvement	25 acres	bioswales, irrigation retrofit, and stormdrains	CD 11	Concept Report

LEGEND: [green] Projects added after submittal of the I Plan(s).

Appendix 3.C
Supporting Information for BMP Performance Analysis

A statistical analysis of available BMP performance data relevant to southern California was completed to review and summarize data regarding performance of BMPs for reducing constituents of concern from stormwater and non-stormwater flows. The following sections provide an overview of the data sources, description of statistical methods, and summary of the results of the statistical analysis.

Data Sources for BMP Performance Data

Data for the BMP performance analysis were derived from the IBD, the most extensive effort to collect and distribute BMP performance data in the US. The IBD is sponsored by USEPA, WERF, the American Society of Civil Engineers (ASCE)/Environmental and Water Resources Institute (EWRI), the American Public Works Association (APWA), and the Federal Highway Administration (FHWA). The stated purpose of the project is "to provide scientifically sound information to improve the design, selection and performance of BMPs."

The currently (Nov 2013) available sites with monitoring data in Southern California are displayed in Figure 1. There are 44 sites that have data within the mapped area and the sites have a total of 58 BMPs that were sampled. Each of these BMPs in the IBD was mapped to the categories and subcategories established in Section 3 (see Table 3-1). Many of the BMPs, particularly bioswales, are owned and operated by Caltrans and therefore implemented on roadways, maintenance stations, and park and ride facilities.

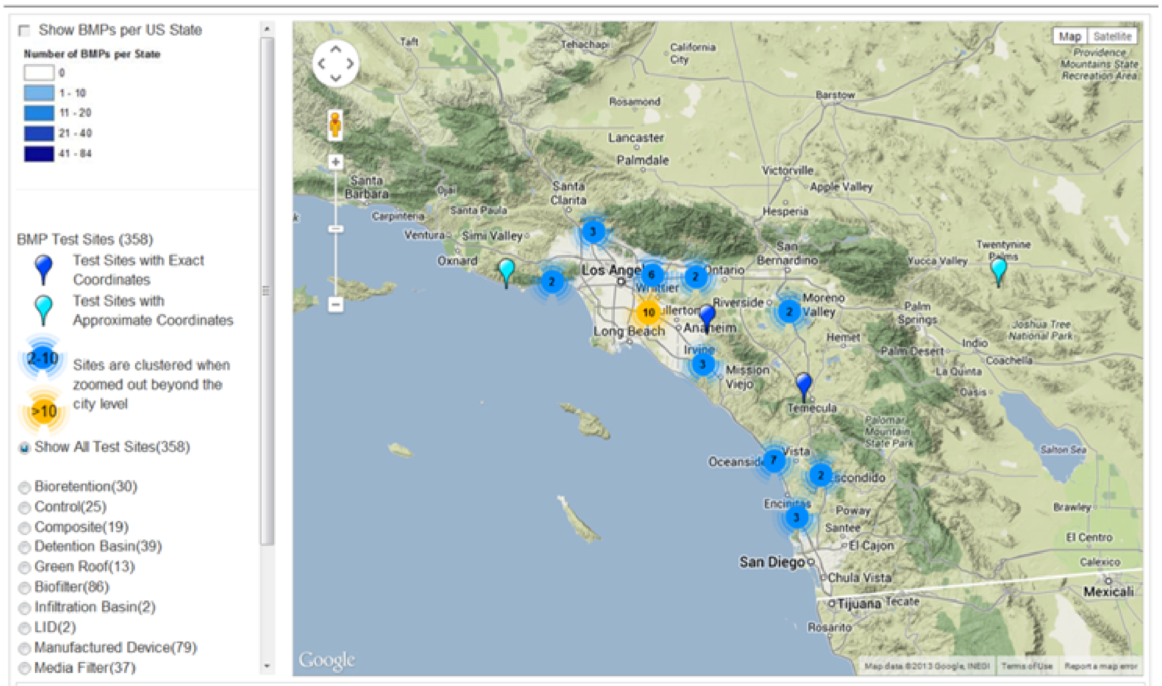

Figure 1 Southern California BMPs from the International BMP Database (www.bmpdatabase.org)

Description of Analyzed Data

Analysis of BMP data in the International BMP database collected from Southern California provides a cross-section of structural BMP results and constituents. The following provides an overview of the data characteristics:

