Appendix 3-J: South Gardena Recycled Water Pipeline Project Project Supporting Documents

(Please see Appendix CD for additional documents)

This page intentionally left blank.

City of Los Angeles

Recycled Water Master Planning

Los Angeles Department of Water and Power
and
Department of Public Works

Non-Potable Reuse Master Planning Report

Prepared by:

RMC in association with CDM Smith

Volume 1 of 3: Report
March 2012

THIS PAGE IS INTENTIALLY LEFT BLANK

City of Los Angeles
Recycled Water Master Planning

Non-Potable Reuse Master Planning Report

Prepared by:

RMC in association with CDM Smith

March 2012

LA DWP

CITY OF LOS ANGELES
SANITATION
DEPARTMENT OF
PUBLIC WORKS

THIS PAGE IS INTENTIONALLY LEFT BLANK

Title:	Non-Potable Reuse Master Planning Report	
Prepared For:	John Hinds, Project Manager, LADWP Elisa Reynolds, Project Manager, LADWP	
Prepared By:	Rob Morrow, Task 2 Project Engineer, RMC Scott Goldman, Task 2 Lead, RMC Scott Lynch, RMC Kraig Erickson, RMC Miluska Propersi, RMC Javier De La Cruz, RMC Eric Wang, RMC Kris Helm, Kris Helm Consulting	
Reviewed By:	Tom Richardson, Project Manager, RMC Heather VanMeter, Deputy Project Manager, CDM Marilyn Bailey, RMC	
Contributors:	James Yannotta, LADWP Doug Walters, BOS Paul Liu, LADWP John Hinds, LADWP Elisa Reynolds, LADWP Bob Sun, LADWP Eloy Perez, LADWP Berenice Barajas, LADWP Albert Perez, LADWP	Jennifer Barrick, LADWP Evelyn Cortez-Davis, LADWP Donald Cresse, LADWP Victoria Cross, LADWP George Zordilla, LADWP Joshua Gillins, LADWP Jesus Gonzalez, LADWP John Lockett, LADWP Amy Lee Webb, LADWP
Date:	March 2012	
Reference:	Task 2: Non-Potable Reuse Master Planning Report Subtask 8.4 Non-Potable Reuse Master Plan	

THIS PAGE IS INTENTIONALLY LEFT BLANK

Table of Contents

Volume 1 of 3: Report

Executive Summary

Appendices

Volume 2 of 3: Appendices A-G

Volume 3 of 3: Appendices H-J

7.3 Harbor – Gateway System

The potential Harbor – Gateway System takes advantage of existing WBMWD recycled water infrastructure within the City for LADWP customers that are too far from the City's reclamation plants. In this case, two potential WRPs were defined around three anchor customers within a cost-effective distance from WBMWD's Title 22 system.

Table 7-7: Harbor – Gateway System – Summary of Potential WRPs

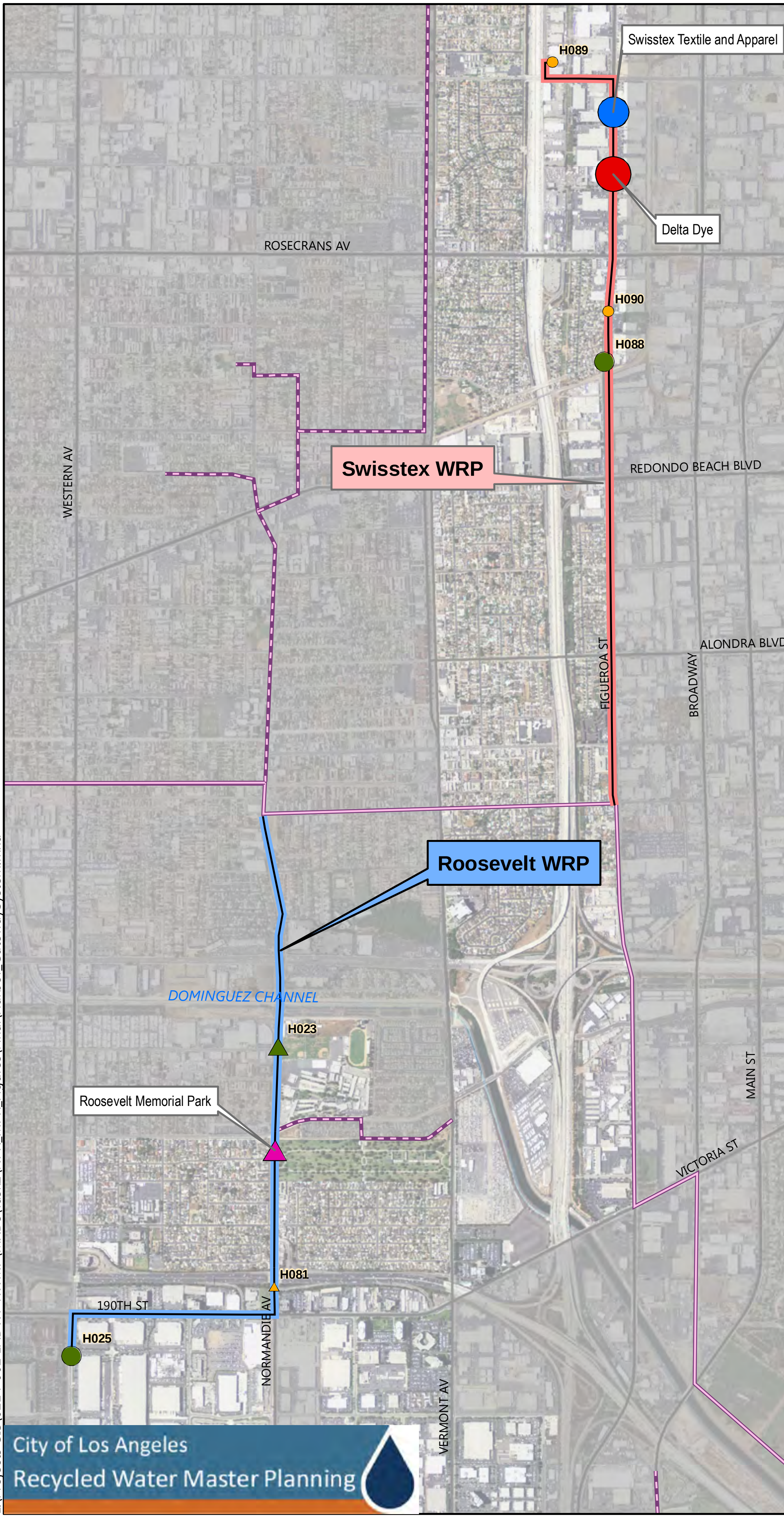
WRP	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Capital Cost ($M)	O&M Cost ($M/yr)	PV Unit Cost ($/AF)
Roosevelt	123	0.11	0.22	$2.70	$0.10	$1,470
Swisstex	523	0.47	0.61	$3.52	$0.39	$1,120
Total	**645**	**0.58**	**0.83**	**$6.21**	**$0.48**	**$1,180**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding. See **Appendix I** for individual WRP descriptions.

Implementation Considerations

Each WRP in this system can be implemented independently so the primary consideration for each WRP is the anchor customer's commitment to use recycled water. Also, the availability of additional supply and conveyance capacity from WBMWD must be confirmed prior to implementation. The availability of additional supply from WBMWD in the future is not ensured since WBWMD has plans to potentially use all remaining treatment capacity at ELWRF. The WBMWD recycled water distribution system has some potential hydraulic capacity limitations.

Potential System Harbor Gateway Figure 7-3



Potential Irrigation-Only Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Potential Non-Irrigation Customer
- ≥ 5 AFY
- ≥ 25 AFY
- ≥ 50 AFY
- ≥ 100 AFY
- ≥ 250 AFY

Exisiting Facilities
- Tank
- Pump Station
- Pipeline

Planned Facilities
- Tank
- Pump station
- Pipeline

Potential Facilities
- Tank
- Pump Station
- PRV

Potential System
- Roosevelt WRP
- Swisstex WRP

Non-LADWP Pipeline
- Existing Pipeline
- Planned Pipeline

Existing/Planned Customers
- Existing Customer
- Planned Customer

Other Feature
- Other City

N

0 0.25 0.5 Miles

CITY OF LOS ANGELES SANITATION DEPARTMENT OF PUBLIC WORKS

RMC in association with CDM

Data Sources: USGS, LADWP, ESRI, NAIP

Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

Customers

Table 7-8: Harbor – Gateway System – Summary of Potential Customers

Customers[1]	Type of Use	Annual Demand (AFY)	Annual Demand (mgd)	Peak Day Demand (mgd)	Conversion Rating[1] Initial[2]	Conversion Rating[1] Comprehensive[3]
Roosevelt WRP		**123**	**0.11**	**0.22**		
Roosevelt Memorial Park	Irrigation	60	0.05	0.12	B	--
Non-Anchor Customers (3)		63	0.06	0.10		
Swisstex WRP		**523**	**0.47**	**0.61**		
Delta Dye	Industrial	270	0.24	0.31	B	B,B
Swisstex Textile and Apparel	Industrial	180	0.16	0.21	B	C,B
Non-Anchor Customers (3)		73	0.06	0.08		
Total[4]		**645**	**0.58**	**0.83**		

1. Anchor customers, which have an estimated annual average demand of at least 50 AFY, are individually listed and non-anchor customers are summarized for each WRP.
2. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY.
3. The "Comprehensive" conversion ratings based on a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
4. Total system demands may not be equal to the sum of the individual WRP demands due to rounding.

Facilities

This system depends on the WBMWD Title 22 system for supply and pressure and the availability of conveyance capacity and sufficient pressure must be confirmed with WBMWD. Each WRP requires a connection with the existing WBMWD Title 22 Distribution System. The Roosevelt WRP connection is at W 168th Street and S Figueroa Street. The Swisstex WRP connection is at W 168th Street and South Normandie Avenue. No new major facilities are included in this system since it is dependent on the WBMWD Title 22 system.

Costs

Table 7-9: Harbor – Gateway System – Summary of Potential Costs

Item \ WRP	Roosevelt	Swisstex	Total
Annual Yield (AFY)	123	523	645
Capital Cost ($M)			
Storage Tanks	--	--	--
Pump Stations	--	--	--
PRVs	--	--	--
Pipelines	$1.60	$2.08	$3.68
Subtotal	*$1.60*	*$2.08*	*$3.68*
Construction Cont.	$0.48	$0.62	$1.10
Subtotal	*$2.07*	*$2.70*	*$4.78*
Implementation	$0.62	$0.81	$1.43
Total	**$2.70**	**$3.52**	**$6.21**
Annual O&M Cost ($M/yr)			
Facility O&M	$0.01	$0.01	$0.01
RW Purchase Cost	$0.09	$0.38	$0.47
Total	**$0.10**	**$0.39**	**$0.48**
50-Year Present Value Analysis			
Present Value ($M)	$9.00	$29.28	$38.21
Total Yield (AF)	6,127	26,131	32,257
PV Unit Cost ($/AF)	**$1,470**	**$1,120**	**$1,180**

Note: Total costs may not be equal to the sum of the individual component costs due to rounding. See **Appendix J** for detailed cost estimates.

4. Harbor – Gateway System

Overview

The potential Harbor – Gateway System takes advantage of existing WBMWD recycled water infrastructure within the City for LADWP customers that are too far from the City's reclamation plants. In this case, two potential WRPs were defined around three anchor customers within a cost-effective distance from WBMWD's Title 22 system.

Harbor – Gateway System – Summary of WRPs

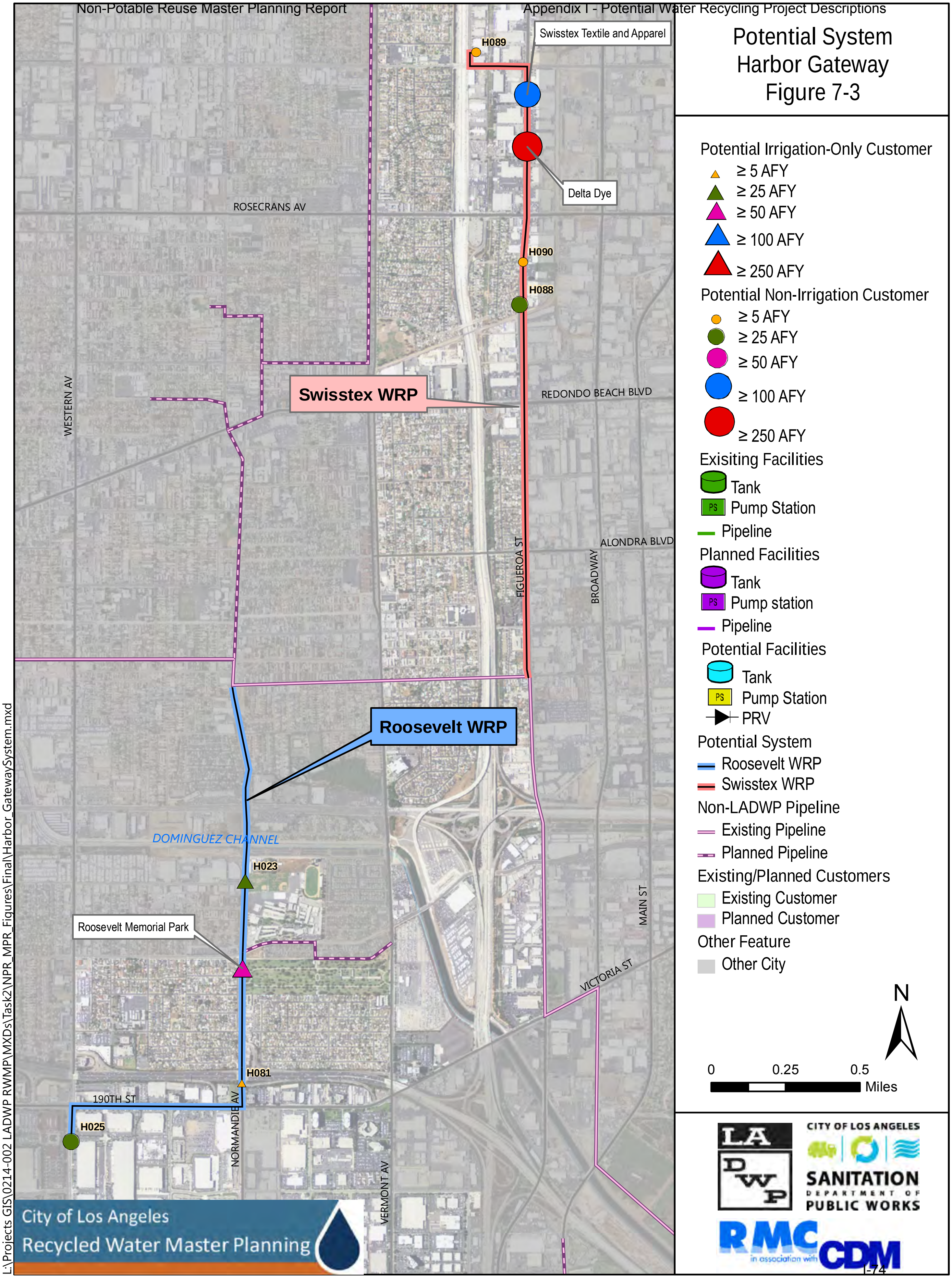
WRP	Annual Demand (AFY)	Annual Demand (MGD)	Peak Day Demand (MGD)	Capital Cost ($M)	O&M Cost ($M/yr)	Lifecycle Unit Cost ($/yr)
Roosevelt	123	0.11	0.22	$2.70	$0.10	$1,470
Swisstex	523	0.47	0.61	$3.52	$0.39	$1,120
Total	**645**	**0.58**	**0.83**	**$6.21**	**$0.48**	**$1,180**

Note: Total system demands or costs may not be equal to the sum of the individual WRP demands or costs due to rounding.

Implementation Considerations

Each WRP in this system can be implemented independently so the primary consideration for each WRP is the anchor customer's commitment to use recycled water. Also, the availability of supply and conveyance capacity from WBMWD must be confirmed prior to implementation. WBWMD has plans to potentially use all remaining treatment capacity at ELWRF so the availability of supply from WBMWD in the future is not guaranteed. A potential challenge to this WRP is that the WBMWD recycled water distribution system may have hydraulic restrictions which prevent it delivering the additional supply for these potential WRPs.

Potential System Harbor Gateway Figure 7-3



Data Sources: USGS, LADWP, ESRI, NAIP Note: Only potential customers ≥ 50 AFY are labeled and potential customers <50 AFY have IDs shown

DESCRIPTION: Present Value Estimate Date: 3/14/2012

SYSTEM: Harbor Gateway

WRP: All

Annual Yield (AFY)
645

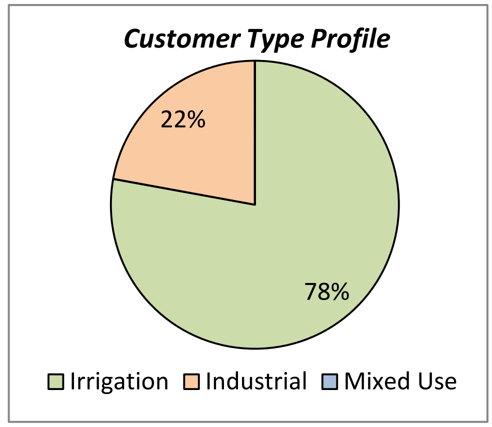
Item	Qty	Units	Unit Cost		Cost
Capital Costs					
Storage					
Tank 1	0.0	MG	$0	$	-
Pump Station					
PS 1	0	gpm	formula	$	-
Pressure Reducing Stations	Diam (in)				
Pressure Reducer 1	0	LS	$0	$	-
Conveyance	Length (ft)				
6 inch	12,015	in-diam*LF	$24	$	1,730,000
8 inch	10,131	in-diam*LF	$24	$	1,945,000
10 inch	0	in-diam*LF	$20	$	-
			Construction Subtotal	**$**	**3,675,000**
		Contingency Costs	30%	$	1,103,000
			Construction Total	**$**	**4,778,000**
		Implementation Costs	30%	$	1,433,000
			Total Capital Cost	**$**	**6,211,000**
Capital Replacement Costs					
20-Year Useful Life					
Storage			10%	$	-
Pump Station			50%	$	-
Conveyance			0%	$	-
Pressure Reducing Stations			50%	$	-
			Construction Subtotal	**$**	**-**
		Contingency Costs	30%	$	-
			Construction Total	**$**	**-**
		Implementation Costs	30%	$	-
			Total 20-year Capital Cost	**$**	**-**

Item		Qty	Units	Unit Cost		Cost
O&M Costs ($ / Year)						
Storage		-	LS	$75,000	$	-
Pump Station						
Maintenance	$	-	capital cost	5.0%	$	-
Maintenance		-	LS	$10,000	$	-
PS 1 - Electricity		-	kWh	$0.12	$	-
PS 2 - Electricity		-	kWh	$0.12	$	-
Conveyance		22,146	LF	$0.60	$	13,000
Pressure Reducing Stations		-	station(s)	$20,000	$	-
				Total Annual O&M	**$**	**13,000**
Recycled Water Purchase ($ / Year)						
West Basin - Nitrified			AFY	$800	$	-
West Basin - Tertiary		645	AFY	$728	$	470,000
Central Basin MWD			AFY	$500	$	-
Burbank WP			AFY	$0	$	-
Las Virgenes MWD			AFY	$500	$	-
		645		**Purchase Cost Total**	**$**	**470,000**

PV Calculations			
Inflation / Discount Rate		Project Yield	
Construction/O&M Esca	3.0%	Annual Yield (AFY)	645
Water Purchase Escalat	4.0%	Total Yield (AF)	32,257
Discount Rate	3.0%		

Economic Cost Summary					
Present Value Calculations			PV Factor		
Initial Capital Cost	$	6,211,000	1.00	$	6,211,000
20-Year Capital Costs	$	-	2.00	$	-
Annual O&M Costs	$	13,000	49.00	$	637,000
Recycled Water Cost	$	470,000	66.73	$	31,363,000
Salvage	$	-	1.00	$	-
			Total PV	**$**	**38,211,000**
			50-year Project Yield (AF)		**32,257**
			Unit Cost ($/af)		**$1,180**

4.1 Roosevelt WRP



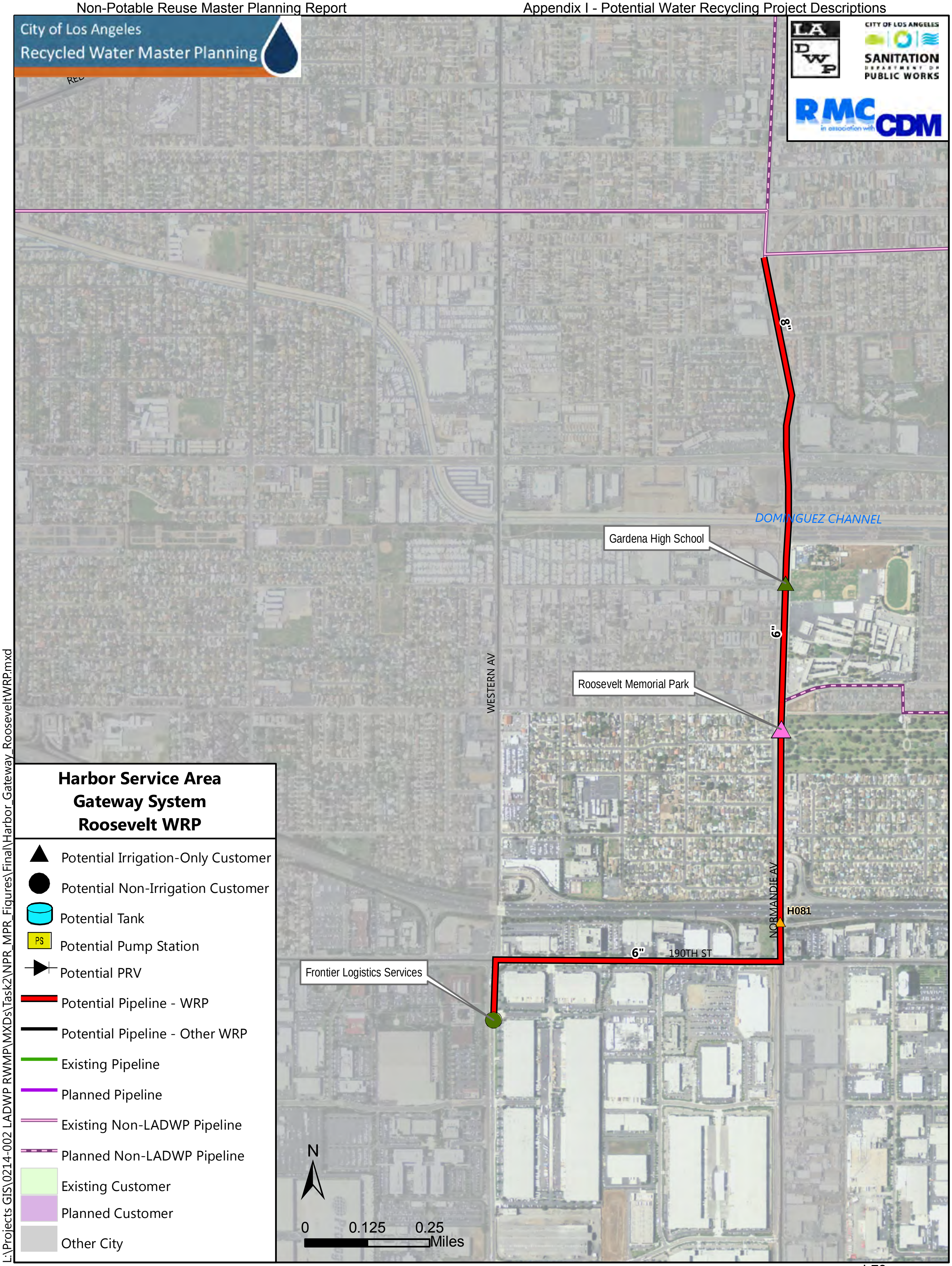
This WRP defines service to four potential customers located south of the existing WBMWD recycled system in the Gateway area of the City, including one anchor customer:

- Roosevelt Memorial Park

Avg Annual Demand (AFY)	Avg Annual Demand (MGD)	Peak Day Demand (MGD)	Capital Cost ($M)	O&M Cost ($M/yr)	Unit Lifecycle Cost ($/AF)
123	0.11	0.22	$2.70	$0.10	$1,470/AF

Facilities

- **WBMWD Connection:** This WRP requires a connection with the existing WBMWD Title 22 Distribution System along W 168th St at S Figueroa St.
- **Crossings:** A crossing of I-405 at the Normandie Ave underpass is required to serve Frontier Logistics but is not necessary for the WRP's other customers.
- **Pipelines:** This WRP includes approximately 1.9 miles of 6"to 8" pipe. The utility review was conducted for transmission pipelines but not completed for laterals and only laterals are included in this WRP so there are no review findings.



Note: Only potential customers ≥ 25 AFY are labeled. Other potential customers have IDs shown.

Customers

Gateway System – Roosevelt WRP Potential Customers

ID[1]	Name[2]	Type of Use	Annual Demand (AFY)	Annual Demand (MGD)	Peak Day Demand (MGD)	Conversion Rating Initial[3]	Conversion Rating Compre-hensive[4]
H015	Roosevelt Memorial Park	Irrigation	60	0.05	0.12	B	--
H023	Gardena High School	Irrigation	30	0.03	0.06	--	--
H025	Frontier Logistics Services	Industrial	27	0.02	0.03	--	--
H081	Caltrans (405 at Normandie Ave)	Irrigation	5	0.00	0.01	--	--
		Total[5]	**123**	**0.11**	**0.22**		

Notes:

1. Table is sorted by the customer's ID from the database and GIS.
2. Names in all caps were not individually reviewed.
3. The "Initial" conversion ratings were prepared for all customers with initial non-potable demands of greater than 75 AFY and were documented in the Initial Customer Evaluations TMs.
4. The basis for the "Comprehensive" conversion ratings were documented in the Customer Conversion Evaluations TMs. The evaluations were a more detailed assessment than the initial evaluation and conducted for a shorter list of priority anchor customers. This assessment has two conversion ratings – one for likelihood to convert and one strictly related to the conversion cost.
5. Individual customer demand values are rounded. Total values are based on the sum of unrounded individual customer demand values.

The following are considerations for the anchor customer:

- **Roosevelt Memorial Park:** LADWP received a Letter of Intent from Roosevelt on June 1, 2010 that states their commitment to using recycled water. However, an issue that must be addressed by all cemeteries is use of recycled in hose bibs across the site because recent CDPH decisions dictate that the hose bibs must remain on potable water, which requires a separate potable water system and significantly increases the cost of the non-potable conversion.

DESCRIPTION: Present Value Estimate

Date: 3/14/2012

SYSTEM: Harbor Gateway

WRP: Roosevelt

Annual Yield (AFY)
123

Item	Qty	Units	Unit Cost	Cost
Capital Costs				
Storage				
Tank 1	0.0	MG	$0	$ -
Pump Station				
PS 1	0	gpm	formula	$ -
Pressure Reducing Stations	Diam (in)			
Pressure Reducer	0	LS	$0	$ -
Conveyance	Length (ft)			
6 inch	6,407	in-diam*LF	$24	$ 923,000
8 inch	3,506	in-diam*LF	$24	$ 673,000
10 inch	0	in-diam*LF	$20	$ -
			Construction Subtotal	**$ 1,596,000**
		Contingency Costs	30%	$ 479,000
			Construction Total	**$ 2,075,000**
		Implementation Costs	30%	$ 623,000
			Total Capital Cost	**$ 2,698,000**
Capital Replacement Costs				
20-Year Useful Life				
Storage			10%	$ -
Pump Station			50%	$ -
Conveyance			0%	$ -
Pressure Reducing Stations			50%	$ -
			Construction Subtotal	**$ -**
		Contingency Costs	30%	$ -
			Construction Total	**$ -**
		Implementation Costs	30%	$ -
			Total 20-year Capital Cost	**$ -**

Item		Qty	Units	Unit Cost		Cost
O&M Costs ($ / Year)						
Storage		-	LS	$75,000	$	-
Pump Station						
Maintenance	$	-	capital cost	5.0%	$	-
Maintenance		-	LS	$10,000	$	-
PS 1 - Electricity		-	kWh	$0.12	$	-
PS 2 - Electricity		-	kWh	$0.12	$	-
Conveyance		9,913	LF	$0.60	$	6,000
Pressure Reducing Stations		-	station(s)	$20,000	$	-
				Total Annual O&M	**$**	**6,000**
Recycled Water Purchase ($ / Year)						
West Basin - Nitrified			AFY	$800	$	-
West Basin - Tertiary		123	AFY	$728	$	90,000
Central Basin MWD			AFY	$500	$	-
Burbank WP			AFY	$0	$	-
Las Virgenes MWD			AFY	$500	$	-
		123		**Purchase Cost Total**	**$**	**90,000**

PV Calculations				
Inflation / Discount Rate			Project Yield	
Construction/O&M Esca	3.0%		Annual Yield (AFY)	123
Water Purchase Escalat	4.0%		Total Yield (AF)	6,127
Discount Rate	3.0%			

Economic Cost Summary					
Present Value Calculations			PV Factor		
Initial Capital Cost	$	2,698,000	1.00	$	2,698,000
20-Year Capital Costs	$	-	2.00	$	-
Annual O&M Costs	$	6,000	49.00	$	294,000
Recycled Water Cost	$	90,000	66.73	$	6,006,000
Salvage	$	-	1.00	$	-
			Total PV	**$**	**8,998,000**
			50-year Project Yield (AF)		**6,127**
			Unit Cost ($/af)		**$1,470**

THIS PAGE IS INTENTIONALLY LEFT BLANK.