- **BMP types**: The BMPs in the IBD were categorized according to those defined in Section 2, after review of the BMP design details. Five of the BMP subcategories were represented in the IBD for the Southern California region, including the following:
  - Constructed wetlands
  - Site-scale detention
  - Bioswales
  - Flow through Treatment BMPs
  - Catch basin inserts
- **Constituents:** The IBD contains sample data for hundreds of constituents ranging from metals to pesticides. This analysis herein emphasized a subset of constituents referred to herein as "common constituents of concern", as follows:
  - Total suspended solids (TSS)
  - Fecal coliform
  - Total copper
  - Total lead, and
  - Total zinc

  Beyond these five constituents, the database was screened for additional constituents with sufficient data to perform analysis and results. Based on this screening, an additional 18 constituents were identified, for a total of 22 constituents. To assist with organization and presentation of the results, each of the 22 constituents was categorized into four groups as follows (shown in Table 1):
  - Metals
  - Bacteria
  - Solids, and
  - Nutrients.
- **Land uses**: A majority of the BMPs are located primarily for transportation related sites. Other major land use categories such as residential, commercial, and industrial are not heavily represented in the analysis herein. However, the effluent concentrations and performance metrics are still generally considered applicable to non-transportation land uses. Many bioswales were

included in the analysis, which allowed for grouping of bioswales into three categories: “all”, “Caltrans”, and “Non-Caltrans.”

- **Monitoring methods:** The majority of the data from the IBD are based on flow-weighted composite (FWC) samples which is the generally preferred practice. FWC samples provide a better measurement of the total load from a storm event and most accurately portray the removal efficiency of BMPs. These types of samples can be used to generate good event mean concentrations (EMCs) that can be used to calibrate water quality models. The analysis herein emphasizes reduction in concentrations of constituents. Flow reduction is heavily site- and storm-specific (depended on rainfall intensity, soil types, antecedent conditions, etc.) and can be predicted through other means (e.g., modeling during the RAA).

Statistical Analysis

The statistical analysis herein is primary based on three metrics:

- Tabular summary statistics of inflow and outflow from BMPs (mean, median, percentiles, etc.)
- Graphical presentation of the inflow and outflow using box plots

It is acknowledged that “percent reduction” is a BMP performance metric that deserves caveats (see the article “Voodoo Hydrology” in the July 2006 article of Stormwater Magazine, http://www.stormh2o.com/SW/Articles/Voodoo_Hydrology_37.aspx). Percent reduction is a readily-understandable BMP performance metric, and it also convenient for reporting a compact form. However, BMP performance is ultimately characterized by both the reduction of pollutants from inflow to outflow and the concentration of constituents in the outflow. For this analysis, percent reduction is presented as a simple metric to compare different BMPs across different storm and land use conditions. In addition, inflow and outflow datasets were analyzed separately, in order to characterize the quality of BMP outfalls and allow for future comparison to permit limitations.

An emphasis of the analysis herein was handling of non-detected samples. The approach to handling non-detects can greatly affect estimated summary statistics. For the BMP performance analysis herein, statistical analyses of measured concentrations were based on regression-on-order statistics (ROS). The primary advantage/purpose of the ROS approach is to account for sample limits of detection (SLODs) in samples that were non-detect (referred to as “censored”). An Excel add-in developed by Caltrans was used to generate ROS, for which the primary references for the statistical procedures are Shumway and Azari (2000) and Helsel (1990).

Results

The analysis performed under this task produced thousands of statistical measures that can be used to evaluate BMPs. These results will support the RAA, by supporting assumptions regarding effluent concentrations from some BMPs. The results are presented in formats that are designed to allow readers to focus on both absolute (inflow and outflow concentrations) and relative performance of BMPs (percent reductions) for individual constituents and groups of constituents. As mentioned previously, extensive appendices were generated and are available for web download. The results of the analysis are presented as follows:

- **Percent removal**: the results in Table 1 provide mean and median removal percentages for the BMPs and for each of the 22 POCs analyzed. The table can be used to evaluate relative performance across constituent and BMP categories.

Table 1 Mean Percent Removal from Inflow to Outflow for Pollutants and BMP Categories

Constituent Group	Pollutant	BioSwale (All)	BioSwale (Caltrans)	BioSwale (Non-Caltrans)	Constructed Wetland	Flow Through Treatment BMP	Site Scale Detention
		% Change, Mean	% Change, Mean	% Change, Mean	% Change, Mean	% Change, Mean	% Change, Mean
Metals	Total Arsenic	-51.1%	21.2%	-70.9%	**-64.2%**	-11.6%	-19.6%
	Total Cadmium	-51.2%	-16.0%	-68.1%	**-74.5%**	1.2%	**-53.7%**
	Total Chromium	-24.9%	-21.1%	-27.4%	**-81.5%**	**-35.1%**	-60.7%
	Total Copper	-69.0%	-59.2%	-70.4%	-98.0%	-55.0%	**-51.8%**
	Total Iron	-57.3%	-48.6%	---	---	---	---
	Total Lead	-75.5%	-69.9%	-76.1%	-98.1%	**-63.7%**	**-66.2%**
	Total Nickel	-59.0%	-41.2%	-69.5%	-48.1%	-21.0%	-62.5%
	Total Zinc	-74.1%	-71.5%	-71.4%	**-84.5%**	**-62.4%**	**-69.0%**
Bacteria	Fecal Coliform	-13.7%	---	-13.7%	-94.5%	-26.4%	99.1%
	Total Coliform	---	---	---	-0.2%	**-99.9%**	---
Solids	Total Suspended Solids	-50.5%	-24.2%	-61.4%	**-94.6%**	**-65.0%**	**-62.8%**
	Total Dissolved Solids	-3.7%	17.6%	-17.4%	**1169%**	12.1%	-0.3%
	Turbidity	-62.7%	-62.7%	---	---	---	---
Nutrients	Kjeldahl Nitrogen (TKN)	-18.5%	29.0%	-31.7%	-22.9%	-24.2%	-14.9%
	Nitrogen, Ammonia as N	15.9%	40.9%	---	-61.9%	28.4%	---
	Nitrogen, Nitrate (NO3) as N	-12.1%	13.8%	-22.5%	-66.9%	24.1%	-13.9%
	Nitrogen, Nitrite (NO2) as N	89.0%	89.0%	---	**-100%**	---	---
	Nitrogen, Unionized Ammonia (NH3) as N	---	---	---	---	**-56.1%**	---
	Organic Carbon, Dissolved	-11.0%	17.7%	-28.3%	-32.5%	-1.4%	6.9%
	Organic Carbon, Total	-13.2%	15.3%	-29.7%	-23.9%	-4.8%	0.7%
	Phosphorus as P, Dissolved	263%	---	263%	187%	-7.1%	-3.2%
	Phosphorus as P, Total	125%	219%	92.9%	-19.3%	**-34.1%**	**-35.6%**
	Phosphorus, Orthophosphate as P	369%	531%	59.1%	---	---	---

Notes

1: Bolded, orange values indicate statistically different inflow and outflow concentrations based on 95% confidence intervals.

2: If insufficient data were available to calculate the % removal, then --- is shown.

3: Catch basin inserts are not shown because effluent data were insufficient.

- **Inflow and outfall concentrations for common POCs**: Shown in Tables 2 thru 6 are comparisons of standard statistics for the five available BMP categories across each of the common POCs. The corresponding box plots in Figures 2 thru 6 graphically represent the range of inflow versus outflow performance for the BMP categories.

The presented box plots include whiskers that span from the 10th to 90th percentiles and display outliers, defined as values that are more than 1.5 times the inner quartile range beyond the median. These outliers are included in all the generated summary statistics. This approach is consistent with technical memorandums on the IBD website.

Table 2 Inflow/Outflow Summary Statistics for TSS (mg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	69	75	23	100	38	169	59
Bioswales	31	31	159	103	45.0	18.0	76.0	31.0	130	54
Catch Basin Inserts	0	6	---	88	---	20	---	37.5	---	71
Flow Through Treatment BMPs	13	13	230	218	8.875	2.875	39.5	7.00	89.25	22.25
Constructed Wetlands	1	1	13	14	140	3.50	230	11.0	255	13.5

Table 3 Inflow/Outflow Summary Statistics for Fecal Coliform (#/100mL)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	9	9	34	30	300	475	600	850	1700	3075
Bioswales	8	8	33	19	500	130	5000	900	16500	5000
Catch Basin Inserts	0	6	---	---	---	---	---	---	---	---
Flow Through Treatment BMPs	11	11	172	152	300	7.47	900	77.1	3000	797
Constructed Wetlands	2	2	13	14	230	20.0	1300	95.0	3800	255