West Basin Municipal Water District

CAPITAL IMPLEMENTATION MASTER PLAN FOR RECYCLED WATER SYSTEMS

FINAL REPORT
June 2009

199 SOUTH LOS ROBLES AVENUE · SUITE 530 · PASADENA, CALIFORNIA 91101 · (626) 535-0180 · FAX (626) 535-0185

WEST BASIN MUNICIPAL WATER DISTRICT

CAPITAL IMPLEMENTATION MASTER PLAN FOR RECYCLED WATER SYSTEMS

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

TABLE OF CONTENTS (continued)

Page No.

LIST OF APPENDICES

TABLE OF CONTENTS (continued)

Page No.

LIST OF TABLES

LIST OF TABLES (continued)

Page No.

LIST OF TABLES (continued)

Page No.

LIST OF FIGURES

LIST OF FIGURES (continued)

Page No.

LIST OF ABBREVIATIONS

Abbreviation	Description
AACE	Association for the Advancement of Cost Engineering
AAD	average annual demand
ADD	average day demand
af	acre-feet
afy	acre feet per year
AOP	advanced oxidation processes
aSAR	adjusted sodium adsorption ratio
B	barrier
Carollo	Carollo Engineers, a Professional Corporation
CBOD	carbonaceous biochemical oxygen demand
CC	construction cost
CC□C	construction cost plus contingency
CCTV	closed circuit television
CIMIS	California Irrigation Management Information System
CIMP	Capital Implementation Master Plan
CIP	Capital Improvement Program
Cl	chloride
CMF	Continuous Microfiltration
CMLC	cement mortar lined and coated
CNF	Chevron Nitrification Facility
CRWRF	Carson Regional Water Recycling Treatment Facility
CSUDH	California State University Dominguez Hills
CT value	the product of total chlorine residual and modal contact time measured at the same point
DCS	distributed control system
DIP	ductile iron pipe
EC	electrical conductivity
ELWRF	Edward C. Little Water Reclamation Facility
EMWRF	ExxonMobil Water Recycling Facility
ENR	Engineering and News Record
EPS	extended period simulation
ET	evapotranspiration
FM	force main
fps	feet per second
frp	fiber reinforced plastic
ft	feet
ft/kft	foot per 1,000 feet
FY	fiscal year
GIS	Geographic Information Systems

Abbreviation	Description
gpd/ac	gallons per day per acre
gpm	gallons per minute
HCO_3	bicarbonate
HDPE	high-density polyethylene
HP	horsepower
HPBF	high pressure boiler feed
HSEFM	Hyperion Secondary Effluent Force Main
HSEPS	Hyperion Secondary Effluent Pump Station
HWWTP	Hyperion Wastewater Treatment Plant
IIMM	International Infrastructure Management Manual, Edition 2006
IN	industrial
IR	irrigation
JWPCP	Joint Water Pollution Control Plant
K_d	density factor
K_{mc}	microclimate factor
K_s	species factor
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation District
LADWP	Los Angeles Department of Water and Power
LF	leaching fraction
LPBF	low pressure boiler feed
MCL	maximum contaminant level
MDD	Maximum Day Demand
MF	Microfiltration
MFP	Mobile Facility Plant
Mg	magnesium
MG	million gallons
mg/L	milligrams per liter.
mgd	million gallons per day
MinDD	minimum day demands
MMD	maximum month demand
MPN	most probable number
MU	mixed use
MWD	Metropolitan Water District of Southern California
N	total nitrogen
Na	sodium
NH_3	ammonia
NO_3	nitrate
NPDES	National Pollutant Discharge Elimination System

Page No.

Abbreviation	Description
O&M	Operations and Maintenance
OD	outer diameter
PS	pump station
psi	pounds per square inch
PVC	polyvinyl chloride
RO	reverse osmosis
RPM	revolutions per minute
SAR	sodium absorption ratio
SCADA	supervisory control and data acquisition
SDR	Standard Dimension Ratio
SE	secondary effluent
sf	square feet
TDS	total dissolved solids
TOC	total organic carbon
UV	ultraviolet
WBMWD	West Basin Municipal Water District
WDF	water demand factor
West Basin	West Basin Municipal Water District
WSPG	Water Surface Pressure Gradient (software package)

This Page Left Blank Intentionally

Table 3.4 Potential Customers
Capital Implementation Master Plan
West Basin Municipal Water District

Customer Name	Database ID[1]	Usage Type Code[2]	Likelihood of Service	Anticipated Year of Service	Estimated Future Demand[3] (afy)	Seasonal Peaking Factor
Arthur Lee Johnson Memorial Park	P106	IR	20□	2018	33	2.5
Thornburg Park	P107	IR	20□	2018	4	2.5
Gardena High School	P108	IR	20□	2018	27	2.5
Serra High School	P109	IR	20□	2018	18	2.5
Vermont Medians	P114	IR	20□	2018	24	2.5
LAUSD - Peary Jr High	P44	IR	20□	2018	20	2.5
Calas Park	P89	IR	20□	2018	20	2.5
Caltrans I-405/190th St.	P93	IR	20□	2018	14	1.5
General Scott Park	P94	IR	20□	2020	14	2.5
Dominguez Hills Golf Course	P75	IR	10□	2012	25	2.5
Stephen M White Middle School	P80	IR	10□	2013	29	2.5
Caltrans I-405/Figueroa St.	P81	IR	10□	2013	28	1.5
Caltrans I-405/Edgar St.	P84	IR	10□	2013	23	1.5
LACMTA	P34	IN	10□	2017	30	1.3
Prime Wheel	P35	IN	10□	2018	27	1.3
Carson High School	P98	IR	10□	2018	41	2.5
One Hundred Fifty Third Street E	P110	IR	10□	2020	3	2.5
Crescendo Charter School	P111	IR	10□	2020	1	2.5
Roosevelt Cemetery	P112	IR	10□	2020	93	2.5
C Star Nursery	P113	IR	10□	2020	14	2.5
Rosecrans Recreation Center	P115	IR	10□	2020	24	2.5
Moneta Nursery	P116	IR	10□	2020	8	2.5

CAPITAL IMPROVEMENT PROGRAM

This chapter presents the recommended capital improvement program (CIP) for the West Basin Municipal Water District's (West Basin) distribution systems. The CIP summarizes the recommended improvements, cost estimates, and the allocation of project cost for the recommended improvements to the distribution systems, and establishes phasing of projects through the planning horizon. The purpose of this CIP is to provide West Basin with a guideline for the planning and budgeting of future improvements to its distribution systems and facilities. The CIP is based on the evaluation of the West Basin's distribution systems, and on the recommended projects described in previous chapters.

This chapter is divided into three subsections. First, the recommended projects are summarized for each of the ten distribution systems and the five treatment plants (four existing and one proposed). Secondly, the phasing of recommendation is presented by planning period from fiscal year (FY) 2008/2009 through FY 2029/2030 (FY29/30). This chapter is concluded with a summary of the entire CIP by presenting summaries of the estimated project improvement cost by planning year and facility type. It should be noted that all cost presented in this chapter are based on 2009 dollars, with the exception of the escalated CIP at the end of this chapter.

The reasons for replacements, upgrades, and/or new facilities and other details for each of the projects recommended in this CIP can be found in Chapters 7 and 8.

Where applicable, it is assumed that West Basin projects will be designed for certification in accordance with the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. However, specific decisions on incorporation of green building technology will need to be made and refined at the preliminary design level.

9.1 PROJECT SUMMARY BY SYSTEM/FACILITY

This section summarizes the recommended projects discussed in Chapter 7 (Existing System Analysis) and Chapter 8 (Future System Analysis) for each of the ten distribution systems and the five treatment plants. The ten distribution systems, in the order presented, are:

- Hyperion Secondary Effluent Pumping Station (HSEPS) System
- Title 22 Distribution System
- West Coast Barrier System
- Chevron High Pressure Boiler Feed (CHPBF) System
- Chevron Low Pressure Boiler Feed (CLPBF) System

- Chevron Nitrified Water System
- ELWRF Brine Line
- bp Reverse Osmosis System (bp-RO)
- bp Nitrified Water System (bp-N)
- CRWRF Brine Line

The five treatment plants, including four existing and one proposed plant, are:

- Edward L. Little Water Reclamation Facility (ELWRF)
- Carson Regional Water Reclamation Facility (CRWRF)
- ExxonMobil Water Reclamation Facility (EMWRF)
- Chevron Nitrified Facility (CNF)
- New Treatment Plant (NTP)

As discussed in Chapter 8, this NTP would treat secondary effluent from the Los Angeles County Sanitation District's Joint Water Pollution Control Plant (JWPCP).

In addition, there are three types of recurring projects that are related to ongoing improvements at the treatment plants, such as membrane replacements, electrical upgrades, mechanical equipment, etc. These three types of recurring projects are:

- Replacement and rehabilitation projects identified in the Condition Assessment TM (Carollo 2009)
- Membrane replacements, assumed to take place every five years, as detailed in Section 8.4.2.
- Recapitalization projects identified by United Water (United Water 2009).

In this section, these recurring projects have been organized by treatment plant (Sections 9.1.13 through 9.1.17) and are phased as "mult", meaning multiple planning phases. In Section 9.2, the costs of these projects are organized by planning phase. The cost breakdown by treatment plant and planning phases can be found in the master CIP list presented at the end of this chapter (Table 9.37).

9.1.1 Hyperion Secondary Effluent Pumping System

Table 9.1 presents the list of recommended improvements to the HSEPS facility and distribution system.

As presented in Table 9.1, the total anticipated cost for improvements at the HSEPS is approximately $83.3 million (M). The most costly improvements are additional pumping capacity to support future demands and the pipeline to parallel the Hyperion Secondary Effluent Force Main (HSEFM) for Scenario 7 demands.

Table 9.1 Project Summary for HSEPS Capital Implementation Master Plan West Basin Municipal Water District			
ID	**Phase**	**Project Description**	**Capital Cost(1)**
HPS-01	FY10/11	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-03	FY10/11	Secondary Power Connection for Backup Power	$2,520,000
HPS-04	FY10/11	PS Building	$560,000
HPS-05	FY11/12	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-06	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$725,000
HPS-07	FY20-25	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	$27,300,000
HPS-08	FY20-25	Parallel HSEFM w/ 36"	$22,815,000
Total			**$83,320,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

The additional pumping capacity is split into two initial phases to supply Scenario 5B demands through 2020 and a single post-2020 phase, to accommodate supplies to meet the additional demands for customers of Scenario 7B. Further details on HSEPS capacity requirements can be found in Chapter 4 and Chapter 8.

Consistent with the *HSEPS Expansion Study* (CDM 2004), a secondary power connection is recommended due to limited space and nearby connection availability.

The rehabilitation and replacement project is an aggregation of expected remaining life of existing equipment at the HSEPS as determined by the condition assessment. More information about the condition assessment can be found in the Condition Assessment Technical Memorandum (Carollo 2009), which can be found in Appendix F.

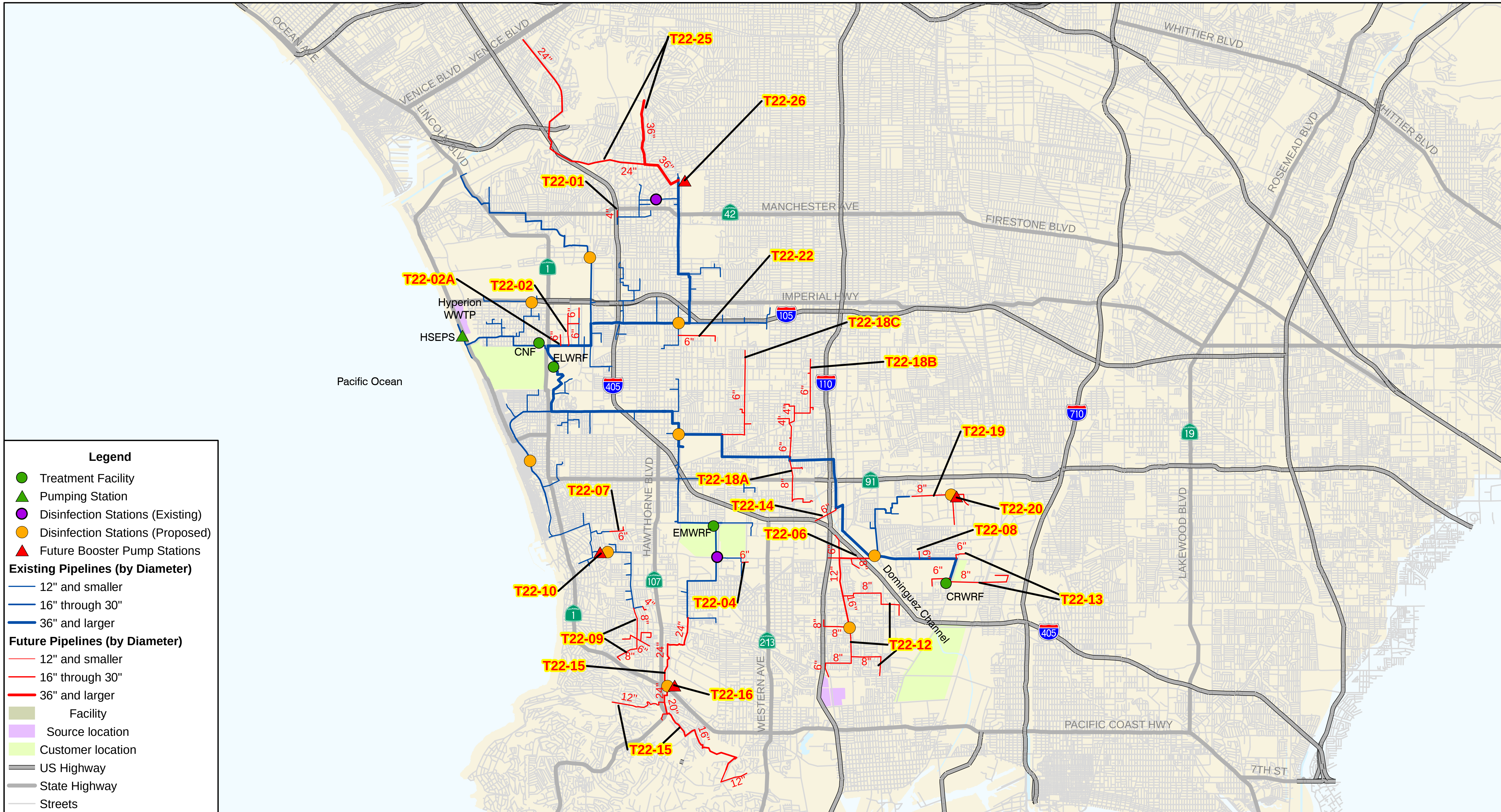
9.1.2 Title 22 Distribution System

Table 9.2 presents the list of recommended improvements to the Title 22 distribution system.

Table 9.2	**Project Summary for Title 22 Distribution System Capital Implementation Master Plan West Basin Municipal Water District**		
ID	**Phase**	**Project Description**	**Capital Cost(1)**
T22-01	FY12/13	Caltrans Inglewood Lateral	$260,000
T22-02	FY11/12	El Segundo Lateral (Boeing, Kilroy Airport)	$1,500,000
T22-02A	FY09/10	Mariposa Lateral (Mattel, Hilton, Marriot)	$750,000
T22-04	FY10/11	Virco-Torrance Lateral	$340,000
T22-06	FY09/10	Carson Mall Lateral(2)	$2,500,000
T22-07	FY11/12	Redondo Beach Lateral (Pete's Nursery)	$660,000
T22-08	FY11/12	Mills Park Lateral	$245,000
T22-09	FY09/10	Anza Lateral Phase II(2)	$3,500,000
T22-10	FY09/10	Anza PS (4-500 gpm pumps)(2)	$2,000,000
T22-11	FY12/13	Chlorination Stations (Phase I)	$1,960,000
T22-12	FY13/14	Main Street Carson Lateral	$17,075,000
T22-13	FY10/11	Dominguez Street Lateral(2)	$4,500,000
T22-14	FY14/15	Caltrans Gardena Lateral	$985,000
T22-15	FY15-20	Palos Verdes - Lateral 6B	$27,290,000
T22-16	FY15-20	Palos Verdes PS (4-1,250 gpm pumps)	$4,900,000
T22-17	FY15-20	Increase Title 22 product water storage by 5.0 MG	$10,500,000
T22-18A	FY15-20	Gardena Lateral - Normandie Ave	$3,635,000
T22-18B	FY15-20	Gardena Lateral - Normandie and Vermont	$6,170,000
T22-18C	FY15-20	Gardena Lateral - Van Ness	$4,480,000
T22-19	FY09/10	Dyehouse Lateral(2)	$3,000,000
T22-20	FY09/10	Dyehouse PS (3-250 gpm pumps)(2)	$1,500,000
T22-21	FY15-20	Chlorination Stations (Phase II)	$1,960,000
T22-22	FY15-20	Hawthorne Lateral (Solec)	$1,595,000
T22-23	FY15-20	Title-22 PS Discharge Pipeline Modification	$465,000
T22-24	FY20-25	Anza Lateral Break Tank	$4,200,000
T22-25	FY25-30	LA Westside Lateral	$40,005,000
T22-26	FY25-30	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	$28,025,000
Total			**$174,000,000**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Cost estimates provided by West Basin staff from preliminary design estimates.

Improvements related to treatment of Title 22 product water are included in the summaries of recommendations for ELWRF and NTP. Figure 9.1 shows each of the recommended distribution system improvements, with IDs corresponding to the IDs shown in Table 9.2. As presented in Table 9.2, the recommended improvements for the Title 22 distribution system are approximately $174.0M.



N

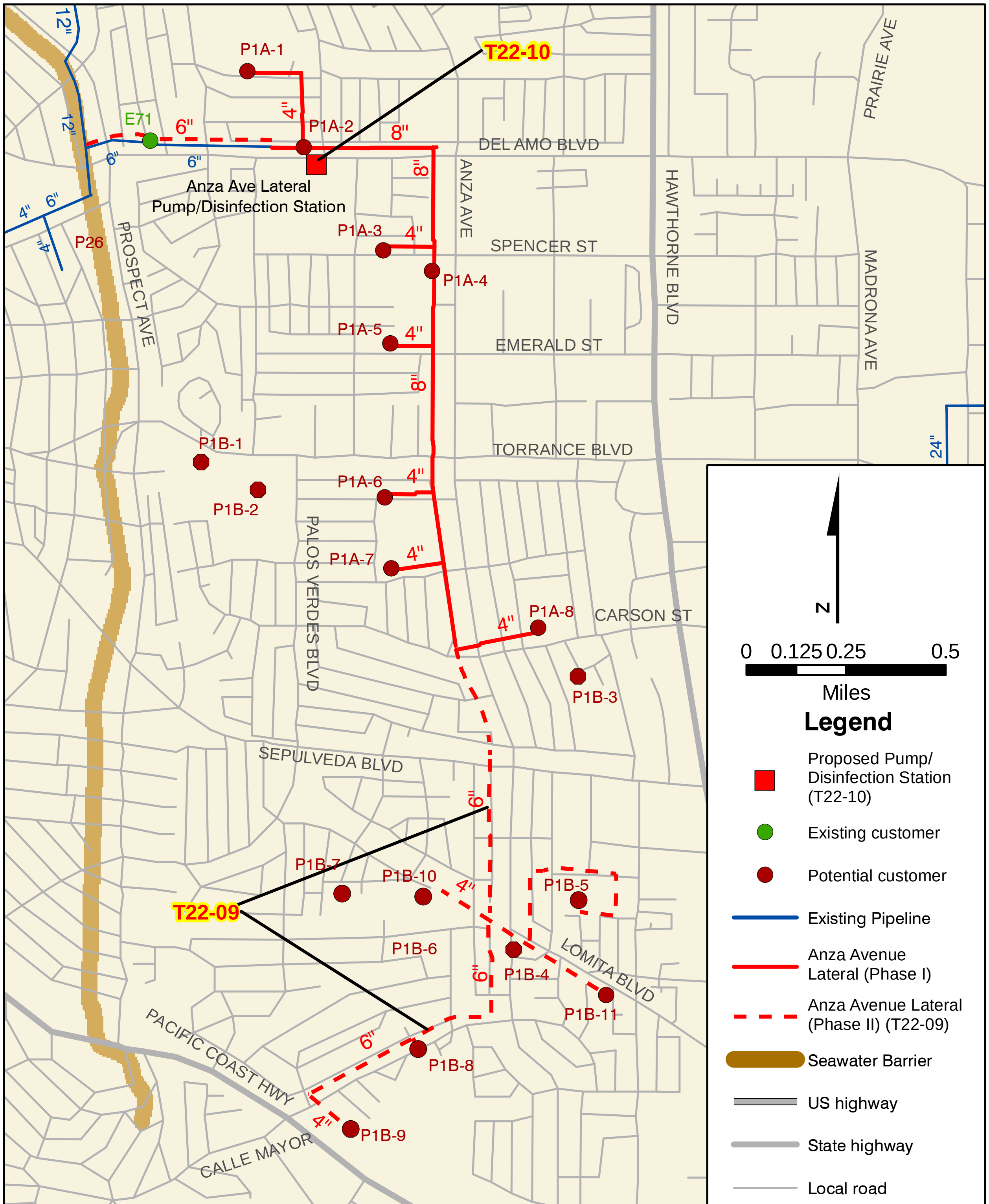
1 0.5 0 1 2 3

Miles

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 9.1
Title 22 CIP Projects

This page left blank intentionally.



carollo in association with AKM SPI

Figure 9.1A
Anza Avenue Lateral

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

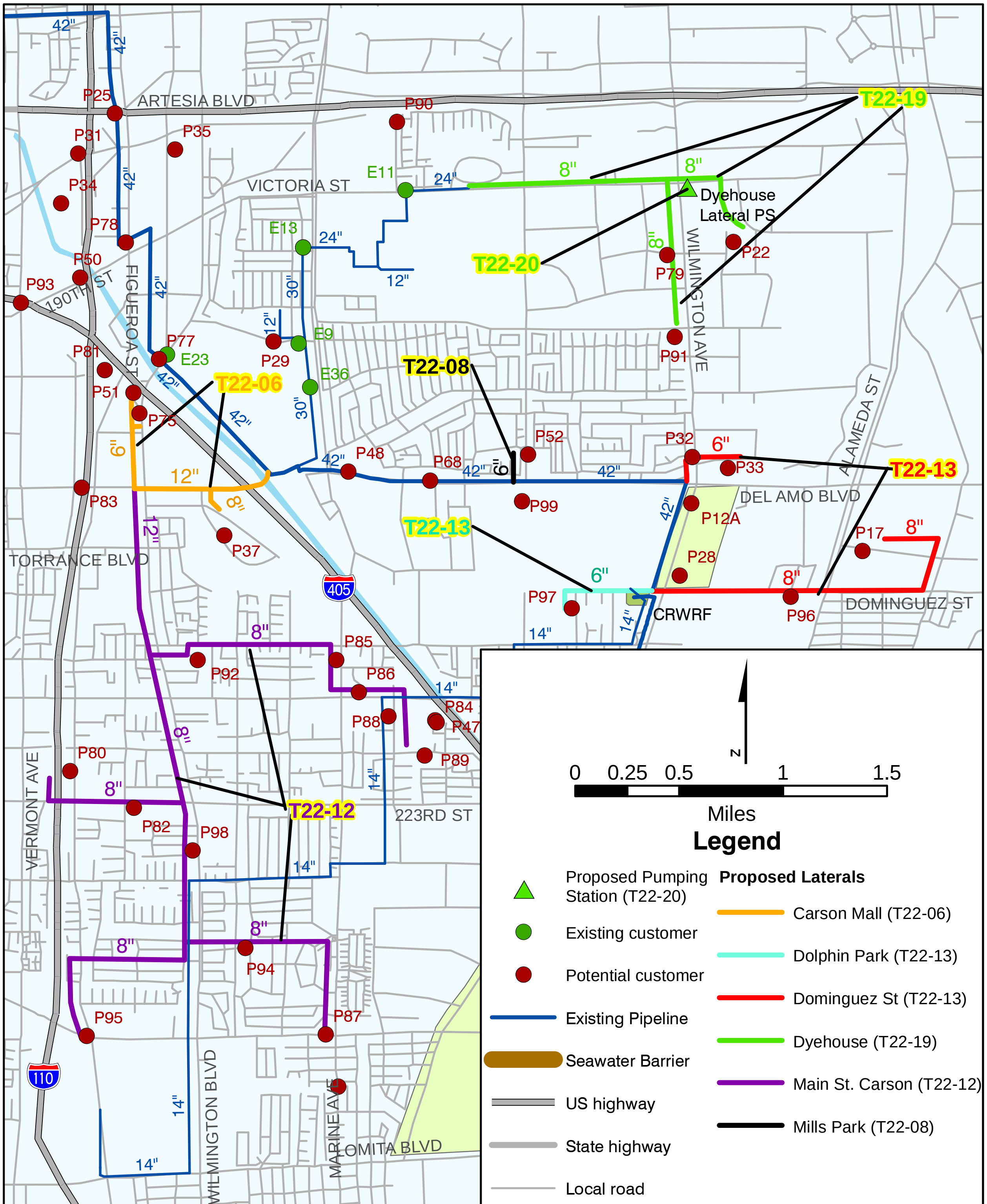
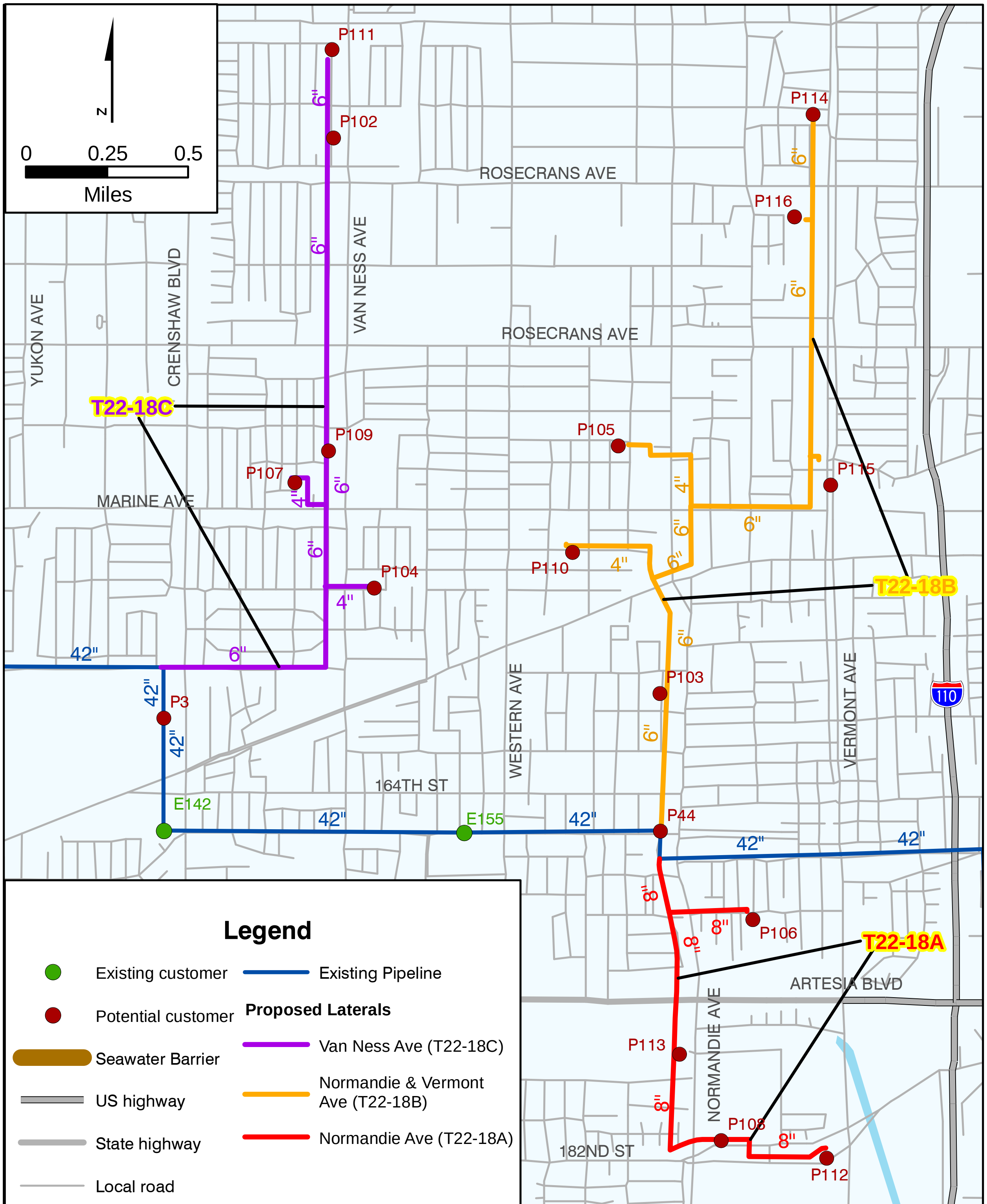