Table 4 Inflow/Outflow Summary Statistics for Copper (µg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	68	26.25	15.00	39.45	20.50	63.75	28.00
Bioswales	31	31	150	100	22.00	8.23	41.00	13.00	70.50	19.90
Catch Basin Inserts	0	6	---	88	---	5.95	---	13	---	22
Flow Through Treatment BMPs	11	11	150	146	11.98	6.20	18.00	11.00	33.00	21.25
Constructed Wetlands	2	2	21	22	11.15	5.55	62.00	8.80	110.00	14.75

Table 5 Inflow/Outflow Summary Statistics for Lead (µg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	69	34.40	13.00	54.00	22.00	108.25	36.50
Bioswales	31	31	150	100	13.92	3.53	32.89	7.55	77.75	21.50
Catch Basin Inserts	0	6	---	88	---	2.3	---	6	---	12.45
Flow Through Treatment BMPs	11	11	149	146	6.50	1.00	13.00	3.10	25.50	7.10
Constructed Wetlands	2	2	21	22	3.32	2.70	170.00	4.40	315.00	8.32

Table 6 Inflow/Outflow Summary Statistics for Zinc (µg/l)

BMP Category	Number of BMP Sampling Locations		Number of Samples Analyzed		25th Percentile		Median (50th Percentile)		75th Percentile	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Site Scale Detention	5	5	76	68	152.75	68.25	280.00	99.00	504.75	150.00
Bioswales	31	31	150	100	110	29.5	228	55.5	360	82.5
Catch Basin Inserts	0	6	---	88	---	50.5	---	107	---	220
Flow Through Treatment BMPs	11	11	150	146	110	23.00	221	55.5	400	131
Constructed Wetlands	2	2	21	22	109.00	28.53	270.00	39.00	450.00	84.35

Discussion and Observations regarding BMP Performance

The statistical analysis presented herein has many applications, including supporting the RAA for the EWMP. As future applications are undertaken, the results can be analyzed in more detail. For this Work Plan, several general observations are highlighted, as follows:

- **Comparison of outflow quality among BMPs**: the constructed wetland (n = 2) and flow through treatment BMPs (n = 31) generally exhibited the highest quality effluent. Reductions of TSS were generally higher compared to other BMPs and concentrations of TSS in outflows were generally lower (see Table 2-5 and Figure 2-16). Elevated performance is also apparent for other constituents. The constructed wetlands exhibited exceptional reductions (>84 percent) of total copper, lead, and zinc. Constituents were likely reduced in the constructed wetlands by means of sedimentation, chemical and biological conversions, and uptake. The flow through treatment BMPs in the dataset were mostly Caltrans BMPs including media filters and proprietary cartridge filters with a range of sand/peat and sand/gravel mixes.

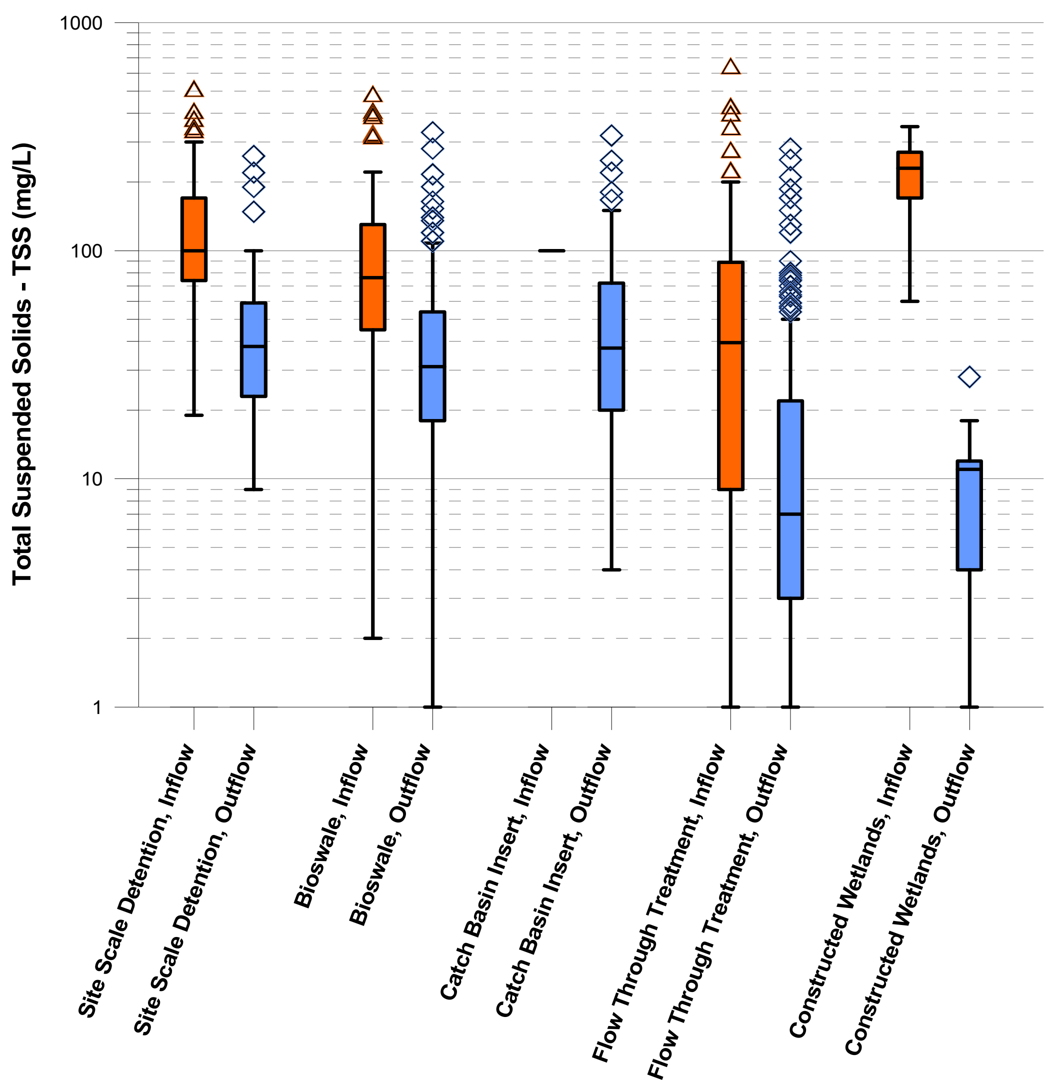

Figure 2 Box Plots of Inflow/Outflow TSS Concentrations in Southern California

- **BMP performance for individual constituents**: among the constituents analyzed, the percent removals were often the highest for total metals, especially lead and zinc (Tables 2-8 and 2-9). The poorest performance was often for nutrients, with phosphorous concentrations increasing in some cases (likely due to leaching). For bacteria, only the constructed wetlands and flow through treatment BMPs were able to generate outflows with median fecal coliform concentrations less than 235 most probable number (MPN) per 100mL (which is an applicable Permit limitation if fecal coliform is assumed equivalent to *Escherichia coli* [*E. coli*]) (see Table 3 and Figure 3).