Figure 9.1B
City of Carson -
Potential Recycled
Water Customer Sites

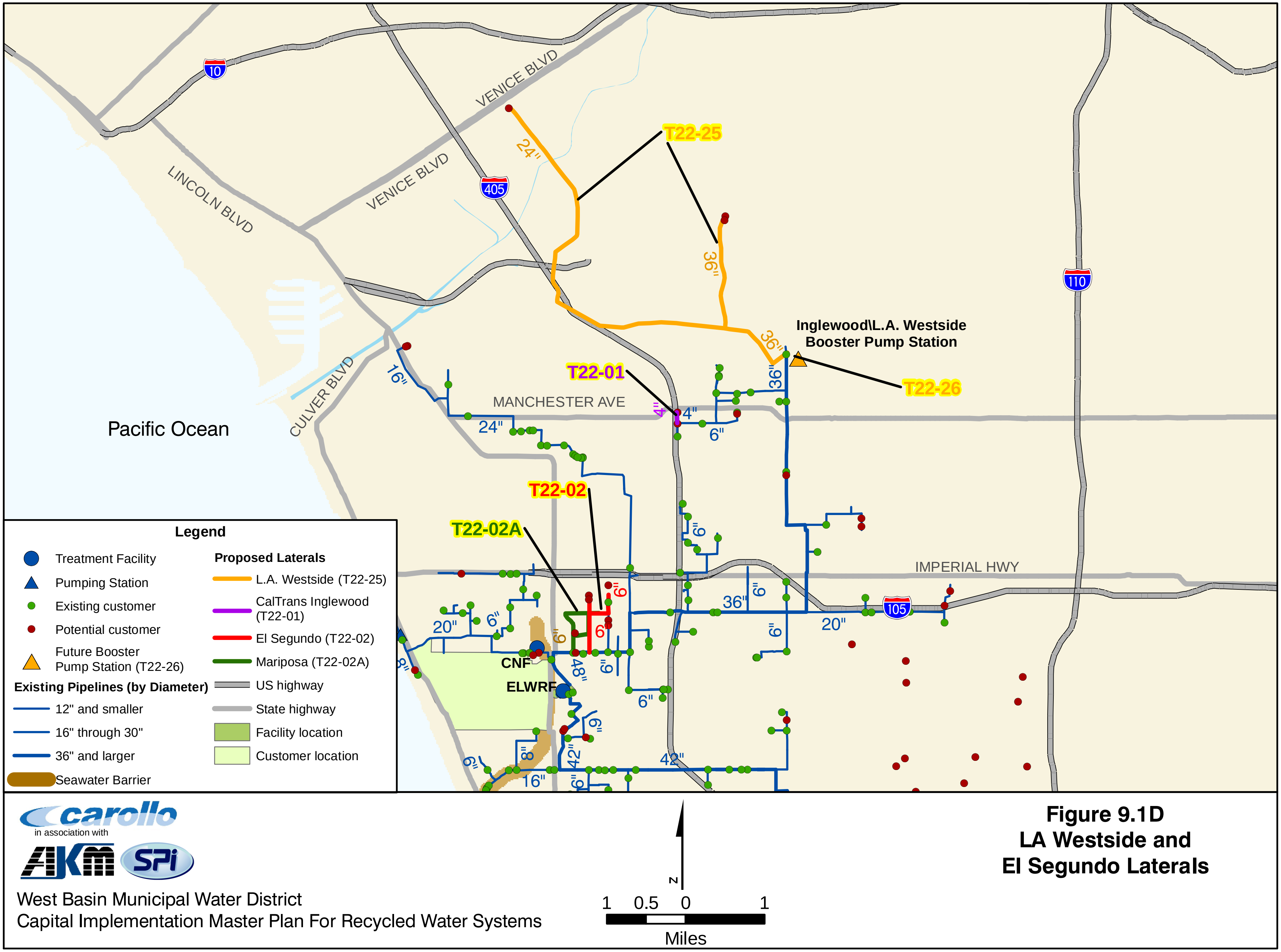
West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems



carollo in association with AKM SPi

Figure 9.1C
City of Gardena -
Potential Recycled
Water Customer Sites

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems



carollo
in association with
AKM SPi

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Figure 9.1D
LA Westside and
El Segundo Laterals

For all pipeline alignments, it is recommended that West Basin evaluate alternative alignments during preliminary design. As indicated in Table 9.2, cost estimates for several projects were provided by West Basin based on preliminary design and funding of specific laterals and were not estimated as a part of this study.

Special construction markups were applied to several of the Title 22 distribution system pipelines, as detailed in Table 9.4. The special construction markups were applied utilizing GIS layers for railroad, freeway, and arterial streets to determine which pipeline segments were anticipated to carry a larger cost of construction than anticipated by the developed unit costs. For railroad and freeway crossings, the markups account for assumed jack and bore construction techniques, while for arterial streets, higher markups account for increased cost of temporary traffic control. Where pipeline segments were not easily delineated into segments applicable for application of special construction markups, 500 feet was assumed for the construction markup (i.e., if the pipeline segment is 5,000 feet long, but crosses a freeway, the construction markup is applied to 500 feet of the segment length rather than the entire pipeline length).

It should be noted that the locations of the ten proposed disinfection stations shown on Figure 9.1 need to be verified and further evaluated based on water quality data obtained from field measurements. For budgetary purposes the ten recommended stations were divided into two groups, Phase I (T22-11) and Phase II (T22-21). The prioritization of these stations would need to be evaluated by comparing field measurements of existing and historical chlorine residual levels. It is also recommended that a study be conducted to evaluate if the installation of pig-launching and retrieval ports at strategic locations in the distribution system could replace and/or increase the effectiveness of these proposed disinfection stations. This study is included in the list of recommended studies found in Table 9.35.

For each of the laterals recommended for the Title 22 distribution system, demands served by the lateral are presented in Table 9.3. The projected average annual demands reflect Scenarios 7A and 7B.

A detailed breakdown of pipeline sizes for each lateral is presented in Table 9.4. The lengths in Table 9.4 are grouped into individual projects listed in Table 9.2 and Table 9.37. Special construction considerations indicate portions of the project to which are apply additional markups to account for advanced construction techniques or additional traffic control.

Table 9.3 Demands Associated with Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Average Annual Demand (afy)
T22-01	Caltrans Inglewood Lateral	10.0
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	200.0
T22-02A	Mariposa Lateral (Mattel, Hilton, Marriot)	15.0
T22-04	Virco-Torrance Lateral	10.0
T22-06	Carson Mall Lateral	110.0
T22-07	Redondo Beach Lateral (Pete's Nursery)	25.0
T22-08	Mills Park Lateral	10.0
T22-09	Anza Lateral Phase II	80.0
T22-10	Anza PS (4-500 gpm pumps)	
T22-12	Main Street Carson Lateral	275.0
T22-13	Dominguez Street Lateral	260.0
T22-14	Caltrans Gardena Lateral	25.0
T22-15	Palos Verdes - Lateral 6B	670.0
T22-16	Palos Verdes PS (4-1,250 gpm pumps)	
T22-18A	Gardena Lateral - Normandie Ave	165.0
T22-18B	Gardena Lateral - Normandie and Vermont	70.0
T22-18C	Gardena Lateral - Van Ness	55.0
T22-19	Dyehouse Lateral	220.0
T22-20	Dyehouse PS (3-250 gpm pumps)	
T22-22	Hawthorne Lateral (Solec)	175.0
T22-25	LA Westside Lateral	5,500.0

Table 9.4 Details of Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Diameter	Special Const(1)	Length(2) (ft)
T22-14	Caltrans Gardena Lateral	8	-	215
		6		3,025
T22-01	Caltrans Inglewood Lateral	4	ART	771
T22-06	Carson Mall Lateral	6	-	1,259
		6	ART	1,623
		6	FWY	1,344
		16	-	1,555
		16	FWY	2,597
		8	-	1,508

Table 9.4 Details of Title 22 Laterals
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Project Description	Diameter	Special Const[1]	Length[2] (ft)
T22-19	Dyehouse Lateral	8	-	11,638
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	6	-	546
T22-02A	Mariposa Lateral (Mattel, Hilton, Marriot)	6	-	1,400
T22-02	El Segundo Lateral (Boeing, Kilroy Airport)	6	-	5,802
T22-22	Hawthorne Lateral (Solec)	6	-	5,055
T22-15	Palos Verdes - Lateral 6B	24	-	13,048
		20	-	1,417
		16	-	14,232
		12	-	13,642
T22-07	Redondo Beach Lateral (Pete's Nursery)	6	-	2,092
T22-04	Virco-Torrance Lateral	6	-	1,072
T22-08	Mills Park Lateral	6	-	864
T22-12	Main Street Carson Lateral	16	ART	8,452
		8	-	13,538
		8	ART	3,500
		6	-	9,156
		6	ART	2,195
T22-13	Dominguez Street Lateral	6	-	5,073
		8	-	5,887
		8	RR	3,322
T22-18B	Gardena Lateral - Normandie and Vermont	6	-	11,908
		6	ART	2,243
		4	-	5,072
T22-18A	Gardena Lateral - Normandie Ave	8	-	8,235
		8	ART	915
T22-18C	Gardena Lateral - Van Ness	6	-	12,784
		4	-	1,742
T22-25	LA Westside Lateral	24	-	25,802
		36	-	12,721
		36	FWY	1,000
		36	RR	500
T22-09	Anza Lateral Phase II	8	-	8,002
		6	-	7,167
		4	-	698
Total				**234,618**

Notes:
1. Special Construction Markup Abbreviations: ART – Arterial Street requiring extensive temporary traffic control or alternate construction hours (125% of unit cost for distance of crossing or distance along street); RR – Railroad Crossing requiring jack and bore or alternate trenchless construction techniques (200% of unit cost for distance of crossing).FWY – Freeway Crossing requiring jack and bore or alternate trenchless construction techniques (200% of unit cost for distance of crossing).
2. Totals may not line up with Table 9.37 due to rounding.

As shown in Table 9.4, the total length of new Title 22 laterals is estimated at 235,000 lineal feet or 44 miles.

9.1.3 West Coast Barrier System

Table 9.5 presents the list of recommended improvements to the West Coast Barrier distribution system and treatment processes.

Table 9.5 Project Summary for West Coast Barrier System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost
BW-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	FY10/11	Add VFDs to product water pumps	$700,000(1)
BW-04	FY10/11	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000(1)
Total			**$32,675,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.5, the total anticipated cost for the recommended improvements for the West Coast Barrier System are approximately $32.7 M. The most costly project of the projects proposed for the West Coast Barrier Water System is the Phase V Treatment Expansion Project (BW-01).

For BW-01, the cost estimate shown is from the ELWRF Phase V Expansion Feasibility Study (HDR 2008) and was not estimated as a part of this study. Costs for expansion of the Barrier product water pump station are assumed to be included in the capital cost shown. This project is anticipated to be completed as a part of the ELWRF Phase V Expansion.

9.1.4 Chevron High Pressure Boiler Feed System

Table 9.6 presents the list of recommended improvements to the Chevron HPBF distribution system and treatment processes.

Table 9.6		**Project Summary for CHPBF System Capital Implementation Master Plan West Basin Municipal Water District**	
ID	**Phase**	**Project Description**	**Capital Cost**
CH-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	FY10/11	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000(1)
Total			**$3,350,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.6, the total anticipated cost for improvements for the CHPBF is approximately $3.4M. The most costly component is the additional treatment capacity. Phasing of these improvements is coordinated with the ELWRF Phase V Expansion.

The cost estimate for CH-01 was provided by West Basin staff and is based on cost estimates prepared during ELWRF Phase V Expansion Feasibility Study phase.

9.1.5 Chevron Low Pressure Boiler Feed System

Table 9.7 presents the list of recommended improvements to the Chevron LPBF distribution system and treatment processes, excluding improvements to the system for the addition of the El Segundo Power Plant, which are addressed in Section 9.1.6.

Table 9.7		**Project Summary for CLPBF System Capital Implementation Master Plan West Basin Municipal Water District**	
ID	**Phase**	**Project Description**	**Capital Cost**
CL-01	FY10/11	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	FY10/11	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000(1)
Total			**$2,100,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.7, the total anticipated cost for improvements at the CLPBF is approximately $2.1 M. The most costly component is the additional treatment capacity. Phasing of these improvements is coordinated with the ELWRF Phase V Expansion.

The cost estimate for CL-01 was provided by West Basin staff and is based on cost estimates prepared during ELWRF Phase V Expansion Feasibility Study phase.

Figure 9.2 shows locations of each of the recommended improvements from Table 9.7.

9.1.6 El Segundo Power Plant Boiler Feed System

Table 9.8 presents the list of recommended improvements to the El Segundo Power Plant Boiler Feed System distribution system. Pump station costs are included with upgrades to the Chevron Low Pressure Boiler Feed System, found in Table 9.7.

Table 9.8 Project Summary for ESPP System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
ESPP-01	FY15-20	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	FY15-20	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	FY15-20	PRV at Chevron	$80,000
Total			**$5,875,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.8, the total anticipated cost for improvements to serve El Segundo Power Plant is approximately $5.9 M. The most costly component is the pipeline from the CLPBF system to the El Segundo Power Plant.

For ESPP-01, the cost estimate shown is from the ELWRF Phase V Expansion Study and was not estimated as a part of this study. Figure 9.2 shows locations of each of the recommended improvements from Table 9.8.

carollo
in association with
AKM SPi

Figure 9.2
Chevron LPBF & ESPP
CIP Projects

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

9.1.7 Chevron Nitrified Water System

Table 9.9 presents the list of recommended improvements to the Chevron Nitrified Water distribution system. Recommended improvements for treatment, backup power, and replacement equipment for the Chevron Nitrification Facility are included in Table 9.18.

Table 9.9 Project Summary for Chevron Nitrified Water System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
CN-01	FY10/11	Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	$1,575,000
Total			**$1,575,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.9, the total anticipated cost for improvements at the CNS is approximately $1.6M. The only recommendation for this distribution system is upgrade of the pump station. Phasing of this improvement is coordinated with the ELWRF Phase V Expansion. It should be noted that the improvements associated with the Chevron Nitrification Facility are listed in Section 9.1.16.

9.1.8 ELWRF Brine Line

Table 9.10 presents the list of recommended improvements to the ELWRF Brine Line system. Recommended improvements for treatment, backup power, and replacement equipment for this system are included in the ELWRF improvement list in Table 9.15.

Table 9.10 Project Summary for ELWRF Brine Line
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
EBRN-01	FY10/11	Install pinch valves/reducers	$630,000
EBRN-02	FY11/12	Install access ports for cleaning	$1,885,000
Total			**$2,515,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.10, the total anticipated cost for improvements in the ELWRF Brine Line system is approximately $2.5 M.

9.1.9 bp Reverse Osmosis System

Table 9.11 presents the list of recommended improvements to the bp RO system.

Table 9.11 Project Summary for bp Reverse Osmosis System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
BPRO-01	FY11/12	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	$73,080,000
BPRO-02	FY11/12	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$8,705,000
BPRO-03	FY11/12	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$4,200,000
Total			**$85,985,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.11, the total anticipated cost for improvements in the bp RO system is approximately $86.0 M. The most costly component is the treatment associated with supplying Industrial RO water at the JWPCP. It is important to note that under supply alternative Option 1, discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF, but the MF/RO treatment at JWPCP incorporates both SE treatment and Industrial RO treatment into one process. Phasing of these improvements are coordinated with the CRWRF Phase II Expansion.

9.1.10 bp Nitrified Water System

Table 9.12 presents the list of recommended improvements to the bp Nitrified water system.

As presented in Table 9.12, the total anticipated cost for improvements in the bp Nitrified system is approximately $48.0 M. The most costly component is the treatment associated with supplying MF water at the JWPCP to the Nitrification process. It is important to note that under supply alternative Option 1, discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF. Phasing of these improvements are coordinated with the CRWRF Phase II Expansion.

Table 9.12 Project Summary for bp Nitrified Water System
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
BPN-01	FY11/12	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	$16,800,000
BPN-02	FY11/12	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	$12,205,000
BPN-03	FY11/12	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$9,535,000
BPN-03A	FY11/12	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	$4,245,000
BPN-04	FY11/12	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	$3,150,000
BPN-05	FY11/12	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	$2,100,000
Total			**$48,035,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

The 14-inch diameter parallel pipeline from CRWRF to Gate 7 at the bp Carson Refinery would provide redundancy to the current 12-inch diameter pipeline used for conveyance of Nitrified Water. The configuration of the projects listed in Table 9.12 will need to be established during preliminary design.

9.1.11 CRWRF Brine Line

Table 9.13 presents the list of recommended improvements to the CRWRF Brine Line system. Recommended improvements for treatment, backup power, and replacement equipment for this system are included in the CRWRF improvement list in Table 9.16.

As presented in Table 9.13, the total anticipated cost for improvements in the CRWRF Brine Line system is approximately $1.3M. Phasing of these improvements is coordinated with the CRWRF Phase II Expansion.

Table 9.13	Project Summary for CRWRF Brine Line Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost[(1)]**
CBRN-01	FY11/12	Install access ports for cleaning	$1,260,000
Total			**$1,260,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As discussed in Chapter 8, sufficient pressure is available at the CRWRF RO process train to convey the additional flow anticipated for this system. Costs for reconfiguring the RO process train to provide additional head for this system are assumed minimal and thus not included in the CIP.

9.1.12 System-Wide Improvements

Table 9.14 presents a list of recommended improvements which apply to more than one West Basin facility.

Table 9.14	Project Summary for System-Wide Improvements Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost**
SW-01	Mult	United Water Recapitalization Improvements (recurring)	$4,230,000
SW-02	FY09/10	UW Recap - Major Painting Projects	$150,000
SW-03	FY09/10	UW Recap - Purchase trailer for spill response	$5,000
SW-04	FY09/10	UW Recap - Asset Management Software, Implementation and Training	$300,000
SW-05	FY09/10	UW Recap - Replace all Biofor valves at CNF and EMWRF	$200,000
SW-06	Mult	United Water Recapitalization Improvements (recurring)	$4,230,000
Total			**$9,115,000**

As shown in Table 9.14, the costs for improvements associated with more than one facility total $9.1M. The system-wide improvements consist solely of recapitalization improvements, identified by United Water (UW), West Basin's system operator. These are improvements requested by United Water and are listed individually for FY0910. For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY1415, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in SW-01 and SW-06 (listed as two separate projects to separate the costs for FY1415 through FY1920 and FY2021 through FY2930). United Water projects are listed similarly for all treatment facilities. For a summary of these project costs by treatment facility and other recurring costs, see Section 9.3.4.

9.1.13 ELWRF

The recommended projects for ELWRF are listed in Table 9.15.

As presented in Table 9.15, the total anticipated cost for improvements for ELWRF is anticipated to be approximately $276.2 M. Phasing of improvements related to Phase V are coordinated with the ELWRF Phase V Expansion, and are included in the relevant subsystems (i.e., Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6). A summary of items included in the Phase V expansion are included in Section 9.3.3).

Table 9.15 does not include treatment expansions at ELWRF associated with subsystems, as detailed in Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6. The total cost of all projects physically located at ELWRF, including projects listed in detailed in Sections 9.1.3, 9.1.4, 9.1.5, and 9.1.6, is estimated to be $316.2 M (excluding the Title 22 pump station and storage).

Table 9.15 Project Summary for ELWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
ELWRF-01	FY09/10	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	$100,000
ELWRF-03	FY10/11	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
ELWRF-04	FY10/11	ELWRF Phase V Expansion - Resolve underperformance of baskwash equalization basin.	$170,000
ELWRF-05	FY10/11	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-06	FY10/11	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	$100,000
ELWRF-07	FY12/13	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
ELWRF-09	FY15-20	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	$48,440,000

Table 9.15 Project Summary for ELWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost[(1)]
ELWRF-10	FY15-20	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	$14,340,000
ELWRF-11	FY15-20	Microfiltration - Replace existing Phase II and III MF System w/ Pressurized System	$16,800,000
ELWRF-12	FY15-20	Backup Power	$11,200,000
ELWRF-13	FY15-20	Dewatered Sludge Handling Transfer System	$2,800,000
ELWRF-15	FY15-20	Potable Water Connection to ELWRF	$280,000
ELWRF-16	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$21,860,000
ELWRF-17	Mult	Membrane Replacement (recurring)	$11,053,800
ELWRF-18	Mult	United Water Recapitalization Improvements (recurring)	$5,070,000
ELWRF-19	FY09/10	UW Recap - Pave area between T 22 filters and the holding basins	$8,800
ELWRF-20	FY09/10	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	$100,000
ELWRF-21	FY09/10	UW Recap - Phase III Memcor and SCADA and PC	$5,000
ELWRF-22	FY09/10	UW Recap - No. 3 Sulfuric acid day tank replace	$30,000
ELWRF-23	FY09/10	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	$40,000
ELWRF-24	FY09/10	UW Recap - Trench Drains at Decant Sump area	$30,000
ELWRF-25	FY09/10	UW Recap - Power receptacles for emergency generator hook up for Title 22	$20,000
ELWRF-26	FY09/10	UW Recap - Replace DCS back up power (48vac) generator	$45,000
ELWRF-27	FY09/10	UW Recap - Flow control valve and actuator for barrier product pump	$100,000
ELWRF-28	FY09/10	UW Recap - Replace or expand plant instrument air compressor system	$75,000
ELWRF-29	FY09/10	UW Recap - Replace phase II RO Membranes	$375,000
ELWRF-30	FY09/10	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	$25,000
ELWRF-31	FY09/10	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	$25,000
ELWRF-32	FY20-25	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	$9,600,000

Table 9.15	Project Summary for ELWRF Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost[1]**
ELWRF-33	FY25-30	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	$16,800,000
ELWRF-34	FY25-30	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	$24,945,000
ELWRF-35	FY25-30	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	$42,970,000
ELWRF-36	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$17,965,000
ELWRF-37	Mult	Membrane Replacement (recurring)	$11,055,000
ELWRF-38	Mult	United Water Recapitalization Improvements (recurring)	$5,070,000
Total			**$276,197,600**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Recapitalization improvements requested by United Water are listed individually for FY09/10 (ELWRF-19 through ELWRF-31). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in ELWRF-18 and ELWRF-38 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.14 CRWRF

The recommended projects for CRWRF are listed in Table 9.16. As seen in Table 9.16, the total anticipated cost for improvements for CRWRF is anticipated to be approximately $126.1 M. The most costly recommendation for this distribution system is the Nitrified treatment for future Nitrified water demands served by CRWRF.

Table 9.15 does not include treatment expansions at the NTP, which are detailed in Sections 9.1.9 and 9.1.10. If the JWPCP secondary source is not utilized for service to bp and Dominguez Gap Barrier, most of the NTP projects would need to be redefined and included at CRWRF.

Figure 9.3 shows the proposed alignment of the pipeline required to convey recycled water to the boundary between the cities of Carson and Los Angeles to deliver the LADWP Harbor demand. This figure also shows the alignment of the pipeline to serve the bp Nitrification demands (listed in Table 9.12, with the bp Nitrified water distribution system) associated with the NTP. It should be noted that the actual locations of the NTP and the pipeline would need to be determined during preliminary design of these projects.

Table 9.16 Project Summary for CRWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Year / Phase	Project Description	Capital Cost(1)
CRWRF-01	FY11/12	Pipeline for LADWP Harbor demands at Carson City bndy	$29,100,000
CRWRF-02	FY11/12	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$43,141,278
CRWRF-03	FY11/12	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$5,250,000
CRWRF-04	FY11/12	Surge Protection – Modify MF Units with Break Tank and Pumps	$6,300,000
CRWRF-05	FY11/12	Raw Water Storage (1 hour)	$5,250,000
CRWRF-06	FY11/12	Repair Nitrified Product Water Storage Tank	$560,000
CRWRF-07	FY15-20	Backup Power	$2,520,000
CRWRF-08	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,375,000
CRWRF-09	Mult	Membrane Replacement (recurring)	$2,799,000
CRWRF-10	Mult	United Water Recapitalization Improvements (recurring)	$1,690,000
CRWRF-11	FY09/10	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	$10,000
CRWRF-12A	FY20-25	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	$10,480,000
CRWRF-12B	FY20-25	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$4,200,000
CRWRF-13	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$3,895,000
CRWRF-14	Mult	Membrane Replacement (recurring)	$2,800,000
CRWRF-15	Mult	United Water Recapitalization Improvements (recurring)	$1,690,000
Total			**$126,060,278**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Recapitalization improvements requested by United Water are listed individually for FY09/10 (CRWRF-11). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in CRWRF-10 and CRWRF-15 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.15 EMWRF

Table 9.17 presents the list of recommended improvements to EMWRF.

Table 9.17 Project Summary for EMWRF
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
EMWRF-01	FY11/12	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	$700,000
EMWRF-02	FY11/12	Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
EMWRF-03	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,980,000
EMWRF-04	FY15-20	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	$1,890,000
EMWRF-05	FY15-20	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	$735,000
EMWRF-06	FY15-20	Surge Protection - Modify MF Units with Break Tank and Pumps	$3,500,000
EMWRF-07	FY15-20	Backup Power for Product Water Pumps	$700,000
EMWRF-08	Mult	Membrane Replacement (recurring)	$1,650,000
EMWRF-09	Mult	United Water Recapitalization Improvements (recurring)	$850,000
EMWRF-10	FY09/10	UW Recap - Pavement of area between gated entrance and plant.	$20,000
EMWRF-11	FY09/10	UW Recap - Add an additional air compressor for the MF system	$30,000
EMWRF-12	FY09/10	UW Recap - RO Train 4 membrane change out	$160,000
EMWRF-13	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$3,265,000
EMWRF-14	Mult	Membrane Replacement (recurring)	$1,650,000
EMWRF-15	Mult	United Water Recapitalization Improvements (recurring)	$850,000
Total			**$23,065,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.17, the total anticipated cost for improvements for EMWRF is anticipated to be approximately $23.1 M. Projects EMWRF-04 and EMWRF-05 are included to accommodate potential expansion of the capacity of EMWRF. It should be noted that, as the projects due to growth or expansion anticipated at EMWRF are not associated with demands listed in the customer database, no analysis or hydraulic evaluation associated with the effects of these demands was conducted (these demands are not mentioned in Chapters 3, 4, or 8). All remaining projects are either replacement or rehabilitation of existing equipment, as planned by the condition assessment, reliability projects, or surge reduction projects to reduce surges to the Title 22 distribution system (i.e., EMWRF-06).

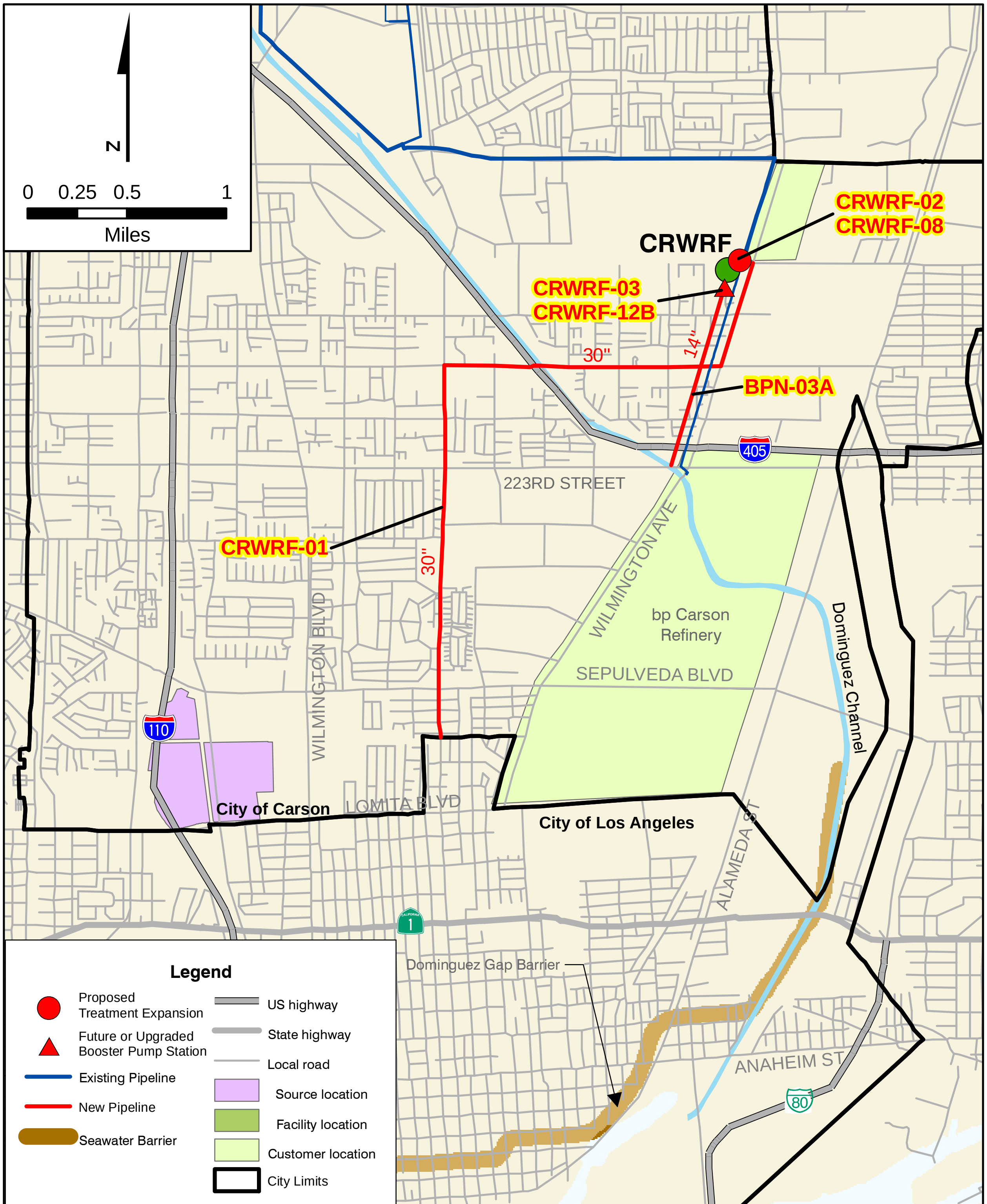
Recapitalization improvements requested by United Water are listed individually for FY09/10 (EMWRF-10 through EMWRF-12). For conservative planning purposes, it is assumed a similar cost will occur approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in EMWRF-09 and EMWRF-15 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.16 CNF

Table 9.18 presents the list of recommended improvements to CNF.

As presented in Table 9.17, the total anticipated cost for improvements for CNF is anticipated to be approximately $11.5 M. The vast majority of this cost is in replacement of existing equipment, as planned by the condition assessment. However, the costs for expansion of Nitrified treatment capacity are also significant. These improvements are described as the ELWRF Phase Va Expansion.

It should be noted that costs associated with the Chevron Nitrified Water system (consisting solely of expansion of the Nitrified water product water pump station) are included in Section 9.1.7, even though they are geographically located at the CNF. Since the Chevron Nitrified Water system costs total $1.7 M, the total cost of all improvements anticipated at the CNF is estimated to be $13.1 M.



carollo
in association with
AKM SPi

Figure 9.3
Carson Regional Water Recycling Facility (CRWRF) Area CIP

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Table 9.18	Project Summary for CNF Capital Implementation Master Plan West Basin Municipal Water District		
ID	**Phase**	**Project Description**	**Capital Cost[1]**
CNF-01	FY15-20	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	$3,090,000
CNF-02	FY15-20	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	$700,000
CNF-03	FY10/11	ELWRF Phase Va Expansion - Replace Turbine	$700,000
CNF-04	FY15-20	ELWRF Phase Va Expansion - Potable Water Backup Supply	$350,000
CNF-05	FY11/12	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
CNF-06	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$4,520,000
CNF-07	Mult	United Water Recapitalization Improvements (recurring)	$850,000
CNF-08	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$350,000
CNF-09	Mult	United Water Recapitalization Improvements (recurring)	$850,000
Total			**$11,495,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

No recapitalization improvements requested by United Water are included for CNF. For conservative planning purposes, it is assumed United Water costs will be required in future years, similar to West Basin's other treatment facilities approximately every five years through the planning horizon, in FY14/15, FY15-20, FY20-25, and FY25-30. The total capital cost of the recurrence of these items is summarized in CNF-07 and CNF-09 (listed as two separate projects to separate the costs for FY14/15 through FY19/20 and FY20/21 through FY29/30). For detailed information on the development of recurring costs, see Section 9.3.4.

9.1.17 New Treatment Plant System

A new treatment plant (NTP) is needed to cost-effectively meet expanded advanced treatment demands in the south-east portion of West Basin's service area. As discussed in Chapter 8, it was determined that it would be most beneficial to add additional treatment on the south-east side to the West Basin recycled water system by treating secondary effluent from the Los Angeles County Sanitation District's JWPCP. This would provide cost savings and increase the overall system reliability. Sizing of the NTP is discussed in Section 8.4.1. The major recommended components for this treatment plant and associated distribution system are listed in Table 9.19. Treatment, pump station, and pipeline improvements associated with specific distribution systems are included separately with those distribution systems (i.e., Sections 9.1.9 and 9.1.10).

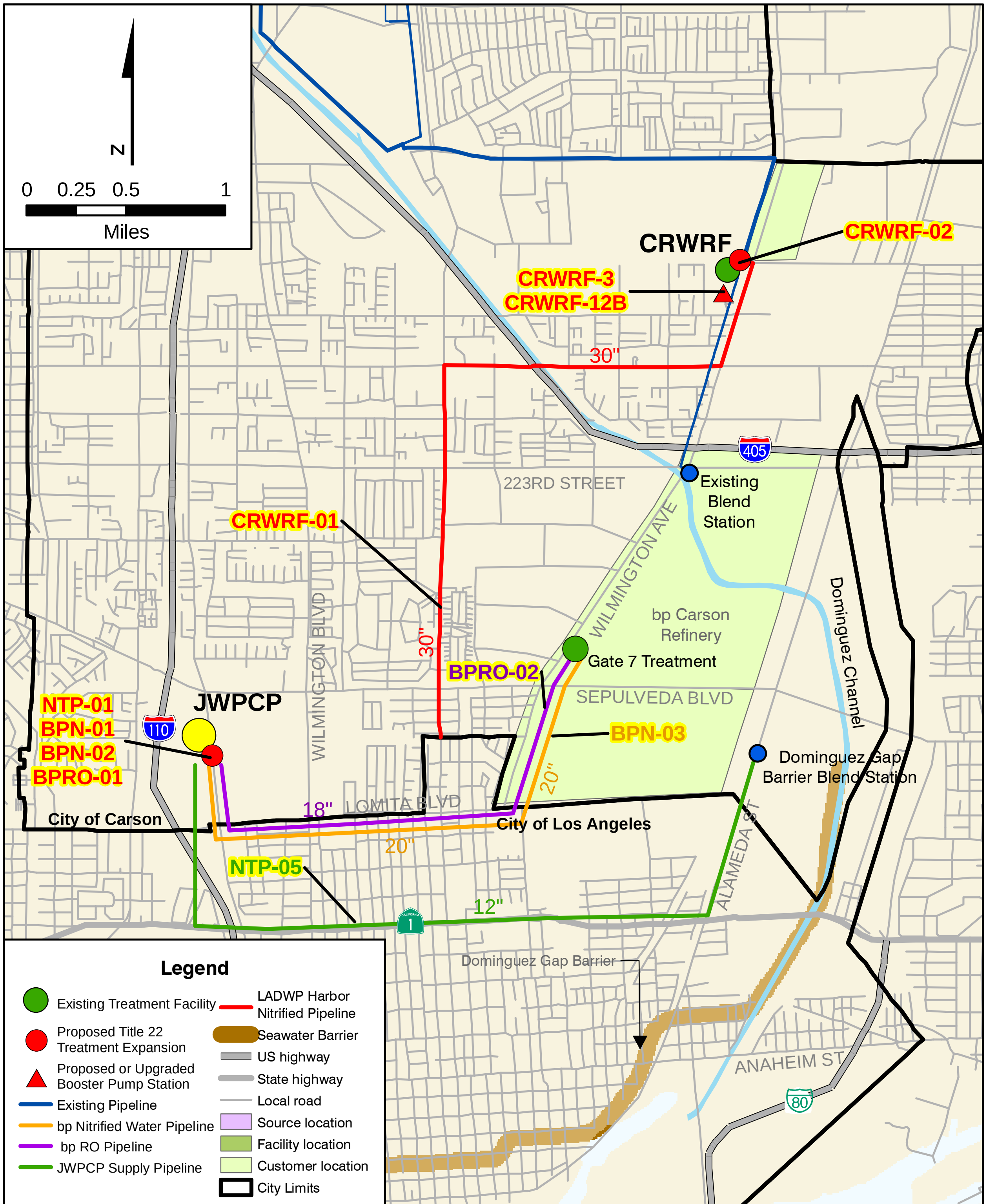
Table 9.19 Project Summary for the New Treatment Plant
Capital Implementation Master Plan
West Basin Municipal Water District

ID	Phase	Project Description	Capital Cost(1)
NTP-01	FY11/12	Land Acquisition of 4.5 ac near JWPCP for NTP	$4,800,000
NTP-02	Mult	Membrane Replacement (recurring)	$8,525,000
NTP-03	FY20-25	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	$34,125,000
NTP-04	FY20-25	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2,100,000
NTP-05	FY20-25	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$9,640,000
NTP-06	Mult	Membrane Replacement (recurring)	$17,050,000
Total			**$76,240,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.19, the total anticipated cost for improvements for the NTP is approximately $76.2 M. The most costly recommendation listed in Table 9.19 is the treatment costs associated with the Dominguez Gap Barrier. However, treatment capacities for the bp Nitrified water system and bp RO system are listed separately in Sections 9.1.9 and 9.1.10 although they would be geographically located at the NTP.

The total cost of all improvements located at the NTP is estimated to be $187.8 M. It is important to note that under supply alternative Option 1, as discussed in Section 8.4, this cost would be partially encountered through expansion of the conventional Title 22 treatment processes at ELWRF. Phasing of these improvements is coordinated with the CRWRF Phase II Expansion.



carollo
in association with
AKM SPi

Figure 9.4
New Treatment Plant (NTP) Area CIP

West Basin Municipal Water District
Capital Implementation Master Plan For Recycled Water Systems

Based on the modeling conducted with *OPTIMO*™, the major treatment process components that would need to be included in this NTP are:

- Microfiltration (MF)
- Reverse Osmosis (RO)
- MF Backwash Disposal
- RO Brine Disposal
- Disinfection

This NTP could be located at or in the vicinity of JWPCP, CRWRF, or along the transmission main alignment between the two plants. The preliminary locations of the facilities are shown on Figure 9.4. It should be noted that the actual locations of the NTP and the associated pipelines would need to be determined during preliminary design of these projects.

9.1.18 CIP Summary by System

The total estimated capital cost for the proposed projects of each of the systems described in Sections 9.1.1through 9.1.16 are summarized in Table 9.20.

Table 9.20 Project Summary by System
Capital Implementation Master Plan
West Basin Municipal Water District

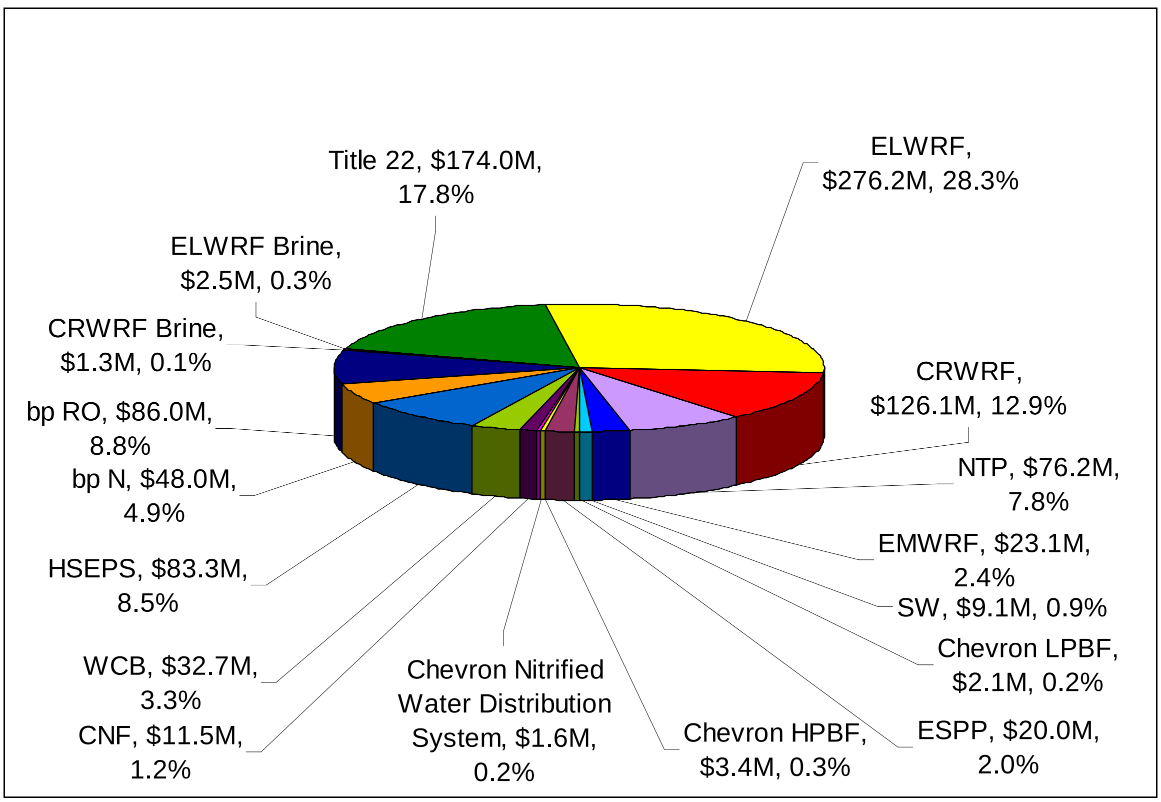
Facility ID	System/Treatment Plant Name	No. of Projects	Capital Cost(1)	Percentage of Total
HPS	Hyperion Secondary Effluent Pumping System	7	$83,320,000	8.6%
T22	Title 22 Distribution System	27	$174,000,000	18.1%
BW	West Coast Barrier Water System	3	$32,675,000	3.4%
CH	Chevron High Pressure Boiler Feed System	2	$3,350,000	0.3%
CL	Chevron Low Pressure Boiler Feed System	2	$2,100,000	0.2%
ESPP	El Segundo Power Plant System	3	$5,875,000	0.6%
CN	Chevron Nitrified Water System	1	$1,575,000	0.2%
EBRN	ELWRF Brine Line	2	$2,515,000	0.3%
BPRO	bp RO System	3	$85,985,000	8.9%
BPN	bp Nitrified Water System	6	$48,035,000	5.0%
CBRN	CRWRF Brine Line	1	$1,260,000	0.1%
SW	System Wide Improvements	6	$9,115,000	0.9%
ELWRF	Edward C. Little Water Recycling Facility	35	$276,197,600	28.7%
CRWRF	Carson Regional Water Recycling	16	$126,060,278	13.1%

Table 9.20	Project Summary by System Capital Implementation Master Plan West Basin Municipal Water District			
Facility ID	**System/Treatment Plant Name**	**No. of Projects**	**Capital Cost(1)**	**Percentage of Total**
	Facility			
EMWRF	ExxonMobil Water Recycling Facility	15	$23,065,000	2.4%
CNF	Chevron Nitrification Facility	9	$11,495,000	1.2%
NTP	New Treatment Plant	6	$76,240,000	7.9%
Total		**144**	**$962,862,878**	**100.0%**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.20, the total capital cost for all facilities is estimated at approximately $963.0 M. Figure 9.5 shows the distribution of these capital costs by system.

Figure 9.5
Distribution of Capital Costs by System



As shown in Figure 9.5, more than half of the total CIP costs are contributed by four of the fifteen systems, the Title 22 system, ELWRF, CRWRF, and the NTP.

9.2 PHASING OF RECOMMENDATIONS

This CIP is divided into six 1-year planning periods from Fiscal Year (FY) 2009/2010 through FY 2014/2015, and three 5-year planning periods from FY2015/2016 through FY 2025/2030. The phasing for a large number of projects is related to the phasing of the CRWRF Phase II Expansion project, for which the Carson Regional WRF Expansion Feasibility Study should be completed in April 2009. Project phasing is also based on the anticipated year that customers could be connected as determined in discussions with West Basin staff and as listed in Chapter 3.

This section presents a summary of the CIP projects by planning phase.

9.2.1 CIP Projects for FY09/10

Table 9.21 presents the CIP projects phased in FY2009/2010 (FY09/10).

Table 9.21 CIP Projects for FY09/10
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
T22-02A	T22	Mariposa Lateral (Mattel, Hilton, Marriot)	$750,000
T22-06	T22	Carson Mall Lateral	$2,500,000
T22-09	T22	Anza Lateral Phase II	$3,500,000
T22-10	T22	Anza PS (4-500 gpm pumps)	$2,000,000
T22-19	T22	Dyehouse Lateral	$3,000,000
T22-20	T22	Dyehouse PS (3-250 gpm pumps)	$1,500,000
Subtotal – Title 22 Distribution System			***$13,250,000***
ELWRF-01	ELWRF	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	$100,000
ELWRF-19	ELWRF	UW Recap - Pave area between T 22 filters and the holding basins	$8,800
ELWRF-20	ELWRF	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	$100,000
ELWRF-21	ELWRF	UW Recap - Phase III Memcor and SCADA and PC	$5,000
ELWRF-22	ELWRF	UW Recap - No. 3 Sulfuric acid day tank replace	$30,000
ELWRF-23	ELWRF	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	$40,000
ELWRF-24	ELWRF	UW Recap - Trench Drains at Decant	$30,000

Table 9.21 CIP Projects for FY09/10
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
		Sump area	
ELWRF-25	ELWRF	UW Recap - Power receptacles for emergency generator hook up for Title 22	$20,000
ELWRF-26	ELWRF	UW Recap - Replace DCS back up power (48vac) generator	$45,000
ELWRF-27	ELWRF	UW Recap - Flow control valve and actuator for barrier product pump	$100,000
ELWRF-28	ELWRF	UW Recap - Replace or expand plant instrument air compressor system	$75,000
ELWRF-29	ELWRF	UW Recap - Replace phase II RO Membranes	$375,000
ELWRF-30	ELWRF	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	$25,000
ELWRF-31	ELWRF	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	$25,000
CRWRF-11	CRWRF	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	$10,000
EMWRF-10	EMWRF	UW Recap - Pavement of area between gated entrance and plant.	$20,000
EMWRF-11	EMWRF	UW Recap - Add an additional air compressor for the MF system	$30,000
EMWRF-12	EMWRF	UW Recap - RO Train 4 membrane change out	$160,000
SW-02	SW	UW Recap - Major Painting Projects	$150,000
SW-03	SW	UW Recap - Purchase trailer for spill response	$5,000
SW-04	SW	UW Recap - Asset Management Software, Implementation and Training	$300,000
SW-05	SW	UW Recap - Replace all Biofor valves at CNF and EMWRF	$200,000
Subtotal – United Water Recapitalization Improvements			***$1,853,800***
Total			**$15,103,800**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.21, projects currently anticipated in FY09/10 include only rehabilitation and recapitalization projects. These projects total $15.1M. The projects listed for FY09/10 are either Title 22 distribution system improvements or United Water recapitalization improvements.

9.2.2 CIP Projects for FY10/11

Table 9.22 presents the CIP projects phased in FY2010/2011 (FY10/11).

Table 9.22 CIP Projects for FY10/11
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
CL-01	CL	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	CL	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000
CH-01	CH	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	CH	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000
CN-01	CN	ELWRF Phase Va Expansion - Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	$1,575,000
CNF-03	CNF	ELWRF Phase Va Expansion - Replace Turbine	$700,000
BW-01	BW	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	BW	Add VFDs to product water pumps	$700,000
BW-04	BW	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000
HPS-01	HPS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
HPS-03	HPS	Secondary Power Connection for Backup Power	$2,520,000
HPS-04	HPS	PS Building	$560,000
EBRN-01	EBRN	Install pinch valves/reducers	$630,000
T22-04	T22	Virco-Torrance Lateral	$340,000
T22-13	T22	Dominguez Street Lateral	$4,500,000
ELWRF-03	ELWRF	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
ELWRF-04	ELWRF	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	$170,000

Table 9.22	CIP Projects for FY10/11 Capital Implementation Master Plan West Basin Municipal Water District		
ID	**System**	**Project Description**	**Capital Cost[1]**
ELWRF-05	ELWRF	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-06	ELWRF	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	$100,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$1,340,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$68,910,280**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Recurrence for United Water improvements is assumed to be every five years.

As presented in Table 9.22, the total anticipated cost for the project recommended for phase FY10/11 are approximately $68.9 M. The most costly projects proposed for this phase are associated with the ELWRF Phase V Expansion.

9.2.3 CIP Projects for FY11/12

Table 9.23 presents the CIP projects phased in FY2011/2012 (FY11/12).

As presented in Table 9.23, the total anticipated cost for the project recommended for phase FY11/12 are approximately $251.9 M. The most costly projects proposed for this phase are associated with the bp / CRWRF expansion.

9.2.4 CIP Projects for FY12/13

Table 9.24 presents the rehabilitation and recapitalization projects anticipated in FY2012/2013 (FY12/13).

Table 9.23 CIP Projects for FY11/12
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
CNF-05	CNF	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
HPS-05	HPS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	$14,700,000
BPN-01	BPN	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	$16,800,000
BPN-02	BPN	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	$12,205,000
BPN-03	BPN	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	$9,535,000
BPN-03A	BPN	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	$4,245,000
BPN-04	BPN	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	$3,150,000
BPN-05	BPN	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	$2,100,000
BPRO-01	BPRO	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	$73,080,000
BPRO-02	BPRO	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	$8,705,000
BPRO-03	BPRO	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	$4,200,000
CBRN-01	CBRN	Install access ports for cleaning	$1,260,000
EBRN-02	EBRN	Install access ports for cleaning	$1,885,000
T22-02	T22	El Segundo Lateral (Boeing, Kilroy Airport)	$1,500,000
T22-07	T22	Redondo Beach Lateral (Pete's Nursery)	$660,000
T22-08	T22	Mills Park Lateral	$245,000
CRWRF-01	CRWRF	Pipeline for LADWP Harbor demands at Carson City bndy	$29,100,000
CRWRF-02	CRWRF	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	$43,141,278
CRWRF-03	CRWRF	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$5,250,000

Table 9.23	CIP Projects for FY11/12 Capital Implementation Master Plan West Basin Municipal Water District		
ID	**System**	**Project Description**	**Capital Cost[1]**
CRWRF-04	CRWRF	Surge Protection - Modify MF Units with Break Tank and Pumps	$6,300,000
CRWRF-05	CRWRF	Raw Water Storage (1 hour)	$5,250,000
CRWRF-06	CRWRF	Repair Nitrified Product Water Storage Tank	$560,000
NTP-01	NTP	Land Acquisition of 4.5 ac near JWPCP for NTP	$4,800,000
EMWRF-01	EMWRF	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	$700,000
EMWRF-02	EMWRF	Inspect Nitrified Product Water Storage Tank Internal Condition	$85,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$775,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$251,866,558**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

Table 9.24	CIP Projects for FY12/13 Capital Implementation Master Plan West Basin Municipal Water District		
ID	**System**	**Project Description**	**Capital Cost[1]**
T22-01	T22	Caltrans Inglewood Lateral	$260,000
T22-11	T22	Chlorination Stations (Phase I)	$1,960,000
ELWRF-07	ELWRF	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$345,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$16,715,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.24, the total anticipated cost for the projects recommended for phase FY12/13 is approximately $16.7 M. Recommendations in this planning year consist primarily of improvements to the Title 22 distribution system and treatment processes. Project ELWRF-07, the Title 22 High Rate Clarifier is triggered by growth in Title 22 demand, with the total Title 22 demand exceeding 30.0 mgd in this planning year.

9.2.5 CIP Projects for FY13/14

Table 9.25 presents the rehabilitation and recapitalization projects anticipated in FY2013/2014 (FY13/14).

Table 9.25 CIP Projects for FY13/14
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
T22-12	T22	Main Street Carson Lateral	$17,075,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$6,895,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$25,520,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.25, the total anticipated cost for the projects recommended for phase FY13/14 is approximately $25.5M. Recommendations for this planning period consist of the Main Street Carson Lateral, and equipment rehabilitation and replacement estimates and ongoing membrane replacement.

9.2.6 CIP Projects for FY14/15

Table 9.25 presents the rehabilitation and recapitalization projects anticipated in FY2014/2015 (FY14/15).

Table 9.26 CIP Projects for FY14/15
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
T22-14	T22	Caltrans Gardena Lateral	$985,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$1,110,000
Mult	Mult	Membrane Replacement (recurring)	$1,550,280
Total			**$9,990,280**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As shown in Table 9.25, the total anticipated cost for the projects recommended for phase FY14/15 is approximately $10.0 M. Recommendations for this planning period consist of a Title 22 lateral, triggered by individual customers estimated date of connection (as detailed in the customer database), and equipment rehabilitation and replacement estimates. United Water recapitalization recurrences also occur in this year, as they are assumed to recur every five years.

9.2.7 CIP Projects for FY15/20

Table 9.27 presents the CIP projects phased in FY2015/2020 (FY15/20).

Table 9.27 CIP Projects for FY15/20
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost(1)
ESPP-01	ESPP	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	ESPP	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	ESPP	PRV at Chevron	$80,000
CNF-01	CNF	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	$3,090,000
CNF-02	CNF	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	$700,000
CNF-04	CNF	ELWRF Phase Va Expansion - Potable Water Backup Supply	$350,000
T22-15	T22	Palos Verdes - Lateral 6B	$27,290,000
T22-16	T22	Palos Verdes PS (4-1,250 gpm pumps)	$4,900,000
T22-17	T22	Increase Title 22 product water storage by 5.0 MG	$10,500,000
T22-18A	T22	Gardena Lateral - Normandie Ave	$3,635,000
T22-18B	T22	Gardena Lateral - Normandie and Vermont	$6,170,000
T22-18C	T22	Gardena Lateral - Van Ness	$4,480,000
T22-21	T22	Chlorination Stations (Phase II)	$1,960,000
T22-22	T22	Hawthorne Lateral (Solec)	$1,595,000
T22-23	T22	Title-22 PS Discharge Pipeline Modification	$465,000
ELWRF-09	ELWRF	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	$48,440,000

Table 9.27	CIP Projects for FY15/20 Capital Implementation Master Plan West Basin Municipal Water District		
ID	**System**	**Project Description**	**Capital Cost(1)**
ELWRF-10	ELWRF	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	$14,340,000
ELWRF-11	ELWRF	Microfiltration - Replace existing Phase II and III MF System w/ Pressurized System	$16,800,000
ELWRF-12	ELWRF	Backup Power	$11,200,000
ELWRF-13	ELWRF	Dewatered Sludge Handling Transfer System	$2,800,000
ELWRF-15	ELWRF	Potable Water Connection to ELWRF	$280,000
CRWRF-07	CRWRF	Backup Power	$2,520,000
EMWRF-04	EMWRF	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	$1,890,000
EMWRF-05	EMWRF	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	$735,000
EMWRF-06	EMWRF	Surge Protection - Modify MF Units with Break Tank and Pumps	$3,500,000
EMWRF-07	EMWRF	Backup Power for Product Water Pumps	$700,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$29,995,000
Mult	Mult	Membrane Replacement (recurring)	$16,276,400
Total			**$226,831,400**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.27, the total anticipated cost for the project recommended for phase FY15/20 are approximately $226.8 M. The most costly projects proposed for this phase are related to increasing Title 22 treatment capacity at ELWRF.

It should be noted that improvements required to serve all customers included in Scenario 5, as discussed in Section 8.1 are incorporated by the end of this planning phase. Remaining planning phases include improvements required to serve customers in Scenario 6 and 7 and recurring rehabilitation or replacement projects associated with equipment useful life.