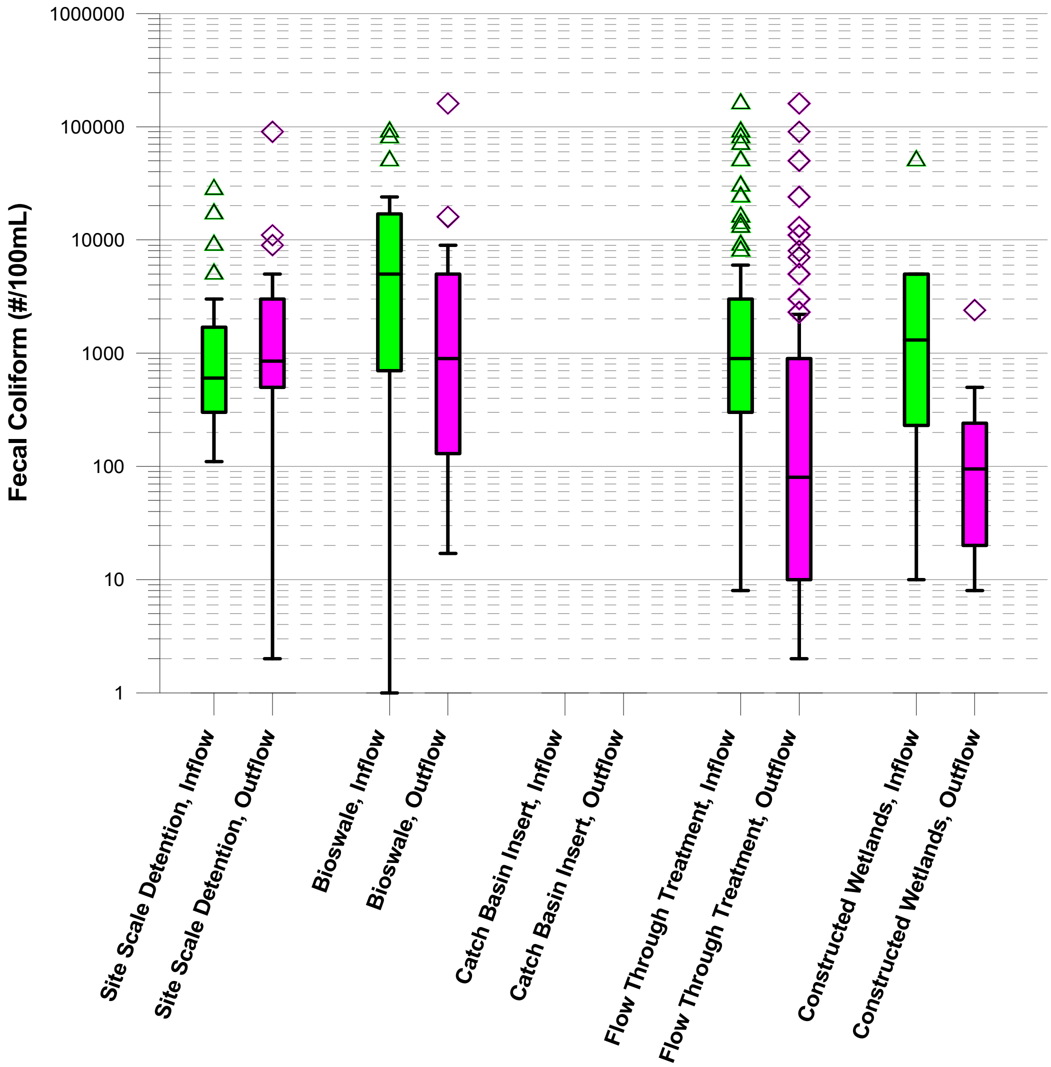

Figure 3 Box Plots of Inflow/Outflow Fecal Coliform Concentrations in Southern California

- **Application of the data herein for the RAA effort**: in general, the majority of pollutant removal associated with potential stormwater BMPs in the RAA will be due to volume reduction (infiltration). The WMMS, which will be used for the RAA in the Ballona Creek EWMP, is process-based and thus is able to estimate volume reduction and the proportion of inflow that is infiltrated, treated, and overflowed. Because the model is dynamic, these proportions change from storm to storm (*i.e.*, overflows are less frequent during small storms than large storms). For the subset of planned BMPs with a treatment component, some assumptions will be needed regarding the quality of treated and discharged outflow (*e.g.*, biofiltration BMPs, which have an underdrain). The analysis herein will support those assumptions. It is noted that only a subset of the potential

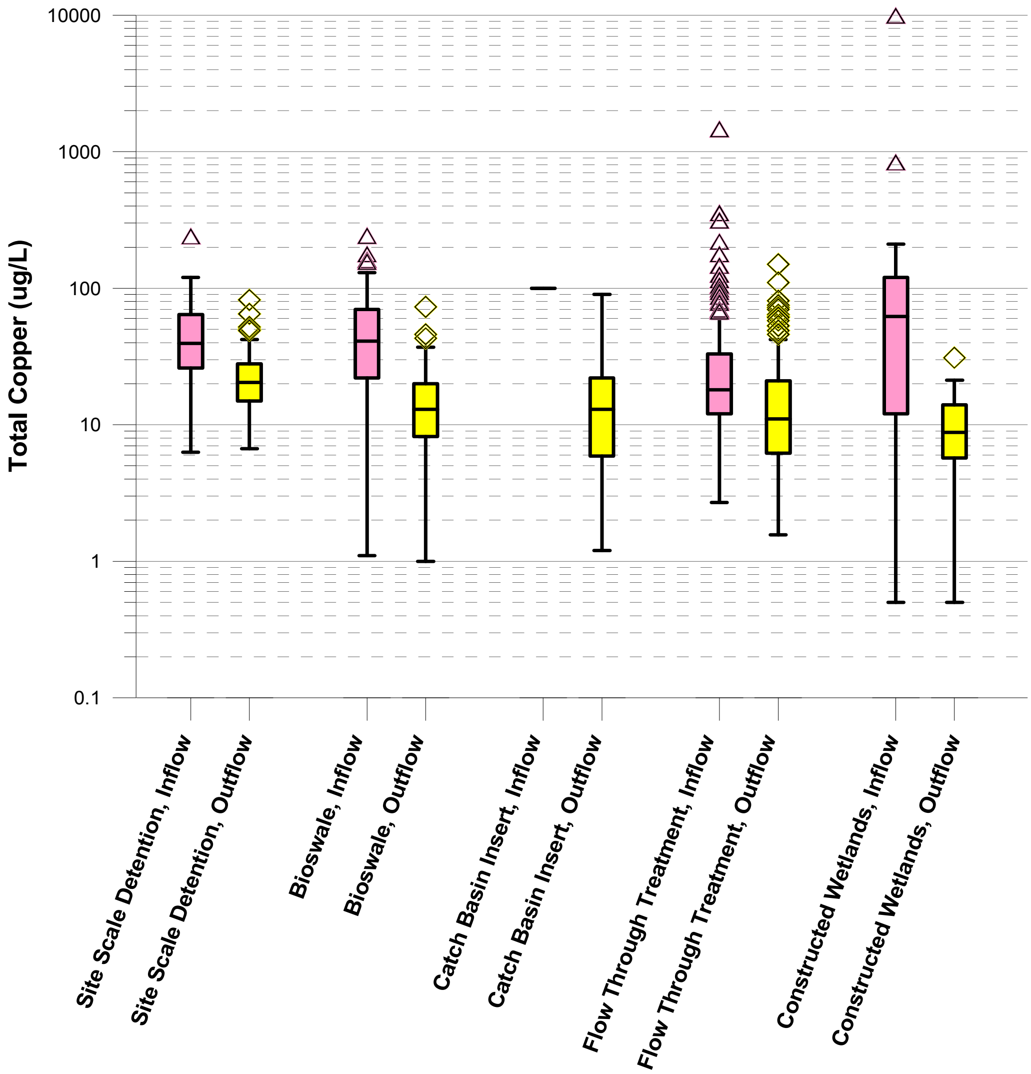

Figure 4 Box Plots of Inflow/Outflow Copper Concentrations in Southern California

- BMP categories (defined in Section 2) had sufficient data for data analysis. As such, an important consideration will be whether BMP performance statistics of the BMPs analyzed herein are relevant to some of the other BMPs that may be included in the RAA (but were not analyzed herein). For example, because biofiltration is vegetated filtration, it is reasonable to assume the performance data for the flow through treatment (filtration) BMPs (and perhaps constructed wetlands) are applicable to biofiltration. The specific approach for applying the statistics herein for estimating concentrations of constituents in underdrain outflows (if necessary) will be determined during the RAA effort.