9.2.8 CIP Projects for FY20/25

Table 9.28 presents the CIP projects phased in FY2020/25 (FY20/25).

Table 9.28 CIP Projects for FY20/25
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
HPS-07	HPS	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	$27,300,000
HPS-08	HPS	Parallel HSEFM w/ 36"	$22,815,000
T22-24	T22	Anza Lateral Break Tank	$4,200,000
ELWRF-32	ELWRF	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	$9,600,000
CRWRF-11	CRWRF	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	$10,480,000
CRWRF-12	CRWRF	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	$4,200,000
NTP-03	NTP	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	$34,125,000
NTP-04	NTP	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	$2,100,000
NTP-05	NTP	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	$9,640,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$16,245,000
Mult	Mult	Membrane Replacement (recurring)	$16,277,500
Total			**$163,327,500**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.28, the total anticipated cost for the project recommended for phase FY20/25 are approximately $163.3 M. The most costly projects proposed for this phase are treatment costs at the NTP related to service of the Dominguez Gap and HSEPS and HSEFM expansions associated with serving future demands from Hyperion.

9.2.9 CIP Projects for FY25/30

Table 9.29 presents the CIP projects phased in FY2025/30 (FY25/30).

Table 9.29 CIP Projects for FY25/30
Capital Implementation Master Plan
West Basin Municipal Water District

ID	System	Project Description	Capital Cost[1]
T22-25	T22	LA Westside Lateral	$40,005,000
T22-26	T22	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	$28,025,000
ELWRF-33	ELWRF	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	$16,800,000
ELWRF-34	ELWRF	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	$24,945,000
ELWRF-35	ELWRF	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	$42,970,000
Mult	Mult	United Water Recapitalization Improvements (recurring)	$6,345,000
Mult	Mult	Rehabilitation and Replacement from Condition Assessment (recurring)	$9,230,000
Mult	Mult	Membrane Replacement (recurring)	$16,277,500
Total			**$184,597,500**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.29, the total anticipated cost for the project recommended for phase FY25/30 are approximately $184.6 M. The most costly projects proposed for this phase are related to service of the LADWP Westside Title 22 demands.

9.3 CIP SUMMARIES

This section presents the following summaries of the CIP:

- CIP by Phase
- CIP by Facility Type
- Recurring Projects by Treatment Plant Facility

- Summary of ELWRF Phase V Projects
- Summary of Recommended Studies
- Escalated CIP Cost by Phase

In addition, a detailed list of all CIP projects is presented at the end of this chapter in Table 9.37.

9.3.1 CIP Summary by Phase

The project phasing presented in Section 9.2 is summarized in Table 9.30.

Table 9.30 Summary of Project Phasing
Capital Implementation Master Plan
West Basin Municipal Water District

Planning Phase	Planning Year	Capital Cost(1)	Percentage of Total Capital Cost
FY09/15	FY09/10	$15,103,800	1.6%
	FY10/11	$68,910,280	7.2%
	FY11/12	$251,866,558	26.2%
	FY12/13	$16,715,280	1.7%
	FY13/14	$25,520,280	2.7%
	FY14/15	$9,990,280	1.0%
	FY09/15	***$388,106,478***	***40.3%***
FY15/20		$226,831,400	23.6%
Subtotal	***FY09-20***	***$614,937,878***	
FY20/25		$163,327,500	17.0%
FY25/30		$184,597,500	19.2%
Total		**$962,862,878**	**100.0%**

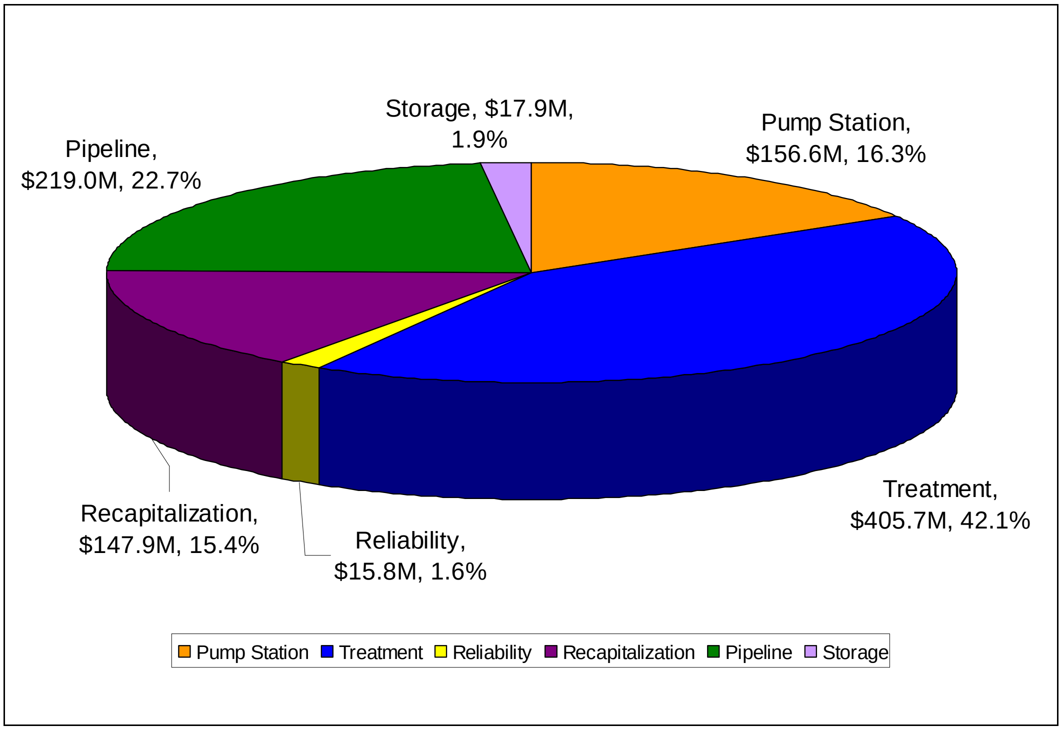
Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

As presented in Table 9.30, the total estimated capital cost of all projects recommended in Chapters 7 and 8, combined with rehabilitation and recapitalization projects, is about $962.9M. As shown, the phase with the largest contribution to the overall CIP cost is FY11/12 with $251.9 M. The total estimated cost through FY19/20 is $615 M.

9.3.2 CIP Summary by Facility Type

The CIP cost distribution of by project type is depicted on Figure 9.6. As shown in this figure, the majority of costs are related to water treatment, contributing to $406M or 42 percent of the total CIP. The second largest category is pipelines with a combined estimated capital cost of $219M or 23 percent of the total CIP.

Figure 9.6
Distribution of Capital Costs by Facility Type



9.3.3 Summary of ELWRF Phase V Expansion Costs

The above projects, which are a part of the ELWRF Phase V Expansion Costs are summarized in Table 9.31.

As shown in Table 9.31, the total cost estimated for the ELWRF Phase V expansion is $58.8 M. The most costly portion of this expansion is the Barrier water treatment capacity expansion for the West Coast Barrier. Note that the cost estimates presented here are based on the ELWRF Phase V Expansion Study.

Table 9.31	**Projects Included in ELWRF Phase IV Expansion Capital Implementation Master Plan West Basin Municipal Water District**		
ID	**Phase**	**Project Description**	**Capital Cost[1]**
BW-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	$31,800,000
BW-02	FY1011	Add VFDs to product water pumps	$700,000
BW-04	FY1011	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	$175,000
ELWRF-04	FY1011	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	$170,000
ELWRF-05	FY1011	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	$140,000
ELWRF-07	FY1213	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	$12,600,000
ELWRF-03	FY1011	ELWRF Phase V Expansion - Add redundant gravity thickener.	$1,960,000
Subtotal - ELWRF Phase V Barrier System			***$47,545,000***
CH-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	$2,650,000
CH-02	FY1011	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	$700,000
CL-01	FY1011	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	$1,050,000
CL-02	FY1011	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	$1,050,000
Subtotal - ELWRF Phase V Chevron Systems			***$5,450,000***
ESPP-01	FY15-20	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	$1,900,000
ESPP-02	FY15-20	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	$3,895,000
ESPP-03	FY15-20	PRV at Chevron	$80,000
Subtotal - ELWRF Phase V ESPP Systems			***$5,875,000***
Total			**$58,870,000**

Note:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.

9.3.4 Recurring Improvements by Treatment Facility

Table 9.32 summarizes United Water improvements for each of West Basin's treatment facilities for each planning period.

Table 9.32 United Water Improvement Summary
Capital Implementation Master Plan
West Basin Municipal Water District

	Planning Year / Phase					Total
Facility	**FY0910**	**FY1415**	**FY15-20**	**FY20-25**	**FY25-30**	**Capital Cost(1)**
ELWRF	$978,800	$2,535,000	$2,535,000	$2,535,000	$2,535,000	$11.1 M
CRWRF	$10,000	$845,000	$845,000	$845,000	$845,000	$3.4 M
EMWRF	$210,000	$425,000	$425,000	$425,000	$425,000	$1.9 M
CNF	$0	$425,000	$425,000	$425,000	$425,000	$1.7 M
SW	$655,000	$2,115,000	$2,115,000	$2,115,000	$2,115,000	$9.1 M
Total	**$1,853,800**	**$6,345,000**	**$6,345,000**	**$6,345,000**	**$6,345,000**	**$27.2 M**

Note:
(1) Costs based on United Water estimates. Additional markups are applied to costs for FY1415 through FY25-30.

In addition to the United Water recommendations, the Rehabilitation and Replacement from the Condition Assessment and Membrane Replacement projects are listed as recurring and consist of summarized values of more detailed items for each treatment facility.

The Rehabilitation and Replacement from Condition Assessment items are estimates of the expected replacement costs based on the anticipated remaining life of various assets evaluated during the Condition Assessment portion of this project. The assumptions used for this cost estimate are described in Appendix F, the Condition Assessment TM.

The membrane replacement costs are costs to replace all of the existing membranes at West Basin's facilities on a continuous basis, assuming individual membrane life of 5 years. The estimated annual costs for the membrane replacement are detailed in Table 9.33.

Table 9.33 Membrane Replacement Costs Capital Implementation Master Plan West Basin Municipal Water District					
	Number of Membranes			**Replacement Cost ($M / 5 yrs)**	**Annual Cost ($M / yr)**
Facility	**RO**	**MF (Type I)**	**MF (Type II)**		
Unit Replacement Cost	$500	$750	$900		
ELWRF	4,536	1,350	2,496	$5.5	$1.1
CRWRF	1,584	810	0	$1.4	$0.3
EMWRF	840	540	0	$0.8	$0.2
Total for Existing	**6,960**	**2,700**	**2,496**	$7.8	$1.6
NTP[(2)]				$8.5	$1.7
Total				$16.3	$3.3

Note:
(1) Membrane replacement cost based on typical costs for type of membrane.
(2) Membrane replacement costs for future facilities were based on total flow and similar facilities rather than number of membranes.

As discussed in Chapter 8, several alternatives were evaluated for reducing surges in the Title 22 distribution system through modifications to the membrane systems at EMWRF and CRWRF. Alternatives were also evaluated for replacing the Phase II and III microfiltration units at ELWRF (to improve performance). A summary of the costs for each alternative discussed in Chapter 7 and 8 is presented in Table 9.34. The costing details for these alternatives are provided at the end of Appendix F. Within Chapter 7, it was recommended that further study be conducted before selecting an alternative. Within the CIP, it was assumed that the second option be implemented in each facility—a break tank and pumps at EMWRF and CRWRF, and pressurized MF units at ELWRF.

9.3.5 Summary of Recommended Studies

Within this report, several studies were considered beyond the scope of this report but recommended for further investigation. Table 9.35 lists each of the recommended studies mentioned within this report. If applicable, the CIP IDs of the related projects are indicated in brackets. Several of the studies listed in Table 9.35 could be incorporated into larger projects, such as the ELWRF Phase V Expansion.

Table 9.34 Alternatives for Resolving Microfiltration Surges
Capital Implementation Master Plan
West Basin Municipal Water District

Facility	Alternatives		
	Dedicated Flush System	**Break Tank and Pumps**	**Alternate MF Units (Submerged)**
EMWRF	$659,000	$2,058,000	$10,129,000
CRWRF	$887,000	$6,907,000	$15,409,000
	Retrofit Existing MF Units	**Replace with Pressurized MF Units**	**Replace with Submerged MF Units**
ELWRF	$12,254,190	$14,893,970	$19,737,510

Notes:
(1) Cost estimate details are included in Appendix F (following the Condition Assessment TM).
(2) Cost estimates shown in this table vary from the estimates used in the CIP (Table 9.37) due to adjustments made to the contingency and markups (as discussed in Chapter 5).

Table 9.35 Recommended Studies
Capital Implementation Master Plan
West Basin Municipal Water District

Study	Description	Report Section
Demand Pattern Revision for Chester Washington Golf Course	For Title 22 Customer Chester Washington Golf Course, review the existing golf course irrigation schedule with the customer to reduce their daily peak demands to a more reasonable level in order to extend life of lateral.	7.1.1.3
CMF Unit Surge Study	Detailed Study to determine the most feasible method for reducing the magnitude of the observed pressure surges. [CRWRF-02, EMWRF-01, ELWRF-03]	7.1.1.3.1
Title 22 Pump Station Control Study	Detailed Study to develop an efficient pumping system that allows operation of the pumps within the preferred operating ranges	7.1.1.3.2
Title 22 Pipe Cleaning Test Program	Study to evaluate whether pipe cleaning test program increases chlorine residual in distribution system, possibly including installation of pig launching and retrieval stations. [T22-11]	7.1.1.3.3
Barrier Product Water Pump Station Operational Efficiency Study	Detailed analysis to evaluate the pump station to resolve energy loss and establish a more efficient method of operation of the Barrier Product Water Pump Station.	7.1.2.3
Hyperion Secondary Effluent Pump	Detailed analysis to optimize system controls, to eliminate the need for manual control of VFD.	7.1.3.3

Table 9.35 Recommended Studies
Capital Implementation Master Plan
West Basin Municipal Water District

Study	Description	Report Section
Station Control Automation and Optimization		
Chevron Nitrified Water Product Pump Station Firm Capacity Study	Detailed analysis to maintain firm capacity of the pump station.	7.1.6.3
CRWRF Brine Line Inspection Program	Evaluate inspection of brine line and establish routine inspection program. [CBRN-01]	7.1.7.3
ELWRF Brine Line Inspection Program	Evaluate inspection of brine line and establish routine inspection program. [EBRN-01]	7.1.8.3
ELWRF Brine Line Velocity Reduction Study	Detailed analysis to mitigate high velocities, possibly installing pinch valves or pipe restrictions.[EBRN-02]	7.1.8.3
ELWRF Brine Line	Inspection program and taps for pipeline calibration	8.2.8.3
Title 22 Pump Station Pressure Increase Evaluation	A detailed study of the existing and future water demand patterns, including phased development, should be conducted in selecting the pumps and increase the discharge pressure to 105 psi.	8.2.1.3.3
Title 22 Surge Analysis	Surge analysis of the Title 22 distribution system following modifications made to EMWRF and CRWRF to reduce surge effects.	8.2.1.3.4
Title 22 Pump Station Operation Evaluation	A detailed study of the demands on the Title 22 pump station, including phased development, should be conducted in selecting the pumps and increase the discharge pressure to 105 psi.	8.2.1.3.5
Title 22 Distribution System Water Quality Analysis	Following incorporation of existing system water quality recommendations, water quality of the distribution system should be reevaluated.	8.2.1.3.6
West Coast Barrier Pump Station Operational Evaluation	Field testing to determine the firm capacity of the pump station. Result should be used to determine improvements to the pump station. [BW-02]	8.2.2.3
Hyperion Secondary Effluent Pump Station Design Study	Detailed design study to review the existing pump station modification for incorporation into the future facility. Increase the capacity of the pump station to meet future supply requirements (add a 9,000 hp PS for Scenario 5A, and a 12,000 hp PS for Scenario 7A).	8.2.3.3

Table 9.35 Recommended Studies Capital Implementation Master Plan West Basin Municipal Water District		
Study	**Description**	**Report Section**
Hyperion Secondary Effluent Pump Station Reliability Study	Detailed design study of the system to formulate the most feasible means of meeting the demand criteria and providing supply reliability	8.2.3.3
Hyperion Secondary Effluent Pumping System Surge Evaluation	Update surge study for future system design conditions.	8.2.3.3
Chevron Nitrified Water System Pump Station Design	Preliminary design to add 1,564 gpm of pump station capacity. To make the maximum use out of the existing facility the future facility should have three identical duty and one standby pump, all operated by VFDs..	8.2.6.3
Chevron Nitrified Water System Hydrogenerator Feasibility Study	Investigate feasibility of placing the hydro generator in service.	8.2.6.3
CRWRF RO Discharge Pressure Adjustment	Evaluate how to effectively increase discharge pressure of RO Trains at CRWRF.	8.2.7.3
CRWRF Brine Line Permit	Apply for revised brine line permit accommodating increased flows[1]	8.2.7.3
CRWRF Power	Investigate power problems at this site.	Condition Assessment

Note:
1. This is not necessary under Scenario 5B and 7B, but will be required wherever the potential bp demands are treated.

The studies listed in Table 9.35 are not included within the CIP, but may affect costs for several of the projects included in the CIP.

9.3.6 Escalated CIP Cost

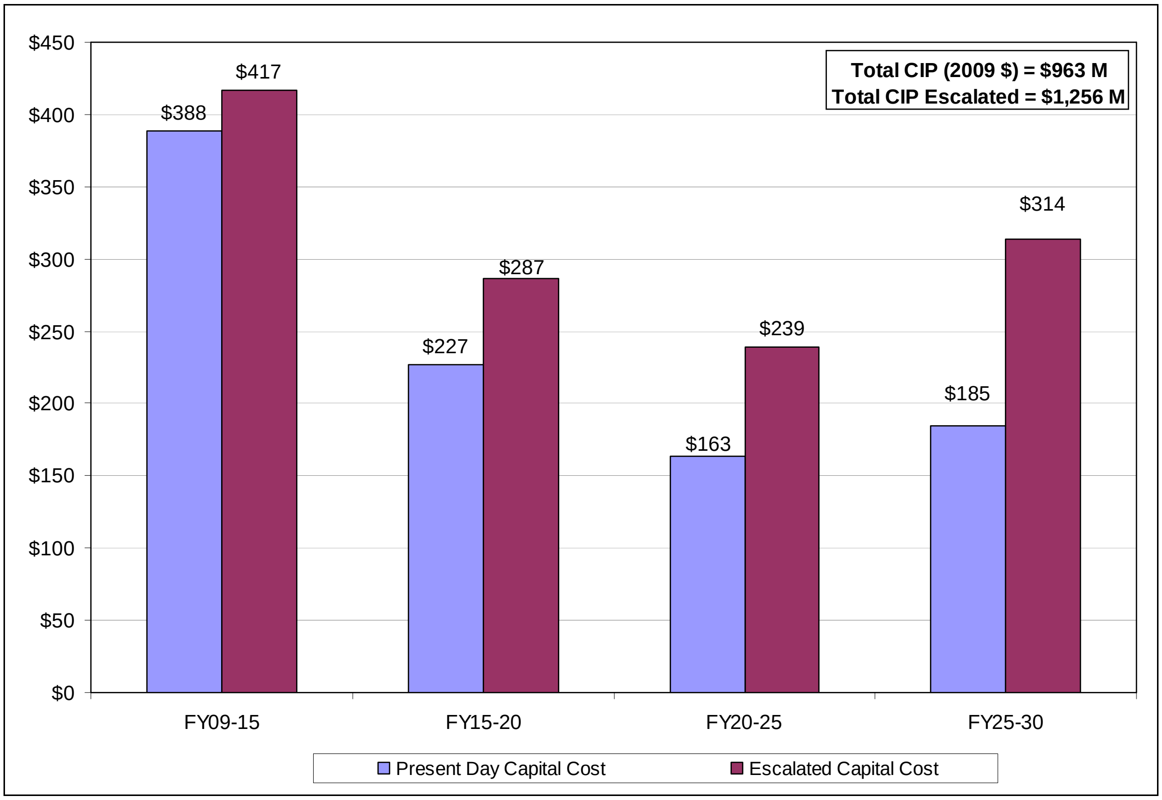
The CIP cost presented in the Master Plan are all based on 2009 dollars and an ENR index for the greater Los Angeles area of 9811 published in January 2009. However, as most projects will be implemented in the future, the actual CIP cost in dollars will be higher based on the phasing of each project. The CIP presented in Table 9.36 shows the escalated CIP cost for each project phase based on an annual inflation rate of 3 percent.

Table 9.36	**Escalated CIP Cost Summary by Phase Capital Implementation Master Plan West Basin Municipal Water District**		
Planning Phase	**Planning Year**	**Capital Cost In 2009 Dollars(1)**	**Escalated Capital Cost(2)**
FY09-15	FY09/10	$15,103,800	$15,300,000
	FY10/11	$68,910,280	$71,860,000
	FY11/12	$251,866,558	$270,520,000
	FY12/13	$16,715,280	$18,500,000
	FY13/14	$25,520,280	$29,080,000
	FY14/15	$9,990,280	$11,730,000
	FY09-15	**$388,106,478**	**$416,990,000**
FY15-20	FY15-20	$226,831,400	$286,640,000
Subtotal	***FY09/10 – FY19/20***		***$703,630,000***
FY20-25	FY20-25	$163,327,500	$239,270,000
FY25-30	FY25-30	$184,597,500	$313,500,000
Total		**$962,862,878**	**$1,256,400,000**

Notes:
(1) Includes markups, contingency, and construction costs. See Table 5.5 for detailed cost breakdown and Table 9.37 for construction costs.
(2) Escalated from January 2009 to the mid-point of each planning period using an annual inflation rate of 3.0% (rounded to $10,000).

As presented in Table 9.36, the escalated cost of the $963M CIP (2009 Dollars) is estimated at $1,256M. The phasing of cost by phase, with and without escalation, is also depicted on Figure 9.7.

Figure 9.7
Breakdown of Capital Costs by Phase including Escalation



West Basin Municipal Water District
Capital Implementation Master Plan for Recycled Water Systems
Detailed CIP List w/ Project Breakdown

WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
1	BW-01	BW	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Barrier treatment by 5.0 mgd, from 12.5 mgd to 17.5 mgd.	FY1011	5.0	mgd			$ -	lumpsum(3)	$ -	1.00	-	$ 14,672,833	-	217%	$ 31,800,000	WRD	$ 31,800,000	$ -	-	$ 31,800,000	-	$ -	$ -
1	BW-02	BW	PS	Add VFDs to product water pumps	FY1011					$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ 700,000	-	$ -	$ -
1	BW-04	BW	Pipeline	Modify site piping at ELWRF, replacing 20-inch discharge piping and meter with 27-inch discharge piping and meter.	FY1011	1	site			$ 125,000	lumpsum(1)	$ 125,000	1.00	-	$ 125,000	IF	140%	$ 175,000	None	$ -	$ 175,000	-	$ 175,000	-	$ -	$ -
1	ELWRF-04	ELWRF	Recapitalization	ELWRF Phase V Expansion - Resolve underperformance of backwash equalization basin.	FY1011	1	system			$ 120,000	lumpsum(5)	$ 120,000	1.00	-	$ 120,000	IF	140%	$ 170,000	None	$ -	$ 170,000	-	$ 170,000	-	$ -	$ -
1	ELWRF-05	ELWRF	Recapitalization	ELWRF Phase V Expansion - Redundant Sludge Conditioning Tank	FY1011	2	tanks	25,000	gallon	$ 2.00	per gallon	$ 100,000	1.00	-	$ 100,000	IF	140%	$ 140,000	None	$ -	$ 140,000	-	$ 140,000	-	$ -	$ -
1	ELWRF-07	ELWRF	Treatment	Add Title 22 High Rate Clarifier and Title 22 Filters (to bring clarifier from 30.0 mgd to 50.0 mgd and filter capacity from 40.0 mgd to 50.0 mgd)	FY1213	1	system			$ 9,000,000	lumpsum(1)	$ 9,000,000	1.00	-	$ 9,000,000	IF	140%	$ 12,600,000	None	$ -	$ 12,600,000	-	$ 12,600,000	-	$ -	$ -
1	ELWRF-03	ELWRF	Recapitalization	ELWRF Phase V Expansion - Add redundant gravity thickener.	FY1011	1	system			$ 1,400,000	system(5)	$ 1,400,000	1.00	0	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ 1,960,000	-	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - Barrier System											$ 11,245,000			$ 25,917,833			$ 47,545,000		$ 31,800,000	$ 15,745,000	$ -	$ 47,545,000	$ -	$ -	$ -
2	CH-01	CH	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO Ultra treatment for HPBF by 0.5 mgd, from 2.6 mgd to 3.1 mgd (to meet MMD of 2,153 gpm).	FY1011	0.5	mgd			$ -	lumpsum(5)	$ -	0.00	0.00	$ -		0%	$ 2,650,000	Chev	$ 2,650,000	$ -	-	$ 2,650,000	-	$ -	$ -
2	CH-02	CH	PS	Replace existing pumps with 2-2,400 gpm pumps (to meet MDD of 2,395 gpm).	FY1011	4,600	gpm	200	hp	$ 2,500	per hp	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ 700,000	-	$ -	$ -
2	CL-01	CL	Treatment	ELWRF Phase V Expansion - Increase treatment capacity of Industrial RO treatment for LPBF by 0.4 mgd, from 1.7 mgd to 2.1 mgd (to meet MMD of 1,218 gpm).	FY1011	0.4	mgd			$ -	lumpsum(5)	$ -	0.00	0.00	$ -		0%	$ 1,050,000	Chev	$ 1,050,000	$ -	-	$ 1,050,000	-	$ -	$ -
2	CL-02	CL	PS	Replace existing pumps with 3-1,250 gpm pumps (to meet MDD of 2,039 gpm).	FY1011	3,750	gpm	300	hp	$ 2,500	per hp	$ 750,000	1.00	-	$ 750,000	IF	140%	$ 1,050,000	Chev	$ 1,050,000	$ -	-	$ 1,050,000	-	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - Chevron Boilerfeed											$ 1,250,000			$ 1,250,000			$ 5,450,000		$ 5,450,000	$ -	$ -	$ 5,450,000	$ -	$ -	$ -
3	ESPP-01	ESPP	Treatment	Add to treatment capacity of Industrial RO treatment for ESPP of 0.5 mgd (to meet MMD of 325 gpm).	FY15-20	0.7	mgd			$ -	lumpsum(7)	$ 1,355,000	1.00	-	$ 1,355,000	IF	140%	$ 1,900,000	ESPP	$ 1,900,000	$ -	-	$ -	$ 1,900,000	$ -	$ -
3	ESPP-02	ESPP	Pipeline	El Segundo Power Plant Pipeline from Chevron to El Segundo Power Plant	FY15-20	8,000	lineal ft	12	inches	$ 310	per ft	$ 2,480,000	1.00	-	$ 2,480,000	OF	157%	$ 3,895,000	ESPP	$ 3,895,000	$ -	-	$ -	$ 3,895,000	$ -	$ -
3	ESPP-03	ESPP	Pipeline	PRV at Chevron	FY15-20	1	PRV	8	inches	$ 50,000	per PRV	$ 50,000	1.00	-	$ 50,000	OF	157%	$ 80,000	ESPP	$ 80,000	$ -	-	$ -	$ 80,000	$ -	$ -
Subtotal	ECLWRF Phase V Expansion - El Segundo Power Plant											$ 3,885,000			$ 3,885,000			$ 5,875,000		$ 5,875,000	$ -	$ -	$ -	$ 5,875,000	$ -	$ -
4	CN-01	CN	PS	ELWRF Phase Va Expansion - Replace existing pumps with 4-1,800 gpm pumps (to meet peak demand of 5,164 gpm).	FY1011	7,200	gpm	500	hp	$ 2,250	per hp	$ 1,125,000	1.00	-	$ 1,125,000	IF	140%	$ 1,575,000	Chev	$ 1,575,000	$ -	-	$ 1,575,000	-	$ -	$ -
4	CNF-01	CNF	Treatment	ELWRF Phase Va Expansion - Increase treatment capacity of Nitrified by 2.1, from 4.9 mgd to 7.0 mgd. (Two Biofor Units)	FY15-20	2.1	mgd			$ 1.05	per gal	$ 2,205,000	1.00	-	$ 2,205,000	IF	140%	$ 3,090,000	Chev	$ 3,090,000	$ -	-	$ -	$ 3,090,000	$ -	$ -
4	CNF-03	CNF	Recapitalization	ELWRF Phase Va Expansion - Replace Turbine	FY1011	1	site			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ 700,000	-	$ -	$ -
4	CNF-02	CNF	Reliability	ELWRF Phase Va Expansion - Backup Power to Product Water Pumps	FY15-20	1	system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	Chev	$ 700,000	$ -	-	$ -	$ 700,000	$ -	$ -
4	CNF-04	CNF	Reliability	ELWRF Phase Va Expansion - Potable Water Backup Supply	FY15-20	1	site			$ 250,000	per site	$ 250,000	1.00	-	$ 250,000	IF	140%	$ 350,000	Chev	$ 350,000	$ -	-	$ -	$ 350,000	$ -	$ -
Subtotal	Chevron Nitrification Facility - Nitrified System Expansion											$ 4,580,000			$ 4,580,000			$ 6,415,000		$ 6,415,000	$ -	$ -	$ 2,275,000	$ 4,140,000	$ -	$ -
5	BPN-01	BPN	Treatment	Treat SE from JWPCP w/ MF to serve growth in bp Nitrified System	FY1112	8.7	mgd			$ 12,000,000	lumpsum(1)	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	bp	$ 16,800,000	$ -	-	$ 16,800,000	-	$ -	$ -
5	BPN-02	BPN	Treatment	Nitrified Treatment - treat MF treated SE (BPN-01) from JWPCP to serve growth in bp Nitrified System	FY1112	8.3	mgd			$ 1.05	per gpd	$ 8,715,000	1.00	-	$ 8,715,000	IF	140%	$ 12,205,000	bp	$ 12,205,000	$ -	-	$ 12,205,000	-	$ -	$ -
5	BPN-03	BPN	Pipeline	New 20" pipeline from NTP to bp for conveyance of Nitrified Water.	FY1112	10,560	lineal ft	20	inches	$ 460	per lineal ft	$ 4,857,600	1.25	A	$ 6,072,000	OF	157%	$ 9,535,000	bp	$ 9,535,000	$ -	-	$ 9,535,000	-	$ -	$ -
5	BPN-03A	BPN	Pipeline	Parallel 14" pipeline from CRWRF to bp for conveyance of Nitrified Water.	FY1112	6,178	lineal ft	14	inches	$ 350	per lineal ft	$ 2,162,160	1.25	A	$ 2,702,700	OF	157%	$ 4,245,000	bp	$ 4,245,000	$ -	-	$ 4,245,000	-	$ -	$ -
5	BPN-04	BPN	PS	New pump station at NTP to serve bp Nitrified (assumes 4-1,500 gpm pumps, in PS w/ BPRO-03)	FY1112	6,000	gpm	300	hp	$ 7,500	per hp	$ 2,250,000	1.00	-	$ 2,250,000	IF	140%	$ 3,150,000	bp	$ 3,150,000	$ -	-	$ 3,150,000	-	$ -	$ -
5	BPN-05	BPN	Storage	Add a 1.0 MG storage reservoir to NTP to maintain current number of hours of backup for bp Nitrified system.	FY1112	1.0	MG			$ 1.50	per gallon	$ 1,500,000	1.00	-	$ 1,500,000	IF	140%	$ 2,100,000	bp	$ 2,100,000	$ -	-	$ 2,100,000	-	$ -	$ -
5	BPRO-01	BPRO	Treatment	Treat SE from JWPCP w/ MF/RO to serve growth in bp RO System	FY1112	8.7	mgd			$ 6.00	per gal	$ 52,200,000	1.00	-	$ 52,200,000	IF	140%	$ 73,080,000	bp	$ 73,080,000	$ -	-	$ 73,080,000	-	$ -	$ -
5	BPRO-02	BPRO	Pipeline	New Pipeline from NTP to bp for conveyance of Industrial RO Water.	FY1112	10,560	lineal ft	18	inches	$ 420	per lineal ft	$ 4,435,200	1.25	A	$ 5,544,000	OF	157%	$ 8,705,000	bp	$ 8,705,000	$ -	-	$ 8,705,000	-	$ -	$ -
5	BPRO-03	BPRO	PS	New pump station at NTP to serve bp Industrial RO (assumes 4-2,100 gpm pumps, in PS w/ BPN-04)	FY1112	8,400	gpm	400	hp	$ 7,500	per hp	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	bp	$ 4,200,000	$ -	-	$ 4,200,000	-	$ -	$ -
5	CRWRF-04	CRWRF	Treatment	Surge Protection - Modify MF Units with Break Tank and Pumps	FY1112			lump sum		$ 4,500,000	lumpsum(2)	$ 4,500,000	1.00	-	$ 4,500,000	IF	140%	$ 6,300,000	None	$ -	$ 6,300,000	-	$ 6,300,000	-	$ -	$ -
5	CRWRF-05	CRWRF	Storage	Raw Water Storage (1 hour)	FY1112	2.5	MG			$ 1.50	per gallon	$ 3,750,000	1.00	-	$ 3,750,000	IF	140%	$ 5,250,000	None	$ -	$ 5,250,000	-	$ 5,250,000	-	$ -	$ -
5	NTP-01	NTP	Treatment	Land Acquisition of 4.5 ac near JWPCP for NTP	FY1112	21.3	mgd	4.0	ac	$ 1,000,000	per acre(1)	$ 4,000,000	1.00	-	$ 4,000,000	LA	120%	$ 4,800,000	None	$ -	$ 4,800,000	-	$ 4,800,000	-	$ -	$ -
Subtotal	bp Refinery Capacity Expansion Project											$ 103,369,960			$ 106,233,700			$ 150,370,000		$ 134,020,000	$ 16,350,000	$ -	$ 150,370,000	$ -	$ -	$ -
6	CRWRF-01	CRWRF	Pipeline	Pipeline for LADWP Harbor demands at Carson City bndy	FY1112	20,200	lineal ft	30	inches	$ -	lumpsum(7)	$ 18,535,000	1.00	-	$ 18,535,000	OF	157%	$ 29,100,000	Other	$ 29,100,000	$ -	-	$ 29,100,000	-	$ -	$ -
6	CRWRF-02	CRWRF	Treatment	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand and Rhodia)	FY1112	12.3	mgd			$ -	lumpsum(7)	$ 30,815,000	1.00	-	$ 30,815,000	IF	140%	$ 43,141,278	None	$ -	$ 43,141,278	-	$ 43,141,278	-	$ -	$ -
6	CRWRF-03	CRWRF	PS	Add new 11.6 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	FY1112	9,667	gpm	500	hp	$ 7,500	per hp	$ 3,750,000	1.00	-	$ 3,750,000	IF	140%	$ 5,250,000	None	$ -	$ 5,250,000	-	$ 5,250,000	-	$ -	$ -
Subtotal	Los Angeles Harbor Area Expansion Project											$ 53,100,000			$ 53,100,000			$ 77,491,278		$ 29,100,000	$ 48,391,278	$ -	$ 77,491,278	$ -	$ -	$ -

West Basin Municipal Water District
Capital Implementation Master Plan for Recycled Water Systems
Detailed CIP List w/ Project Breakdown

WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
7	ELWRF-09	ELWRF	Treatment	Add 17.3 mgd of Title 22 Treatment, to increase Title 22 treatment capacity from 50.0 mgd to 67.3 mgd	FY15-20	17.3	mgd			$ 2.00	per gpd	$ 34,600,000	1.00	-	$ 34,600,000	IF	140%	$ 48,440,000	None	$ -	$ 48,440,000	-	$ -	$ 48,440,000	$ -	$ -
7	ELWRF-10	ELWRF	PS	Increase capacity of Title 22 Pump Station at ELWRF by 3,200 hp (from 4,800 hp to 8,000 hp) to serve Future Title 22 Customers	FY15-20			3,200	hp	$ 3,200	per hp	$ 10,240,000	1.00	-	$ 10,240,000	IF	140%	$ 14,340,000	None	$ -	$ 14,340,000	-	$ -	$ 14,340,000	$ -	$ -
7	ELWRF-11	ELWRF	Treatment	Microfiltration - Replace existing Phase II MF System w/ Pressurized System	FY15-20	8.4	mgd			$ 12,000,000	lumpsum(1)	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	None	$ -	$ 16,800,000	-	$ -	$ 16,800,000	$ -	$ -
7	ELWRF-12	ELWRF	Reliability	Backup Power	FY15-20	1	system			$ 8,000,000	lumpsum(1)	$ 8,000,000	1.00	-	$ 8,000,000	IF	140%	$ 11,200,000	None	$ -	$ 11,200,000	-	$ -	$ 11,200,000	$ -	$ -
7	ELWRF-13	ELWRF	Treatment	Dewatered Sludge Handling Transfer System	FY15-20	1	system			$ 2,000,000	lumpsum(1)	$ 2,000,000	1.00	-	$ 2,000,000	IF	140%	$ 2,800,000	None	$ -	$ 2,800,000	-	$ -	$ 2,800,000	$ -	$ -
7	ELWRF-15	ELWRF	Reliability	Potable Water Connection to ELWRF	FY15-20					$ 200,000	per site(1)	$ 200,000	1.00	-	$ 200,000	IF	140%	$ 280,000	None	$ -	$ 280,000	-	$ -	$ 280,000	$ -	$ -
7	EMWRF-07	EMWRF	Reliability	Backup Power for Product Water Pumps	FY15-20	1	system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ -	$ 700,000	$ -	$ -
7	T22-17	T22	Storage	Increase Title 22 product water storage by 5.0 MG	FY15-20	5	MG			$ 1.50	per gallon	$ 7,500,000	1.00	-	$ 7,500,000	IF	140%	$ 10,500,000	None	$ -	$ 10,500,000	-	$ -	$ 10,500,000	$ -	$ -
7	T22-23	T22	Pipeline	Title-22 PS Discharge Pipeline Modification	FY15-20	300	lineal ft	54	inches	$ 1,100	per lineal ft	$ 330,000	1.00	-	$ 330,000	IF	140%	$ 465,000	None	$ -	$ 465,000	-	$ -	$ 465,000	$ -	$ -
Subtotal	ELWRF Phase VI - Future Plant Expansions											$ 75,370,000			$ 75,370,000			$ 105,525,000		$ -	$ 105,525,000	$ -	$ -	$ 105,525,000	$ -	$ -
13	HPS-01	HPS	PS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 74 mgd of firm capacity. (Phase I of II; total project assumes 7 pumps, 7,000 hp total)	FY1011			7,000	hp	$ 3,000	per hp	$ 10,500,000	1.00	-	$ 10,500,000	IF	140%	$ 14,700,000	None	$ -	$ 14,700,000	-	$ 14,700,000	-	$ -	$ -
13	HPS-04	HPS	PS	PS Building	FY1011	1	building					$ 400,000	1.00	-	$ 400,000	IF	140%	$ 560,000	None	$ -	$ 560,000	-	$ 560,000	-	$ -	$ -
13	HPS-05	HPS	PS	Add 23 mgd of additional pumping capacity, to bring firm capacity to 97 mgd of firm capacity. (Phase II of II; total project assumes 7 pumps, 7,000 hp total)	FY1112			7,000	hp	$ 3,000	per hp	$ 10,500,000	1.00	-	$ 10,500,000	IF	140%	$ 14,700,000	None	$ -	$ 14,700,000	-	$ 14,700,000	-	$ -	$ -
Subtotal	Hyperion Secondary Effluent Pump Station Expansion											$ 21,400,000			$ 21,400,000			$ 29,960,000		$ -	$ 29,960,000	$ -	$ 29,960,000	$ -	$ -	$ -
14	HPS-03	HPS	PS	Secondary Power Connection for Backup Power	FY1011	1	system			$ 1,800,000	lumpsum(1)	$ 1,800,000	1.00	-	$ 1,800,000	IF	140%	$ 2,520,000	None	$ -	$ 2,520,000	-	$ 2,520,000	-	$ -	$ -
Subtotal	Hyperion Secondary Effluent Pump Station Secondary Feed											$ 1,800,000			$ 1,800,000			$ 2,520,000		$ -	$ 2,520,000	$ -	$ 2,520,000	$ -	$ -	$ -
15	T22-11	T22	Pipeline	Chlorination Stations (Phase I)	FY1213	5	stations			$ 280,000	per station	$ 1,400,000	1.00	-	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ 1,960,000	-	$ -	$ -
15	T22-21	T22	Pipeline	Chlorination Stations (Phase II)	FY15-20	5	stations			$ 280,000	per station	$ 1,400,000	1.00	-	$ 1,400,000	IF	140%	$ 1,960,000	None	$ -	$ 1,960,000	-	$ -	$ 1,960,000	$ -	$ -
Subtotal	Water Quality Facility Improvements											$ 2,800,000			$ 2,800,000			$ 3,920,000		$ -	$ 3,920,000	$ -	$ 1,960,000	$ 1,960,000	$ -	$ -
16	T22-02	T22	Pipeline	El Segundo Lateral (Boeing, Kilroy Airport)	FY1112	6,300	lineal ft	6	inches		see detail	$ 955,000	1.00	-	$ 955,000	OF	157%	$ 1,500,000	Fed	$ 1,031,250	$ 468,750	-	$ 1,500,000	-	$ -	$ -
16	T22-02A	T22	Pipeline	Mariposa Lateral (Mattel, Hilton, Marriot)	FY0910	1,700	lineal ft	6	inches		see detail	$ 475,000	1.00	-	$ 475,000	OF	157%	$ 750,000	Fed	$ 515,625	$ 234,375	$ 750,000	$ -	-	$ -	$ -
16	T22-06	T22	Pipeline	Carson Mall Lateral	FY0910	10,000	lineal ft	6 - 16	inches		lumpsum(7)	$ 1,070,000	1.48	A,F	$ 1,590,000	OF	157%	$ 2,500,000	Fed	$ 1,718,750	$ 781,250	$ 2,500,000	$ -	-	$ -	$ -
16	T22-08	T22	Pipeline	Mills Park Lateral	FY1112	1,000	lineal ft	6	inches		see detail	$ 175,000	1.00	-	$ 175,000	IF	140%	$ 245,000	Fed	$ 168,438	$ 76,563	-	$ 245,000	-	$ -	$ -
16	T22-09	T22	Pipeline	Anza Lateral Phase II	FY0910	12,000	lineal ft	4 - 8	inches		lumpsum(8)	$ -	0.00	0.00	$ -	-	0%	$ 3,500,000	Fed	$ 2,406,250	$ 1,093,750	$ 3,500,000	$ -	-	$ -	$ -
16	T22-10	T22	PS	Anza PS (4-500 gpm pumps)	FY0910	2,000	gpm	200	hp		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 2,000,000	Fed	$ 1,375,000	$ 625,000	$ 2,000,000	$ -	-	$ -	$ -
16	T22-13	T22	Pipeline	Dominguez Street Lateral	FY1011	14,500	lineal ft	6 - 8	inches		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 4,500,000	Fed	$ 3,093,750	$ 1,406,250	-	$ 4,500,000	-	$ -	$ -
16	T22-19	T22	Pipeline	Dyehouse Lateral	FY0910	12,000	lineal ft	8	inches		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 3,000,000	Fed	$ 2,062,500	$ 937,500	$ 3,000,000	$ -	-	$ -	$ -
16	T22-20	T22	PS	Dyehouse PS (3-250 gpm pumps)	FY0910	600	gpm	40	hp		lumpsum(4)	$ -	0.00	0.00	$ -	-	0%	$ 1,500,000	Fed	$ 1,031,250	$ 468,750	$ 1,500,000	$ -	-	$ -	$ -
Subtotal	Harbor / South Bay Project Laterals - US ARMY CORPS											$ 2,675,000			$ 3,195,000			$ 19,495,000		$ 13,402,813	$ 6,092,188	$ 13,250,000	$ 6,245,000	$ -	$ -	$ -
17	T22-01	T22	Pipeline	Caltrans Inglewood Lateral	FY1213	1,000	lineal ft	4	inches		see detail	$ 130,000	1.25	A	$ 165,000	OF	157%	$ 260,000	Fed	$ 178,750	$ 81,250	-	$ 260,000	-	$ -	$ -
17	T22-04	T22	Pipeline	Virco-Torrance Lateral	FY1011	1,500	lineal ft	6	inches		see detail	$ 215,000	1.00	-	$ 215,000	OF	157%	$ 340,000	None	$ -	$ 340,000	-	$ 340,000	-	$ -	$ -
17	T22-07	T22	Pipeline	Redondo Beach Lateral (Pete's Nursery)	FY1112	2,500	lineal ft	6	inches		see detail	$ 420,000	1.00	-	$ 420,000	OF	157%	$ 660,000	None	$ -	$ 660,000	-	$ 660,000	-	$ -	$ -
17	T22-12	T22	Pipeline	Main Street Carson Lateral	FY1314	37,000	lineal ft	6 - 16	inches		see detail	$ 9,715,000	1.12	A	$ 10,875,000	OF	157%	$ 17,075,000	None	$ -	$ 17,075,000	-	$ 17,075,000	-	$ -	$ -
17	T22-14	T22	Pipeline	Caltrans Gardena Lateral	FY1415	3,500	lineal ft	6 - 8	inches		see detail	$ 625,000	1.00	-	$ 625,000	OF	157%	$ 985,000	None	$ -	$ 985,000	-	$ 985,000	-	$ -	$ -
17	T22-15	T22	Pipeline	Palos Verdes - Lateral 6B	FY15-20	42,500	lineal ft	12 - 24	inches		see detail	$ 17,380,000	1.00	-	$ 17,380,000	OF	157%	$ 27,290,000	Fed	$ 18,761,875	$ 8,528,125	-	$ -	$ 27,290,000	$ -	$ -
17	T22-16	T22	PS	Palos Verdes PS (4-1,250 gpm pumps)	FY15-20	5,000	gpm	375	hp		lumpsum(1)	$ 3,500,000	1.00	-	$ 3,500,000	IF	140%	$ 4,900,000	None	$ -	$ 4,900,000	-	$ -	$ 4,900,000	$ -	$ -
17	T22-18A	T22	Pipeline	Gardena Lateral - Normandie Ave	FY15-20	9,500	lineal ft	8	inches		see detail	$ 2,260,000	1.02	A	$ 2,315,000	OF	157%	$ 3,635,000	None	$ -	$ 3,635,000	-	$ -	$ 3,635,000	$ -	$ -
17	T22-18B	T22	Pipeline	Gardena Lateral - Normandie and Vermont	FY15-20	19,500	lineal ft	4 - 6	inches		see detail	$ 3,815,000	1.03	A	$ 3,930,000	OF	157%	$ 6,170,000	None	$ -	$ 6,170,000	-	$ -	$ 6,170,000	$ -	$ -
17	T22-18C	T22	Pipeline	Gardena Lateral - Van Ness	FY15-20	15,000	lineal ft	4 - 6	inches		see detail	$ 2,855,000	1.00	A	$ 2,855,000	OF	157%	$ 4,480,000	None	$ -	$ 4,480,000	-	$ -	$ 4,480,000	$ -	$ -
17	T22-22	T22	Pipeline	Hawthorne Lateral (Solec)	FY15-20	5,500	lineal ft	6	inches		see detail	$ 1,015,000	1.00	-	$ 1,015,000	OF	157%	$ 1,595,000	Fed	$ 1,096,563	$ 498,438	-	$ -	$ 1,595,000	$ -	$ -
Subtotal	Harbor / South Bay Project Laterals - DISTRICT											$ 41,930,000			$ 43,295,000			$ 67,390,000		$ 20,037,188	$ 47,352,813	$ -	$ 19,320,000	$ 48,070,000	$ -	$ -
18	CRWRF-07	CRWRF	Reliability	Backup Power	FY15-20	1	system			$ 1,800,000	lumpsum	$ 1,800,000	1.00	-	$ 1,800,000	IF	140%	$ 2,520,000	None	$ -	$ 2,520,000	-	$ -	$ 2,520,000	$ -	$ -
Subtotal	Backup Power and Water Supply											$ 1,800,000			$ 1,800,000			$ 2,520,000		$ -	$ 2,520,000	$ -	$ -	$ 2,520,000	$ -	$ -
30	CNF-05	CNF	Recapitalization	ELWRF Phase Va Expansion - Inspect Nitrified Product Water Storage Tank Internal Condition	FY1112	1	site			$ 60,000	lumpsum(1)	$ 60,000	1.00	-	$ 60,000	IF	140%	$ 85,000	Chev	$ 85,000	$ -	-	$ 85,000	-	$ -	$ -
30	CNF-06	CNF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 3,765,000	1.00	-	$ 3,765,000	CA	120%	$ 4,520,000	Chev	$ 4,520,000	$ -	$ -	$ 2,740,000	$ 1,780,000	$ -	$ -
30	CNF-07	CNF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 500,000	1.00	-	$ 500,000	IF	140%	$ 850,000	Chev	$ 850,000	$ -	$ -	$ 425,000	$ 425,000	$ -	$ -
30	HPS-06	HPS	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 600,000	1.00	-	$ 600,000	CA	120%	$ 725,000	None	$ -	$ 725,000	$ -	$ 350,000	$ 375,000	$ -	$ -
Subtotal	Treatment Facility Repair, Replacement, and Improvements											$ 4,925,000			$ 4,925,000			$ 6,180,000		$ 5,455,000	$ 725,000	$ -	$ 3,600,000	$ 2,580,000	$ -	$ -
	EMWRF-04	EMWRF	Treatment	Add 0.6 mgd of Industrial RO Treatment of Title 22 Water (half of 1,000 afy total w/ RO).(6)	FY15-20						per gpd	$ 1,350,000	1.00	-	$ 1,350,000	IF	140%	$ 1,890,000	EMWRF	$ 1,890,000	$ -	-	$ -	$ 1,890,000	$ -	$ -
	EMWRF-05	EMWRF	Treatment	Add 0.5 mgd of Nitrified Treatment of Title 22 Water (half of 1,000 afy total w/ Nitrified).(6)	FY15-20	0.5	mgd			$ 1	per gpd	$ 525,000	1.00	-	$ 525,000	IF	140%	$ 735,000	EMWRF	$ 735,000	$ -	-	$ -	$ 735,000	$ -	$ -
Subtotal	EMWRF Expansion											$ 1,875,000			$ 1,875,000			$ 2,625,000		$ 2,625,000	$ -	$ -	$ -	$ 2,625,000	$ -	$ -
31	CBRN-01	CBRN	Pipeline	Install access ports for cleaning	FY1112	8	ports			$ 100,000	per port	$ 800,000	1.00	-	$ 800,000	OF	157%	$ 1,260,000	None	$ -	$ 1,260,000	-	$ 1,260,000	-	$ -	$ -
31	CRWRF-06	CRWRF	Recapitalization	Repair Nitrified Product Water Storage Tank	FY1112	0.2	MG			$ 2.00	per gallon	$ 400,000	1.00	-	$ 400,000	IF	140%	$ 560,000	None	$ -	$ 560,000	-	$ 560,000	-	$ -	$ -
31	CRWRF-08	CRWRF	PS	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 5,310,000	1.00	-	$ 5,310,000	CA	120%	$ 6,375,000	None	$ -	$ 6,375,000	$ -	$ 1,125,000	$ 5,250,000	$ -	$ -
31	CRWRF-09	CRWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 279,900	per year	$ 2,795,000	1.00	-	$ 2,795,000	MR	100%	$ 2,799,000	None	$ -	$ 2,799,000	-	$ 1,399,500	$ 1,399,500	$ -	$ -
31	CRWRF-10	CRWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 1,205,000	1.00	-	$ 1,205,000	IF	140%	$ 1,690,000	None	$ -	$ 1,690,000	$ -	$ 845,000	$ 845,000	$ -	$ -
31	CRWRF-11	CRWRF	Recapitalization	UW Recap - Construct paved access way from road to rear side of RO CIP tank.	FY0910							$ 10,000	1.00	-	$ 10,000	UW	100%	$ 10,000	None	$ -	$ 10,000	$ 10,000	$ -	-	$ -	$ -
31	EBRN-01	EBRN	Pipeline	Install pinch valves/reducers	FY1011	10	reducers			$ 40,000	per valve(1)	$ 400,000	1.00	-	$ 400,000	OF	157%	$ 630,000	None	$ -	$ 630,000	-	$ 630,000	-	$ -	$ -
31	EBRN-02	EBRN	Pipeline	Install access ports for cleaning	FY1112	12	ports			$ 100,000	per port	$ 1,200,000	1.00	-	$ 1,200,000	OF	157%	$ 1,885,000	None	$ -	$ 1,885,000	-	$ 1,885,000	-	$ -	$ -
31	ELWRF-01	ELWRF	Recapitalization	UW Recap - T-22 backwash pump total rebuilds (increase capacity of T22 backwash blower)	FY0910					$ 100,000	lumpsum(9)	$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-06	ELWRF	Recapitalization	Increase Capacity of Title 22 Air Vacuum Release Valve for Product Water Storage Tanks	FY1011	1	valve			$ 70,000	lumpsum(1)	$ 70,000	1.00	-	$ 70,000	IF	140%	$ 100,000	None	$ -	$ 100,000	-	$ 100,000	-	$ -	$ -

WB Project ID	Project ID	System Name	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
31	ELWRF-16	ELWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 18,215,000	1.00	-	$ 18,215,000	CA	120%	$ 21,860,000	None	$ -	$ 21,860,000	$ -	$ 4,660,000	$ 17,200,000	$ -	$ -
31	ELWRF-17	ELWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,105,380	per year	$ 11,050,000	1.00	-	$ 11,050,000	MR	100%	$ 11,053,800	None	$ -	$ 11,053,800	-	$ 5,526,900	$ 5,526,900	$ -	$ -
31	ELWRF-18	ELWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,620,000	1.00	-	$ 3,620,000	IF	140%	$ 5,070,000	None	$ -	$ 5,070,000	$ -	$ 2,535,000	$ 2,535,000	$ -	$ -
31	ELWRF-19	ELWRF	Recapitalization	UW Recap - Pave area between T 22 filters and the holding basins	FY0910							$ 8,800	1.00	-	$ 8,800	UW	100%	$ 8,800	None	$ -	$ 8,800	$ 8,800	$ -	-	$ -	$ -
31	ELWRF-20	ELWRF	Recapitalization	UW Recap - Shelter/Overhead cover when CO2 tank is removed. To provide covered storage area for chemical totes. Include access for forklifts around dike area.	FY0910							$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-21	ELWRF	Recapitalization	UW Recap - Phase III Memcor and SCADA and PC	FY0910							$ 5,000	1.00	-	$ 5,000	UW	100%	$ 5,000	None	$ -	$ 5,000	$ 5,000	$ -	-	$ -	$ -
31	ELWRF-22	ELWRF	Recapitalization	UW Recap - No. 3 Sulfuric acid day tank replace	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	ELWRF-23	ELWRF	Recapitalization	UW Recap - Replace grating replacement in chemical area with chemical resistant grating	FY0910							$ 40,000	1.00	-	$ 40,000	UW	100%	$ 40,000	None	$ -	$ 40,000	$ 40,000	$ -	-	$ -	$ -
31	ELWRF-24	ELWRF	Recapitalization	UW Recap - Trench Drains at Decant Sump area	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	ELWRF-25	ELWRF	Recapitalization	UW Recap - Power receptacles for emergency generator hook up for Title 22	FY0910							$ 20,000	1.00	-	$ 20,000	UW	100%	$ 20,000	None	$ -	$ 20,000	$ 20,000	$ -	-	$ -	$ -
31	ELWRF-26	ELWRF	Recapitalization	UW Recap - Replace DCS back up power (48vac) generator	FY0910							$ 45,000	1.00	-	$ 45,000	UW	100%	$ 45,000	None	$ -	$ 45,000	$ 45,000	$ -	-	$ -	$ -
31	ELWRF-27	ELWRF	Recapitalization	UW Recap - Flow control valve and actuator for barrier product pump	FY0910							$ 100,000	1.00	-	$ 100,000	UW	100%	$ 100,000	None	$ -	$ 100,000	$ 100,000	$ -	-	$ -	$ -
31	ELWRF-28	ELWRF	Recapitalization	UW Recap - Replace or expand plant instrument air compressor system	FY0910							$ 75,000	1.00	-	$ 75,000	UW	100%	$ 75,000	None	$ -	$ 75,000	$ 75,000	$ -	-	$ -	$ -
31	ELWRF-29	ELWRF	Recapitalization	UW Recap - Replace phase II RO Membranes	FY0910							$ 375,000	1.00	-	$ 375,000	UW	100%	$ 375,000	None	$ -	$ 375,000	$ 375,000	$ -	-	$ -	$ -
31	ELWRF-30	ELWRF	Recapitalization	UW Recap - Data Parser to allow for direct entry of data from instrumentation into LIMS.	FY0910							$ 25,000	1.00	-	$ 25,000	UW	100%	$ 25,000	None	$ -	$ 25,000	$ 25,000	$ -	-	$ -	$ -
31	ELWRF-31	ELWRF	Recapitalization	UW Recap - Replace or repair lab wall to prevent water intrusion and mold	FY0910							$ 25,000	1.00	-	$ 25,000	UW	100%	$ 25,000	None	$ -	$ 25,000	$ 25,000	$ -	-	$ -	$ -
31	EMWRF-01	EMWRF	Recapitalization	Repair or Replace Bulk Chemical Storage Tank and Associated Equipment	FY1112		1 system			$ 500,000	lumpsum(1)	$ 500,000	1.00	-	$ 500,000	IF	140%	$ 700,000	None	$ -	$ 700,000	-	$ 700,000	-	$ -	$ -
31	EMWRF-02	EMWRF	Recapitalization	Inspect Nitrified Product Water Storage Tank Internal Condition	FY1112		1 site			$ 60,000	lumpsum(1)	$ 60,000	1.00	-	$ 60,000	IF	140%	$ 85,000	None	$ -	$ 85,000	-	$ 85,000	-	$ -	$ -
31	EMWRF-03	EMWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult						lumpsum(1)	$ 5,815,000	1.00	-	$ 5,815,000	CA	120%	$ 6,980,000	None	$ -	$ 6,980,000	$ -	$ 1,590,000	$ 5,390,000	$ -	$ -
31	EMWRF-06	EMWRF	Treatment	Surge Protection - Modify MF Units with Break Tank and Pumps	FY15-20		1 system	lump sum for alternatives		$ 2,500,000	lumpsum(2)	$ 2,500,000	1.00	-	$ 2,500,000	IF	140%	$ 3,500,000	None	$ -	$ 3,500,000	-	$ -	$ 3,500,000	$ -	$ -
31	EMWRF-08	EMWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 165,000	per year	$ 1,650,000	1.00	-	$ 1,650,000	MR	100%	$ 1,650,000	None	$ -	$ 1,650,000	-	$ 825,000	$ 825,000	$ -	$ -
31	EMWRF-09	EMWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 605,000	1.00	-	$ 605,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ 425,000	$ 425,000	$ -	$ -
31	EMWRF-10	EMWRF	Recapitalization	UW Recap - Pavement of area between gated entrance and plant.	FY0910							$ 20,000	1.00	-	$ 20,000	UW	100%	$ 20,000	None	$ -	$ 20,000	$ 20,000	$ -	-	$ -	$ -
31	EMWRF-11	EMWRF	Recapitalization	UW Recap - Add an additional air compressor for the MF system	FY0910							$ 30,000	1.00	-	$ 30,000	UW	100%	$ 30,000	None	$ -	$ 30,000	$ 30,000	$ -	-	$ -	$ -
31	EMWRF-12	EMWRF	Recapitalization	UW Recap - RO Train 4 membrane change out	FY0910							$ 160,000	1.00	-	$ 160,000	UW	100%	$ 160,000	None	$ -	$ 160,000	$ 160,000	$ -	-	$ -	$ -
31	NTP-02	NTP	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,705,000	per year	$ 5,040,000	1.00	-	$ 5,040,000	MR	100%	$ 8,525,000	None	$ -	$ 8,525,000	-	$ -	$ 8,525,000	$ -	$ -
31	SW-01	SW	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,020,000	1.00	-	$ 3,020,000	IF	140%	$ 4,230,000	None	$ -	$ 4,230,000	$ -	$ 2,115,000	$ 2,115,000	$ -	$ -
31	SW-02	SW	Recapitalization	UW Recap - Major Painting Projects	FY0910							$ 150,000	1.00	-	$ 150,000	UW	100%	$ 150,000	None	$ -	$ 150,000	$ 150,000	$ -	-	$ -	$ -
31	SW-03	SW	Recapitalization	UW Recap - Purchase trailer for spill response	FY0910							$ 5,000	1.00	-	$ 5,000	UW	100%	$ 5,000	None	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -
31	SW-04	SW	Recapitalization	UW Recap - Asset Management Software, Implementation and Training	FY0910							$ 300,000	1.00	-	$ 300,000	UW	100%	$ 300,000	None	$ -	$ 300,000	$ 300,000	$ -	-	$ -	$ -
31	SW-05	SW	Recapitalization	UW Recap - Replace all Biofor valves at CNF and EMWRF	FY0910							$ 200,000	1.00	-	$ 200,000	UW	100%	$ 200,000	None	$ -	$ 200,000	$ 200,000	$ -	-	$ -	$ -
Subtotal	Conveyance Facility Repair, Replacement, and Improvements											$ 66,108,800			$ 66,108,800			$ 81,656,600		$ -	$ 81,656,600	$ 1,853,800	$ 26,266,400	$ 53,536,400	$ -	$ -
											Total	**$ 398,113,760**	**$ -**	**$ -**	**$ 417,535,333**	**-**	**$ -**	**$ 614,937,878**	**$ -**	**$ 254,180,000**	**$ 360,757,878**	**$ 15,103,800**	**$ 373,002,678**	**$ 226,831,400**	**$ -**	**$ -**

Notes:
1) Cost estimated based on considerations specific to the site, application, or project, rather than through utilization of unit costs.
2) Withfor this report, multiple alternatives were proposed. For conservative planning purposes, the more expensive option is included here. Decisions regarding alternatives will need to be made during preliminary design. See Chapters 7 and 8 for more details.
3) Cost estimate obtained from ELWRF Phase V Expansion Feasibility Study (HDR April 2008). Cost estimate does not reflect unit costs or markups developed for this report.
4) Budget for project prepared by West Basin as a part of preliminary design. Cost estimate does not reflect unit costs or markups developed for this report.
5) Cost based on recent discussions with West Basin staff. Cost estimate does not reflect unit costs or markups developed for this report.
6) Expansion of the EMWRF Facility and associated increase in Title 22 water are not included in the Customer Database or System Analysis portions of this report.
7) Cost provided by West Basin staff. Based on recent customer revisions.
8) Length reduced from 16,000 lf to 12,000 lf based on discussions with West Basin staff.
9) Cost provided by United Water cost estimate.

Post 2020 Projects

Project ID	System Name (Lookup)	Project Type	Project Description	Year	Size	Unit	Capacity	Unit	Unit Cost	Unit	Construction Cost (w/o Spcl Cond)	Special Construction	Spcl Cnst	Construction Cost	Project Location (for TTC)	Contingency	Capital Cost	Other Payer	Cost to Other Party	Cost to West Basin	FY0910	FY10-15	FY15-20	FY20-25	FY25-30
CNF-08	CNF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 290,000	1.00	-	$ 290,000	CA	120%	$ 350,000	None	$ -	$ 350,000	$ -	$ -	$ -	$ 170,000	$ 180,000
CNF-09	CNF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 500,000	1.00	-	$ 500,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ -	$ -	$ 425,000	$ 425,000
HPS-07	HPS	PS	Add 38 mgd of additional firm pumping capacity, to bring total firm capacity to 135 mgd. (For LADWP Westside, Kenneth Hahn, LADWP Harbor Expansion) (Assumes 3 pumps, 3,000 hp increase)	FY20-25	46	mgd	3,000	hp	$ 6,500	per hp	$ 19,500,000	1.00	-	$ 19,500,000	IF	140%	$ 27,300,000	None	$ -	$ 27,300,000	-	$ -	$ -	$ 27,300,000	-
HPS-08	HPS	Pipeline	Parallel HSEFM w/ 36"	FY20-25	15,500	lineal ft	36	inches	$ 750	per lineal ft	$ 11,625,000	1.25	A	$ 14,531,250	OF	157%	$ 22,815,000	None	$ -	$ 22,815,000	-	$ -	$ -	$ 22,815,000	-
T22-24	T22	Pipeline	Anza Lateral Break Tank	FY20-25					0	lumpsum	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	None	$ -	$ 4,200,000	-	$ -	$ -	$ 4,200,000	-
T22-25	T22	Pipeline	LA Westside Lateral	FY25-30	40,500	lineal ft	24 - 36	inches	0	see detail	$ 24,355,000	1.05	F,R	$ 25,480,000	OF	157%	$ 40,005,000	None	$ -	$ 40,005,000	-	$ -	$ -	-	$ 40,005,000
T22-26	T22	PS	Inglewood/LA Westside PS (assumes 4-8,500 gpm pumps)	FY25-30	34,000	gpm	5,950	hp	$ 3,000	per hp	$ 17,850,000	1.00	-	$ 17,850,000	OF	157%	$ 28,025,000	None	$ -	$ 28,025,000	-	$ -	$ -	-	$ 28,025,000
ELWRF-32	ELWRF	Treatment	Land Acquisition of 4.0 ac near ELWRF for Expansion of Title 22 Beyond 70.0 mgd	FY20-25	21.5	mgd	4.0	ac	$ 2,000,000	per acre	$ 8,000,000	1.00	-	$ 8,000,000	LA	120%	$ 9,600,000	None	$ -	$ 9,600,000	-	$ -	$ -	$ 9,600,000	-
ELWRF-33	ELWRF	PS	Increase capacity of Title 22 Pump Station at ELWRF by 4,000 hp (from 8,000 hp to 12,000 hp) to serve LADWP Harbor Expansion, Westside, and Kenneth Hahn	FY25-30			4,000	hp	$ 3,000	per hp	$ 12,000,000	1.00	-	$ 12,000,000	IF	140%	$ 16,800,000	None	$ -	$ 16,800,000	-	$ -	$ -	-	$ 16,800,000
ELWRF-34	ELWRF	Treatment	Add 8.9 mgd of Additional Title 22 Treatment to Serve LADWP Harbor Expansion, increasing Title 22 Treatment Capacity from 67.3 mgd to 76.2 mgd	FY25-30	8.9	mgd			$ 2.00	per gal	$ 17,815,000	1.00	-	$ 17,815,000	IF	140%	$ 24,945,000	None	$ -	$ 24,945,000	-	$ -	$ -	-	$ 24,945,000
ELWRF-35	ELWRF	Treatment	Add 15.3 mgd of Additional Title 22 Treatment to Serve LADWP Westside and Kenneth Hahn Park, increasing Title 22 Treatment Capacity from 76.2 mgd to 91.5 mgd	FY25-30	15.3	mgd			$ 2.00	per gal	$ 30,690,000	1.00	-	$ 30,690,000	IF	140%	$ 42,970,000	None	$ -	$ 42,970,000	-	$ -	$ -	-	$ 42,970,000
ELWRF-36	ELWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 14,970,000	1.00	-	$ 14,970,000	CA	120%	$ 17,965,000	None	$ -	$ 17,965,000	$ -	$ -	$ -	$ 11,040,000	$ 6,925,000
ELWRF-37	ELWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,105,380	per year	$ 11,055,000	1.00	-	$ 11,055,000	MR	100%	$ 11,055,000	None	$ -	$ 11,055,000	$ -	$ -	$ -	$ 5,527,500	$ 5,527,500
ELWRF-38	ELWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,620,000	1.00	-	$ 3,620,000	IF	140%	$ 5,070,000	None	$ -	$ 5,070,000	$ -	$ -	$ -	$ 2,535,000	$ 2,535,000
CRWRF-12A	CRWRF	Treatment	Nitrified Treatment of Title 22 Water (Nitrified Water for LADWP Harbor Demand Phase II)	FY20-25	7.1	mgd			$ 1.05	per gpd	$ 7,485,000	1.00	-	$ 7,485,000	IF	140%	$ 10,480,000	None	$ -	$ 10,480,000	-	$ -	$ -	$ 10,480,000	-
CRWRF-12B	CRWRF	PS	Add new 7.1 mgd pump station at CRWRF to serve LADWP Harbor Demand Phase II (5 pumps)	FY20-25	5,917	gpm	300	hp	$ 10,000	per hp	$ 3,000,000	1.00	-	$ 3,000,000	IF	140%	$ 4,200,000	None	$ -	$ 4,200,000	-	$ -	$ -	$ 4,200,000	-
CRWRF-13	CRWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 3,245,000	1.00	-	$ 3,245,000	CA	120%	$ 3,895,000	None	$ -	$ 3,895,000	$ -	$ -	$ -	$ 2,595,000	$ 1,300,000
CRWRF-14	CRWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 279,900	per year	$ 2,800,000	1.00	-	$ 2,800,000	MR	100%	$ 2,800,000	None	$ -	$ 2,800,000	$ -	$ -	$ -	$ 1,400,000	$ 1,400,000
CRWRF-15	CRWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 1,205,000	1.00	-	$ 1,205,000	IF	140%	$ 1,690,000	None	$ -	$ 1,690,000	$ -	$ -	$ -	$ 845,000	$ 845,000
NTP-03	NTP	Treatment	Barrier Water Treatment - treat SE from JWPCP to serve Dominguez Gap (Phase I and II)	FY20-25	3.9	mgd			$ 6.25	per gal	$ 24,375,000	1.00	-	$ 24,375,000	IF	140%	$ 34,125,000	None	$ -	$ 34,125,000	-	$ -	$ -	$ 34,125,000	-
NTP-04	NTP	PS	Add new 3.1 mgd pump station at NTP to serve Dominguez Gap (Phase I + II)	FY20-25	2,583	gpm	150	hp	$ 10,000	per hp	$ 1,500,000	1.00	-	$ 1,500,000	IF	140%	$ 2,100,000	None	$ -	$ 2,100,000	-	$ -	$ -	$ 2,100,000	-
NTP-05	NTP	Pipeline	New Pipeline from NTP to Dominguez Gap Barrier Blending Station for conveyance of Barrier Water.	FY20-25	15,840	lineal ft	12	inches	$ 310	per ft	$ 4,910,400	1.25	A	$ 6,138,000	OF	157%	$ 9,640,000	None	$ -	$ 9,640,000	-	$ -	$ -	$ 9,640,000	-
NTP-06	NTP	Recapitalization	Membrane Replacement (recurring)	Mult					$ 1,705,000	per year	$ 10,085,000	1.00	-	$ 10,085,000	MR	100%	$ 17,050,000	None	$ -	$ 17,050,000	$ -	$ -	$ -	$ 8,525,000	$ 8,525,000
EMWRF-13	EMWRF	Recapitalization	Rehabilitation and Replacement from Condition Assessment (recurring)	Mult							$ 2,720,000	1.00	-	$ 2,720,000	CA	120%	$ 3,265,000	None	$ -	$ 3,265,000	$ -	$ -	$ -	$ 2,440,000	$ 825,000
EMWRF-14	EMWRF	Recapitalization	Membrane Replacement (recurring)	Mult					$ 165,000	per year	$ 1,650,000	1.00	-	$ 1,650,000	MR	100%	$ 1,650,000	None	$ -	$ 1,650,000	$ -	$ -	$ -	$ 825,000	$ 825,000
EMWRF-15	EMWRF	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 605,000	1.00	-	$ 605,000	IF	140%	$ 850,000	None	$ -	$ 850,000	$ -	$ -	$ -	$ 425,000	$ 425,000
SW-06	SW	Recapitalization	United Water Recapitalization Improvements (recurring)	Mult							$ 3,020,000	1.00	-	$ 3,020,000	IF	140%	$ 4,230,000	None	$ -	$ 4,230,000	$ -	$ -	$ -	$ 2,115,000	$ 2,115,000
										Total	**$ 241,870,400**	**$ -**	**$ -**	**$ 247,129,250**	**-**	**$ -**	**$ 347,925,000**	**$ -**	**$ -**	**$ 347,925,000**	**$ -**	**$ -**	**$ -**	**$ 163,327,500**	**$ 184,597,500**
										Grand Total	**$ 639,984,160**	**$ -**	**$ -**	**$ 664,664,583**	**-**	**$ -**	**$ 962,862,878**	**$ -**	**$ 254,180,000**	**$ 708,682,878**	**$ 15,103,800**	**$ 373,002,678**	**$ 226,831,400**	**$ 163,327,500**	**$ 184,597,500**

This page intentionally left blank.

Appendix 3-K: Upper Malibu Creek Watershed Restoration Supporting Documents

(Please see Appendix CD for additional documents)

This page intentionally left blank.

FEASIBILITY STUDY

FOR THE REMOVAL OF
CONCRETE LINING IN LAS VIRGENES CREEK
DOWN STREAM OF MEADOW CREEK LANE

JULY 2005

Prepared for:
CITY OF CALABASAS
26135 Mureau Road
Calabasas, California 91302-3172

Prepared by:
WILLDAN
27042 Towne Centre Drive Suite 270
Foothill Ranch, CA 92610
(949) 470-8840
(949) 770-9041 fax

Under the Supervision of:
Kenneth C. Taylor, P.E.
Vice President
Division Manager

FEASIBILITY STUDY

FOR REMOVAL OF CONCRETE LINING IN LAS VIRGENES CREEK
DOWN STREAM OF MEADOW CREEK LANE
CITY OF CALABASAS, CALIFORNIA

TABLE OF CONTENTS

List of Tables

List of Figures

1. INTRODUCTION

The City of Calabasas has contract Willdan to provide Engineering Services to prepare a Preliminary Feasibility Study investigating the feasibility of removing the failed concrete channel lining in the Las Virgenes Creek between Meadow Creek Lane and Lost Hills Road and restoring the existing channel within this reach to a naturalized streambed. Figure "A" shows the general project location within the City limits.

2. BACKGROUND

This specific project was identified in the "Las Virgenes, McCoy, and Dry Canyon Creeks Master Plan, Phase I: Comprehensive Study" document, dated September 2003. This document reviewed the three creeks listed above and generated a proposed a projects list, but did not provide an investigation as to the feasibility of constructing or implementing the listed projects. The City of Calabasas' Environmental Services Division therefore is intends to investigate the feasibility to design and construct a stream restoration project to remove a failed sections of concrete channel and construct naturalization improvements, to remove the artificial structures and fish barriers along a portion of Las Virgenes Creek.

3. PURPOSE

The purpose of this study is to determine if an environmental enhance project to construct a streambed naturalization project is feasible for this reach of Las Virgenes Creek. This study will also analyze several flood control restoration concepts to utilize the existing channel configuration and geometry with various channel lining protection measures. The proposed improvements to the channel are required to:

- Support wildlife movement
- Support natural vegetation
- Improve the aesthetics of the channel

This Preliminary Feasibility Study will address the following:

1. Channel hydraulic characteristics under the as-built condition;
2. Channel geometry requirements and constraints for a streambed naturalization project;
3. Channel hydraulic characteristics for alternative channel improvements, advantages and disadvantages (Widened Channel Alternative 1, 2 and 3, Grass Lined, Riprap Lined, Gabion Lined, Concrete Revetment);
4. Cost Analysis of Alternatives and
5. Anticipated Regulatory Permit requirements

Figure A -

FIGURE A Project Location

4. AS-BUILT CONDITIONS

Description of Improvements

Based on the County as-built records, the existing channel improvements were constructed in or about the year 1988. The as-built channel section geometry varies over the 890 feet between Meadow Creek Lane and Lost Hills Road. The channel is bounded by Lost Hills Road to the west and a residential development within Tract 43787 and existing sewer mainline to the east. The upstream culvert at Meadow Creek Lane is an existing 4-barrel (14x16 feet) reinforced concrete box and the down stream culvert under Lost Hills Road is an existing 4-barrel (14x14 feet) reinforced concrete box.

The as-built channel improvements were modeled using the Water Surface Pressure Gradient (WSPG) hydraulic modeling software. The as-built channel geometry was input into the computer model and run with a discharge rate of 15,300 cfs, referenced from the as-built plans. The composite manning n, roughness coefficient used to mimic the hydraulic data table on the as-built plans was approximated at 0.04.

Table 1 □As-built Channel Geometrics□Hydraulics

From Sta.	To Sta.	Base Width	Side Slopes	Channel Height	Channel Top Width	Depth of Flow	V Ft□Sec	Channel Description
20□24.92	18□59.00	Varies 24-59 feet	2:1	30□□ feet	175 feet	Varies 17□8 feet	Varies 16 to 19	Concrete Lined Trap Channel
18□59.00	13□99.32	24 feet	2:1	30□□ feet	Varies 140 to 190 feet	Varies 17.2 to 15.7 feet	Varies 16.9 to 15.9	Soft Bottom, Riprap Side Slopes, Cut off Walls
13□99.32	11□88.48	Varies 24-59 feet	2:1	30□□ feet	Varies 190 to 220 feet	Varies 17.2 to 8.1 feet	Varies 19.2 to 15.9	Soft Bottom, Riprap Side Slopes, Cut off Walls

The As-built Plans are provided for reference in Figure □B□and illustrate the as-built plan and profile of the channel improvements.

Field Visit Observations

A field visit was conducted on June 8, 2005. The culverts as well as the concrete channel lining immediately up and downstream of Meadow Creek Lane and Lost Hills Road appear to be intact. Deposits of silt within the culverts were observed and the channel was overgrown with trees, shrubs and weeds due to the lack of adequate maintenance. Approximately 100 feet or more of the concrete cut-off walls immediately downstream of the concrete channel lining have overturned as the soft bottom section has scoured over time.

The existing riprap on the channel side slopes has sloughed into the channel invert as a result. A vertical drop in the invert of the channel, of approximately 6-8 feet, was observed at approximate channel Station 18+59 (see photo below). The vertical drop occurs downstream of the existing concrete channel lining where the soft bottom channel, concrete cut off walls and riprap side slopes begin.

Looking upstream at approximate Station 18+59 – Failed cut off wall and vertical drop in channel invert.

FIGURE B As-Built Improvement Plans of the Existing Channel

5. ALTERNATIVE CHANNEL IMPROVEMENT CONCEPTS

<u>Alternative Channel Design Geometry and Lining Concepts</u>

The following alternative design geometry and lining concepts were analyzed as part of this study:

- Streambed Naturalization Project utilizing the design criteria outlined in the California Regional Water Quality Control Board, Stream, and River Protection for Regulatory and Program Managers, Technical Reference Circular, dated April 2003.

- Flood Control Restoration Projects utilizing the existing channel configuration and geometry with various channel lining protection measures.

<u>Stream Bed Naturalization Project</u>

Basis of Design

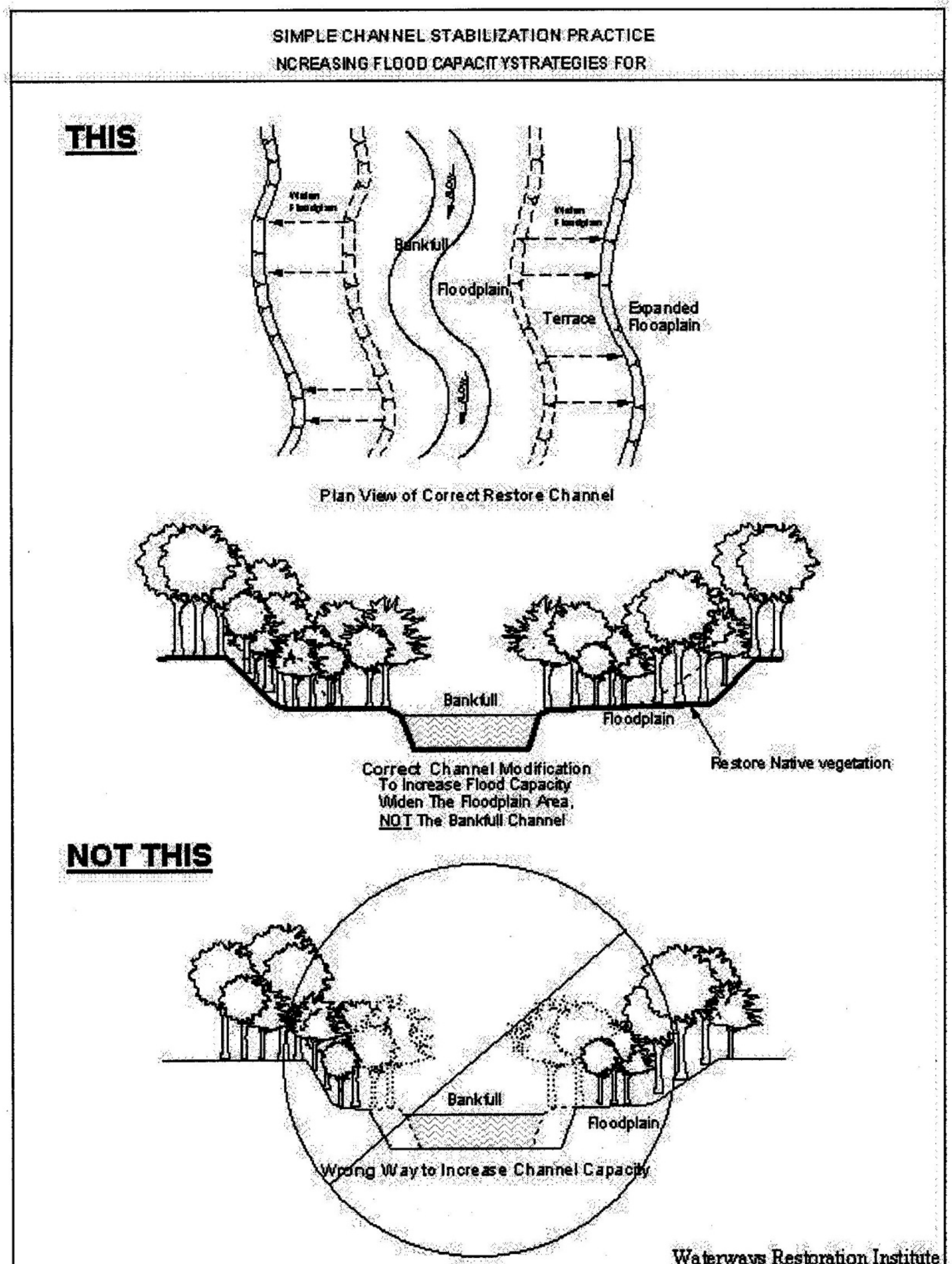
Although, the aforementioned CRWQCB Technical Reference Circular was prepared for the San Francisco Bay Regional Water Quality Control Board, the intent was for other regional boards to adapt the concepts of this circular to address different conditions around the State. It is our understanding that this publication represents the current design requirements for Stream Bed Naturalization Projects and we have based our analysis on the requirements contained therein. The following is a "broad brush" summary of the concepts presented in this circular and only the sections pertaining to the required geometry for a streambed naturalization project were analyzed at this time as part of this preliminary feasibility study

General Description and Design Parameters

In general, the naturalization of streambed channels consists of increasing the stability of the channel, restoring ecological habitat and maintaining the flood capacity of the channel. The stability of the channel is defined as a condition in which the sediment sizes and loads, water discharges, and channel shapes and slopes are in balance. A stable channel is considered to be in equilibrium where the sediment loads entering a channel are equal to those leaving it. The overall approach to obtain a stable channel is to establish a meandering alignment that accounts for the slope, sediment loads, sediment sizes, discharges, roughness of the stream channel and bank-full channel widths and depths. The restoration of ecological habitat is accomplished by re-vegetating the stream banks along with meandering channel to reduce excessive erosion of the channel. Maintaining the flood capacity of the channel by incorporating tiered cross section geometry will contain high flows within the channel banks (Reference, Figure 5, Waterways Restoration Institute). See below.

FIGURE C Figure 5 Waterways Restoration Institute

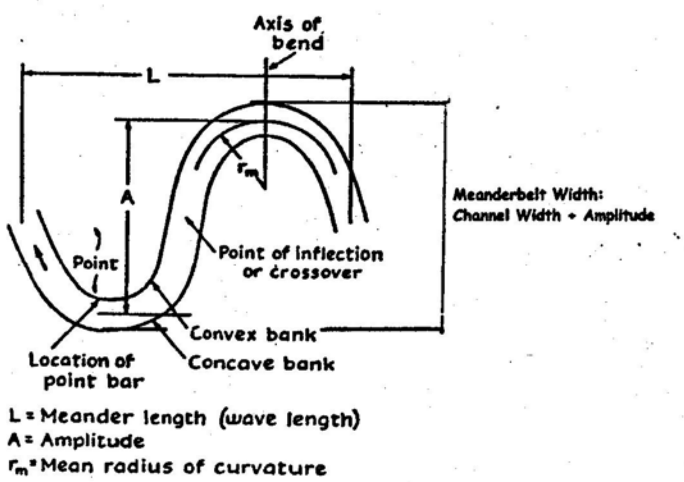
Figure 5



Stable Channel Length and Sinuosity

According to the aforementioned circular, the stable length for an active channel will include matching the channel slope and sinuosity (how much the channel meanders) with the valley slope. The channel slope will be influenced by both the slope of the overall stream valley and by grade controls imposed on the channel slope such as culverts and bridges.

In the absence of historical maps, photos or records to estimate the historic sinuosity, the sinuosity can be determined using regionally based data on the relationship between the length of a meander and the width of a stream. Using national data, on average the meandering length ranges from seven to ten times (used **8.5**) the stream bank-full channel widths. In the Bay Area, the Waterway Restoration Institute determines the radius of curvature of the meanders average **2.3** times the stream channel widths and the amplitudes of the meanders average about **2.7** times the stream channel widths. These values were used in this analysis to determine the approximate horizontal geometry requirements based on an average streambed width of 42 feet ((59□24)□2).