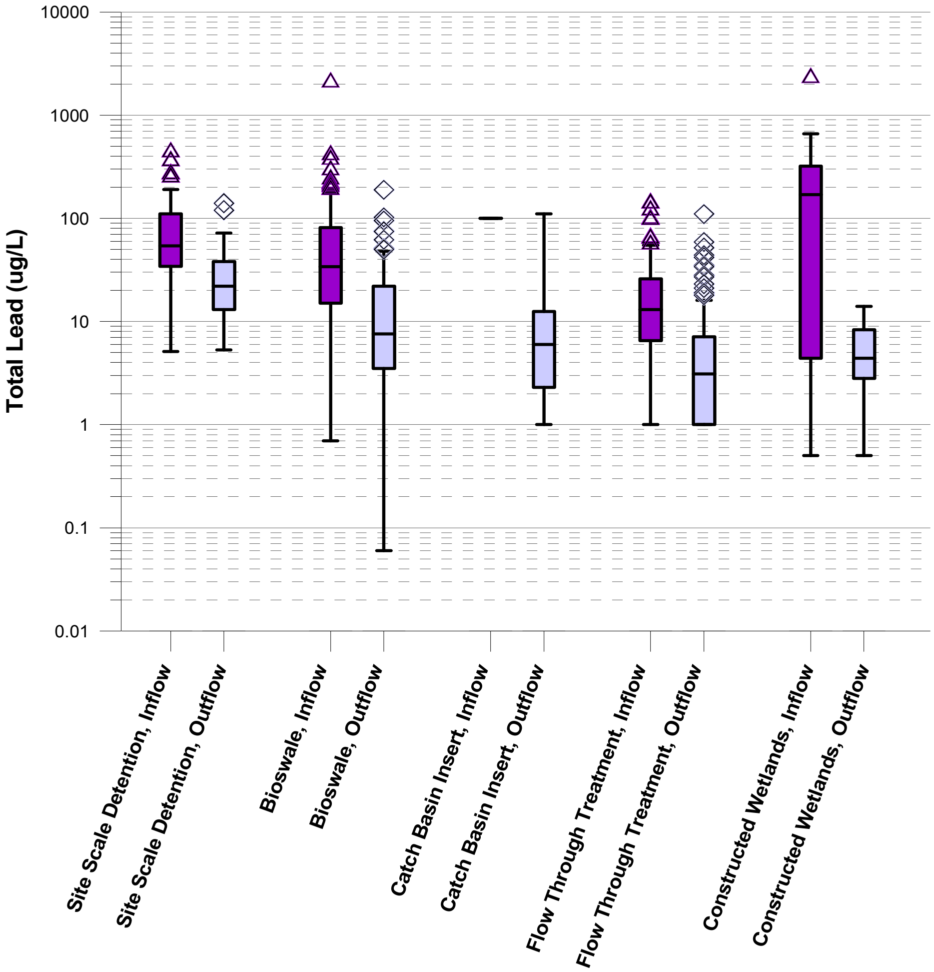

Figure 5 Box Plots of Inflow/Outflow Lead Concentrations in Southern California

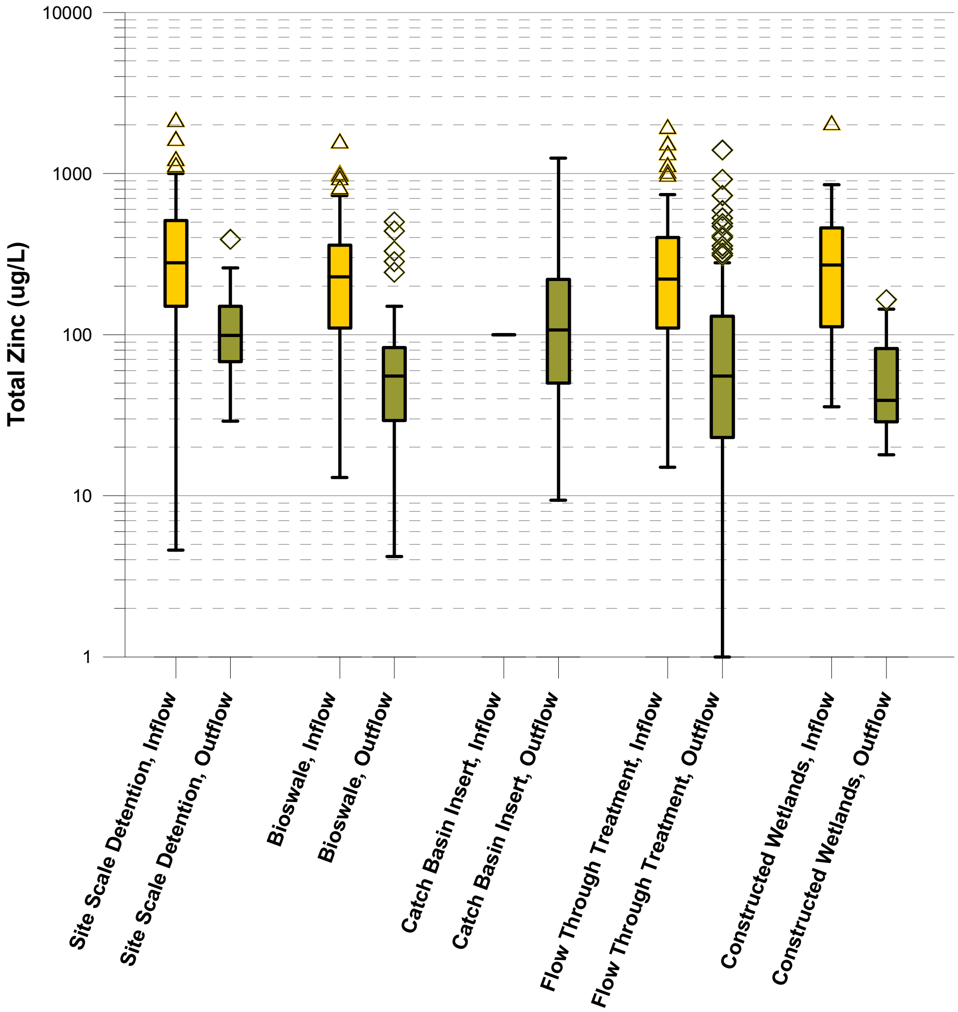

Figure 6 Box Plots of Inflow/Outflow Lead Concentrations in Southern California