Therefore: L (meandering length) = 42*8.5 = **357 feet**
A (amplitude) = 42*2.7 = **113 feet**
r (radius of curvature) = 42*2.3 = **97 feet**

The basic tendencies of river function and adjustment rely on principles reported by Inglis (1947), Leopold and Wolman (1957, 1960) Leopold et.al (1964), and Langbein and Leopold (1966). In addition, because of the complex interactions associated with individual variables (width, depth, slope, velocity, flow resistance, sediment size, sediment load and stream discharge) a stream classification system was developed to describe combination of the various □integrations□ as predictable, morphological stream types. (Rosgen 1985, 1993) Since the sediment size and load are unknown at this time the national averages were utilized as part of this study.

Physical Constraints of Project Site

As shown in Table 1 above, the existing channel width varies from 140 to 220 feet and is approximately 30 feet deep. Since the amplitude calculated above is estimated at 113 feet and the channel invert is approximately 30 feet deep, the required channel width to implement a streambed naturalization project, with 2:1 side slopes, is (113+2*30+2*30) = 233 feet. This width exceeds the available channel top width. Right-of-way acquisition and substantial modifications or protection of the surrounding improvements would be required to implement this type of project (ie. realignment of Lost Hills Road, construction of retaining wall structures, modifications to existing residential improvements including the potential relocation of the existing sewer mainline on the east side of the channel.

<u>Flood Control Restoration Projects</u>

<u>Widened Channel Alternative #1</u>

This alternative would reduce the scour velocities to 5 to 6 feet/sec. Using a normal depth calculation, the required trap channel bottom width required would be approximately 1,500-feet-wide. This alternative meets the minimum scour velocities, but would not be feasible to construct due to the extent of existing improvements that would be effected and the amount of right-of-way acquisition or easements that would be required to accommodate the channel improvements. The existing top width of the existing channel varies from 140 to 220-feet-wide.

<u>Widened Channel Alternative #2</u>

This alternative utilize the available channel width without obtaining right-of way. The maximum channel width that could be accommodated is estimated to be 130 feet. The normal depth calculation for a rectangular channel with vertical concrete channel walls and a soft bottom, n=0.025, the resultant flow velocity is approximately 19 feet/sec. The alternative would not be feasible due to the scour velocities exceeding 5-6 feet/sec, which would scour the soft bottom of the channel.

<u>Grass Lined</u>

Utilizing the existing channel configuration and an "n value" of 0.025 the resultant channel velocities ranged from 18 to 22 feet/sec. The alternative would not be feasible due to the scour velocities exceeding 5-6 feet/sec, which would scour the grass lining from the channel side slopes and invert of the channel.

Riprap Lined

Utilizing the existing channel configuration and an "n value" of 0.040 the resultant channel velocities ranged from 16 to 19 feet/sec. The alternative is feasible since the riprap will be adequate to withstand the anticipated velocities. The riprap lining will also allow for limited vegetative growths and gives a natural appearance. Although the riprap lining does not accommodate easy wildlife movement, it is possible to design and configure the riprap with invert stabilizer in such a way to create pools or steps to eliminate fish barriers and protect the channel side slopes and invert.

Gabion Lined and Concrete Revetment

Utilizing the existing channel configuration and an "n value" of 0.025 to 0.075. The "n-value of 0.025 is typically used for well maintained to obtain highest flow velocity, whereas 0.075 is used for channels that are not maintained well with weeds and brush uncut, high stage of flow. The resultant channel velocities ranged from 18 to 22 feet/sec and 11 to 13 feet/sec for n values of 0.025 and 0.075 respectively. The Gabion Lined and Concreted Revetments are not as conducive to vegetative growth or natural looking as the riprap lining. Although the Gabion Lined and Concreted Revetments does not accommodate easy wildlife movement, it is possible to design and configure these types of linings with invert stabilizer in such a way to create pools or steps to eliminate fish barriers and protect the channel side slopes and invert. However, the construction costs would be more expensive than the riprap channel lining.

Please refer to Appendix A for Hydraulic Calculations

The advantages and disadvantages for the alternative channel configurations are summarized in the following Table 2

Table 2 – Alternative Channel Configurations

ALTERNATIVE	ADVANTAGES	DISADVANTAGES
Streambed Naturalization Project		
Naturalization of streambed channels consists of increasing the stability of the channel, restoring ecological habitat, maintaining flood capacity of the channel	Will reduce velocities, balance erosion, improve water quality by reducing scour and allow for the establishment of vegetation and supports wildlife habitat and movement.	Not economical to construct due to the extent of existing improvements that would be effected and the amount of right-of-way acquisition or easements that would be required to accommodate the channel improvements.
Flood Control Restoration Project		
Widening Channel Alt. No. 1 1500-foot-wide bottom width; riprap side slopes and soft bottom.	Will reduce velocities to eliminate scour and allow for the establishment of vegetation and supports wildlife habitat and movement.	Not economical to construct due to the extent of existing improvements that would be effected and the amount of right-of-way acquisition or easements that would be required to accommodate the channel improvements.
Widening Channel Alt. No. 2 130-foot-wide bottom width with concrete side slopes.	Can be constructed within available right-of-way	High initial construction costs, velocities in the 19ft/sec range, not suitable for intended purpose without incorporating concrete and/or riprap drop structures to reduce scour.
Grass lined Trapezoidal Channel	Economical to construct and maintain, aesthetically blends with the surrounding, gives a natural look and supports wildlife habitat	Cannot withstand velocities greater than 6ft/sec. Existing velocities exceed 18-22 ft/sec. Not suitable for intended purpose without incorporating concrete and/or riprap drop structures
Riprap lined Trapezoidal Channel	Similar to existing channel configuration and moderately economical to construct and maintain. Supports limited vegetative growth and gives natural appearance. Can be configured to create pools to eliminate fish barriers.	Not conducive for establishment of desired vegetative coverage due to movement of the media at high velocities. Does not accommodate easy wildlife movement
Gabion lined Trapezoidal Channel	Withstands high velocities (up to 25 ft/sec), supports limited vegetative growth with permanent anchor. Can be configured to create pools to eliminate fish barriers.	High initial construction cost. Moderate maintenance costs. Does not accommodate easy wildlife movement.
Concrete Block Revetment Trapezoidal Channel	Withstands high velocities (up to 26 ft/sec), provides the environment for vegetative growth with permanent anchor. Accommodates wildlife movement. Can be configured to create pools to eliminate fish barriers.	High initial construction costs

RECOMMENDATIONS

Riprap Lined Trapezoidal Channel.

The conceptual improvements are intended to prevent the erosion of the channel invert and eliminate the existing fish barrier within the Las Virgenes Creek, between the existing channel lining down stream of Meadow Creek Lane and upstream of Lost Hills Road.

CONCEPTUAL IMPROVEMENT DESCRIPTION

The conceptual improvements included the following elements:

1. Clearing and Grubbing the existing vegetation (trees, shrubs and weeds) within the channel invert, including areas for the construction of a temporary access roads.
2. Constructing temporary access roads to access the channel invert from Lost Hills Road. Typically fill material is placed temporarily to construct an earthen ramp into the channel. This ramp will be removed when the improvements within the channel are completed.
3. Removing the failed concrete walls from the channel.
4. Constructing invert stabilization structures (concrete walls) in an arched fashion to create ponds or tiers or steps to allow fish to migrate upstream. There is an elevation drop of approximately seven (7) feet from upstream to down stream, therefore, we have assumed the installation of three (3) invert stabilizers with a two (2) foot max drop between these structures to account for the seven (7) feet of elevation difference.
5. Placing 2-Ton riprap four (4) feet thick, within the channel invert between the existing channel walls, including the reach of channel where the walls will be removed. The riprap will protect the invert from the erosive velocities within the channel.
6. Constructing a trail/maintenance access road along the easterly channel side slope for trail and maintenance purposes. The proposed trail/maintenance access road will be 15 feet wide for maintenance vehicles and assumed to be paved with 2"AC/6"AB.

ENGINEER'S ESTIMATE

Due to the limited access to the site and the proximity of the improvements, the unit costs for construction were escalated. Also, because this is a conceptual design, this preliminary estimate includes a 20% contingency. We have also included a 35% line item to account for the Engineering Design, Contract Administration and Inspection of the project for budgeting purposes. The estimated total cost of this project is: $923,000

Need to discuss before this section is finalized.

6. PERMITS

Any construction activity and changes to the existing condition of a water course requires permits form various regulatory agencies. These permits are designed to protect and/or improve the functionality of the natural resource and public infrastructure. The permits that must be obtained before construction of the project are listed in Table 3.

Table 3 - List of Necessary Permits

AGENCY	TYPE OF PERMIT
1. Los Angeles County Flood Control District 2. U.S. Army Corps of Engineers (U.S. ACOE) 3. California Department of Fish and Game 4. California regional Water Quality Control Board (RWQCB)	1. Encroachment Permit 2. Section 404 Nationwide Permit 3. 1601 Streambed Alteration Agreement 4. National Pollutant Discharge Elimination

APPENDIX □A□HYDRAULIC ANALYSIS

Existing Condition - WSPG run (n=0.40)

Trap Channel □Normal Depth Calculations
Base Width 1500□, 130□, 200□, 300□, 500□and 1000□

Grasslined Channel □WSPG run (n=0.025)

Gabion and Concrete Revetment □WSPG run (n=0.075)

APPENDIX B COST ESTIMATES

Appendix 3-L: Vermont Avenue Stormwater Capture and Green Street Project

Supporting Documents

(Please see Appendix CD for additional documents)

This page intentionally left blank.

VERMONT AVENUE

Stormwater Capture and Green Street Project

A Collaborative Partnership Proposal
by

City of Los Angeles

Department of Public Works Bureau of Sanitation,
Watershed Protection Division

&

Heal the Bay



VERMONT AVENUE

Stormwater Capture and Green Street Project

Project Overview

For over half a century, street construction and improvement projects have focused on improving automotive mobility and minimizing flood risk at the expense of the environment. Rivers and streams have been contained into underground pipes and concrete channels. Pervious areas that were once covered in vegetation have been hardened and graded to convey water off of property as soon as possible. With the City of Los Angeles' increasing focus on a multi-benefit low impact development approach to new and redeveloped private parcels within the city, along with the development of our Green Streets in the public rights-of-way, our street improvements can focus on enhancing non-motorized mobility while reintroducing natural elements into urban areas and promoting the benefits of water quality, flood control, and street beautification. A Green Street is a street that uses vegetated facilities to manage stormwater runoff at or near its source, and is considered a sustainable stormwater strategy for meeting regulatory compliance and resource protection goals. By using a natural systems approach to manage stormwater, reduce flows, improve water quality and enhance watershed health, the proposed Vermont Avenue Stormwater Capture & Green Street Project will be designed to maximize these benefits in a low-tech, cost-effective manner while collecting data to inform future street construction, retrofit, and improvement projects implemented city-wide.

The Vermont Avenue Stormwater Capture and Green Street Project (Project) will implement a series of stormwater best management practices (BMPs) along a half-mile segment spanning from Gage Avenue to Florence Avenue of an area known as the Vermont Corridor in South Los Angeles. BMPs that filter and/or infiltrate stormwater will also be installed in three prioritized sub-watersheds that terminate at storm drains near the eastern flow line of Vermont Avenue. These subwatershed areas were prioritized based on criteria that will contribute to project success, including acreage of tributary, pollutants to be captured, available space in the public right-of-way, land-use, and community visibility (proximity to busy intersection and presence of schools and other community hubs). From north to south, the areas chosen include a 4.7 acre subwatershed at the southeast corner of Vermont Avenue and Gage Avenue (Area A), a 16.9 acre subwatershed at 68th Street (Area B), and a 17.4 acre area from 70th street to Florence Avenue (Area C). The capture goal for these areas is to detain and to filter or infiltrate the ¾" inch design storm for Area A, and the ¾" design storm runoff from the public right-of-way, including sidewalks, parkways, and streets in Areas B and C. To the maximum extent feasible within the constraints of the existing utility and roadway infrastructure, Green Street features will be placed along both the east and west sides of a half-mile stretch of Vermont from Gage Avenue to Florence Avenue, but will be prioritized in areas on the eastern side as these receive the greatest flow volume. A bio-filtration island at the intersection of Gage Avenue and Vermont Avenue has also been identified for additional treatment and greening in Area A.

This project will result in the installation of City of Los Angeles' Green Street Standard Plans and other BMPs within the public right-of-way. These Green Street Standard Plans are construction design details for Green Street elements that incorporate stormwater "best management practices," or BMPs, and have been pre-approved by the City of Los Angeles. Some examples of these Standard Plans are major and local street parkway swales, an alley infiltration system, a drywell, and tree-well watering devices. New standards developed with this project will lead to the development of new Green Street Standard Plans.

Complete Project costs are estimated to be approximately five-million dollars. The Project will assess BMP cost effectiveness, community response, and environmental enhancement through community outreach and surveys. The data collected will lead to the further development of this corridor and regional distributed BMP measures, such as the installation of Green Street Standard Plan BMPs that will be applied to other streets. This effort will be enhanced by a planning effort called the "Greenways to Rivers Arterial Stormwater Greenway System" or "GRASS", which is based on the integration of stormwater BMP's built on local, collector, and highway streets and extended to a citywide scale. Results of this project will also aid the City in estimating the capacity for green streets standards to be implemented on other major, secondary, and collector streets throughout the City. This project will also serve as a demonstration of various new Green Street BMPs to determine factors that will contribute to their effectiveness and aid the City in proposing these features for future projects. Performance of these BMPs will be assessed through water quality sampling and monitoring.

This project also seeks to increase public interest and to encourage stewardship of the project through education and engagement of the community. Education efforts will focus on local schools, including both students and parents, and will serve as an avenue to reach the larger community. Community meetings and other outreach events will also be held. This project outreach will provide resources that support the installation of community-based BMPs such as downspout disconnect on private property. Community surveys will be used to gage response and measure success of these efforts.

Project Area

This project is in an area bordered by Vermont Avenue to the west, Hoover Avenue to the east, Florence Avenue to the south, Gage Avenue to the North. The sub-watershed area evaluated in the project is approximately 100 acres and is tributary to the Ballona Creek watershed. The Vermont Stormwater Capture and Street Project will examine eight 300+/- linear foot blocks on the east and west sides of Vermont Avenue (5000 LF total, approximately one-half mile on each side) from Gage

Avenue to Florence Avenue for retrofit, as well as side streets to the East of Vermont between Vermont and Hoover in South Los Angeles.

This project is sited on and adjacent to Vermont Avenue because it is an important thoroughfare in the City of Los Angeles. Vermont Avenue is located 0.6 miles west of the Harbor freeway. Vermont Avenue is over 23.3 miles in length, and it is a landmark as one of the longest streets in Los Angeles with its northern origination on *Vermont Canyon Road* at the Griffith Park Observatory. Southward, and straddling both the Los Angeles River and Santa Monica Bay watersheds, it terminates at Anaheim street, on the border of Kenneth Malloy Harbor Regional Park, the site of a major City of Los Angeles [Proposition O] Project. From the north end, the route southward towards Barnsdall Art Park intersects with Hollywood Boulevard, Sunset Boulevard, the US 101 (Hollywood) and 405 freeways, and passes through Koreatown and Little Armenia before reaching Gage Avenue, at the northern end of the project. At this point, Vermont Avenue widens to a three lane road in each direction due to a remnant from a former rail line along its median. The cross section of Vermont Avenue widens to 180-feet wide within the project area. Here lateral frontage roads were previously proposed by the Community Redevelopment Agency (CRA) to be added to the width of the median space to allow construction of a public park down the center of Vermont Avenue. Due to state budget cut issues, the CRA has been dissolved, and funds that were acquired for this project have been reallocated by the State. Regardless, the subject project proposal for the parkways and sidewalks, which were reviewed and embraced by the former CRA as an enhancement to their plans, will be designed and constructed without the CRA central median project .

Design Objective: *The proposed Vermont Avenue Stormwater Capture & Green Street Project will be designed to maximize water quality and aesthetic benefits in a simple, low-cost manner, while collecting valuable data to inform future street construction, retrofits, and improvement projects that will be implemented separately, and at a city-wide scale.*

Project Objectives

The primary goals of this project are to:

- Create a model for a cost-effective green street installation and community involvement that can be repeated and used on city-wide applications.
- Demonstrate water quality capture and/or treatment measures on a major highway and its tributary sub-watersheds
- Propose a capacity of treatment for distributed measures that provides the greatest benefit and cost-effectiveness

- Develop and test scalable improvements that will be integrated with standard BMP plans and applied at the regional level
- To develop and refine new means of improving water quality in the receiving waterbodies
- To improve the water quality of storm flows to the stormwater system
- To educate the adjacent community on water quality, stormwater, and biodiversity
- To engage the local community and to encourage stewardship of the project, while encouraging voluntary efforts to capture stormwater on private properties (LID) and which further reduces runoff volumes
- To beautify and enhance existing circulation along the targeted stretch of Vermont Avenue by adding trees and vegetation

The Vermont Avenue Water Capture and Green Street Project will provide a multi-benefit greening retrofit of the public right-of-way bordering Vermont Avenue by installing Green Street Standard Plans and other best management practices (BMPs) combined and configured to maximize both pollutant removal and cost-effectiveness. These BMPs will be open to stormwater inflow allowing a natural reintroduction of hydrology into the impervious urban hardscape. Dry-weather runoff conveying pollution in street gutters will enter the BMPs via curb inlets and will be sequestered in vegetation (which will eventually be removed and replaced), or removed with sediments. Excess wet weather runoff will overflow to the existing street or catch basin. This project aims to provide tree-shaded "walkable" and safe streets, lined with curbside plant enhancements and healthy soils that are available to serve as bio-filters and pedestrian walkway buffers. This project will build upon lessons learned from other projects implemented in Los Angeles, and will follow local Green Street pilot installations at Oros Street, Elmer Avenue and Riverdale Avenue. It will enable a sequential evaluation of distributed BMPs from a cost-benefit and feasibility standpoint at the scale of a major transportation corridor. The project will target capacities for unit BMP installation in the public right-of-way to meet or exceed the runoff volume of a 3/4 inch design storm in a 24-hour period from the sidewalk, parkways, and adjacent roadways. Though this goal has been met or exceeded on local Green Street pilot projects at a small scale, to date, a larger highway or collector scale Green Street pilot project that meets design storm criteria has not been completed in the Los Angeles area.

Street lengths in the entire City of Los Angeles*:

Street Type	Miles
Major	893.41
Secondary	645.26
Collectors	990.71
Local	4251.06
Private	118.26
Undedicated/ Proposed	133.80
Unknown/ Closed	69.09
Alleys	245.00

*extracted from GIS

In addition, the project will utilize concurrent modeling efforts offering available, and/or public domain stormwater modeling tools to predict both BMP effectiveness and target locations of regional and distributed BMPs throughout the Los Angeles county watershed (such as the *Structural BMP Prioritization and Assessment Tool* (*SBPAT) Model*, City of Los Angeles/Geosyntec and the *Sustain Model***,** Los Angeles County/TetraTech). The completed Vermont Avenue project will identify average cubic feet of runoff capture and filtration volumes available per linear foot of this scale of roadway, which may then be used to develop and propose new projects. Costs per linear foot for the construction and maintenance of *distributed* BMPs will be estimated and refined over time as projects accrue, age, and overall benefits are assessed. Project design and flow monitoring will help to determine average street type capacities, and once these are known, and a TMDL water quality link to runoff volume is established, the quantities can be applied to a system of identified stormwater greenways of known street lengths (such as GRASS), enabling the remaining *regional* and distributed treatment requirements and costs to be calculated.

In addition to enhancing water quality, the project intends to be a demonstration the value of multiple-benefits for heat island reduction, pedestrian safety, business/economic and aesthetic enhancements. This project integrates work done through the Living Streets Initiative, and Awahanee Principles. Like most areas of the city, the watershed drainage area along the project area is highly impervious and without modification, will continue to produce the local flooding and ponding conditions seen in the attached photos taken following recent rain events. These ponding problems will be reduced or alleviated in the project installation where BMPs are located.

Photos: Existing wet-weather flooding and ponding along the proposed Vermont Avenue Project Site

The project also seeks to:

- Identify BMP costs and storage capacities for the Green Street Standard Plans as implemented
- Identify design opportunities to improve BMP implementation, and improve cost value
- Evaluate the potential for treatment and capture on a major street
- Provide public safety, health and environmental benefits
- Integrate community education and public/partner objectives

Opportunities

This project will provide an educational opportunity for both the project partners and the community. Through this project, we will not only examine effectiveness of BMPs and build upon the knowledge gained from other existing projects, but we will explore more cost-effective means of accomplishing our water quality goals. We can also learn lessons of how to design and site BMPs to maximize effectiveness based on both the structural requirements and the social climate of a particular subwatershed. This project is an opportunity to evaluate the pollutant removal and volume reduction benefits of a regional and distributed BMP approach, as well as its operations and maintenance. Unlike regional BMP measures that are customized for a particular site, and that offer the advantages of open space and/or prime locations to filter and or infiltrate greater volumes of runoff, these distributed BMP measures are composed of smaller scale units that are applied at a watershed scale and aim to filter or infiltrate runoff nearer to its source. The individual BMP units seek to detain and infiltrate or filter the ¾" targeted volume of runoff from the adjacent street cross section, plus some level of additional capacity. Understanding the costs and volumes of each Green Street Standard Plan per linear foot (LF) of installed length allows their benefits to be projected over miles of targeted city street types. Research has shown that the use of small-scale decentralized capture and/or treatment devices can decrease the need to purchase expensive urban land, or to rely on scarce publicly-owned land for centralized facilities.[1]

Targeted BMP unit volumes will follow the accepted 85th percentile, or 3/4" (SUSMP) event runoff from the adjacent sidewalks, curb and gutter, roadway paving and out to the street centerline. Some of the local scale Green Street improvement projects have easily surpassed this target volume due to narrower street widths, and fewer infrastructure and utility requirements. Due to a former rail line located along the median within the project boundaries, Vermont Avenue currently has up to ten driving and/or turn lanes within the project cross section making it extremely challenging to realistically and cost-effectively achieve the 3/4" target volume. However, certain aspects of the existing infrastructure may be retained and utilized to implement green streets elements. For

[1] Baerenklau, Kenneth A., et. Al Capturing Urban Stormwater Runoff: A Decentralized Market-based Alternative. Policy Matter: A quarterly Publication of the University of California Riverside Vol. 2 issue 3 Fall 2008

instance, medians can be retained to provide pedestrian refuges, shading and green space. Narrow frontage islands along Vermont without pedestrian traffic can be converted to planted bioretention areas to accept and filter street flows. The project capacity will also be extended beyond the major highway by using stormwater BMPs in parkways on side streets and in alleys, as well as by use of novel engineering strategies that may improve the current BMP effectiveness and reduce costs. SUSMP and site-specific stormwater mitigation plans will continue to be incorporated into new development project plans in the watershed, and public education stemming from this project is expected to increase voluntary on-site runoff containment measures on private property, such as rain gardens, downspout disconnections, rainbarrels, and cisterns.

Constraints

Practical constraints that will influence cost-effectiveness and will be encountered in the Vermont Project include concurrent project schedules (i.e. the Department of Transportation's Bike Lane Project, LAUSD's elementary school construction, and ongoing roadway replacement), neighborhood and city council priorities, physical site constraints and funding. The project team anticipates the largest constraints on a major highway will be the available areas for installation due to linear and transverse utilities and roadway structures. The project team plans to compensate for these constraints by encouraging and implementing decentralized BMPs within the subwatersheds to reduce runoff volumes in order to maximize the effectiveness of structural BMPs installed along Vermont Avenue.

Other potential constraints include:

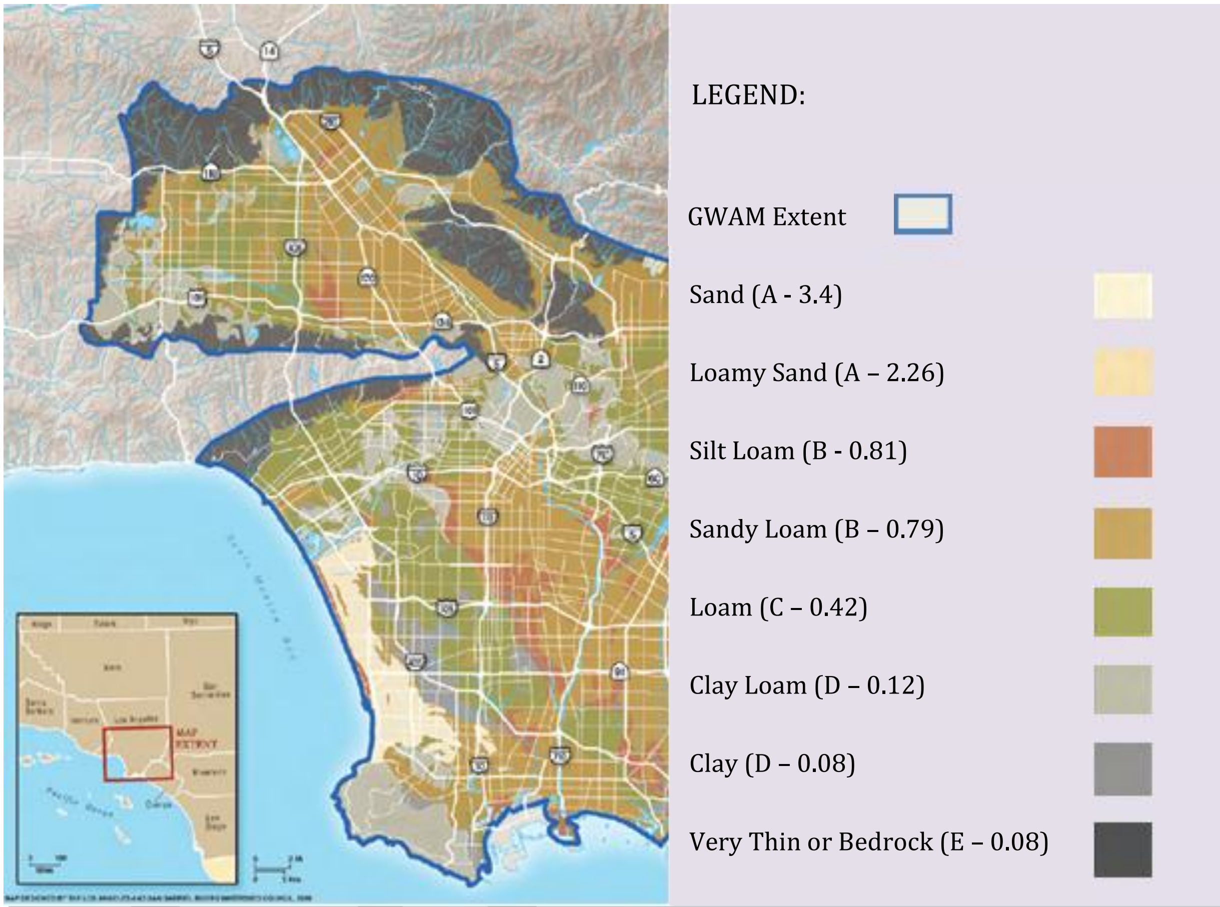
- Suitable soils infiltration rates. All detention facilities shall be designed to drain within 48-hours to minimize vector control and reduce human health-safety concerns
- Construction, operation and maintenance of the BMPs These constraints shall be considered in project design. The project area encompasses multiple owner/operators with varying levels of commitment to aesthetics
- Seasonal rainfall patterns that will either improve or diminish the BMPs efficiency

Watershed Characteristics

Reaches of Vermont Avenue are tributary to both Ballona Creek and Los Angeles River watersheds. However, the project location drains entirely to the Ballona Creek watershed which also receives runoff from 128 square miles of various land uses, several cities, state and county lands all discharging into Santa Monica Bay via Ballona Creek. These flows bypass the estuary and Marina del Rey harbor before entering Santa Monica Bay. The Ballona watershed boundaries are shared by City of Los Angeles, County of Los Angeles, California Department of Transportation, City of Culver City, City of Beverly Hills, City of West Hollywood, City of Inglewood, and City of Santa Monica. In this case, the project lies entirely within the City of Los Angeles.

Regional soils types are inferred from county data, as reported in the joint county map below produced by the Council for Watershed Health (formerly the Los Angeles San Gabriel Watershed Council) and LACDPW Water Augmentation Study (WAS) which shows either loam (Type C) or sandy loam (Type B) soils in the project vicinity:

Water Augmentation Study Map (LASGRWC)



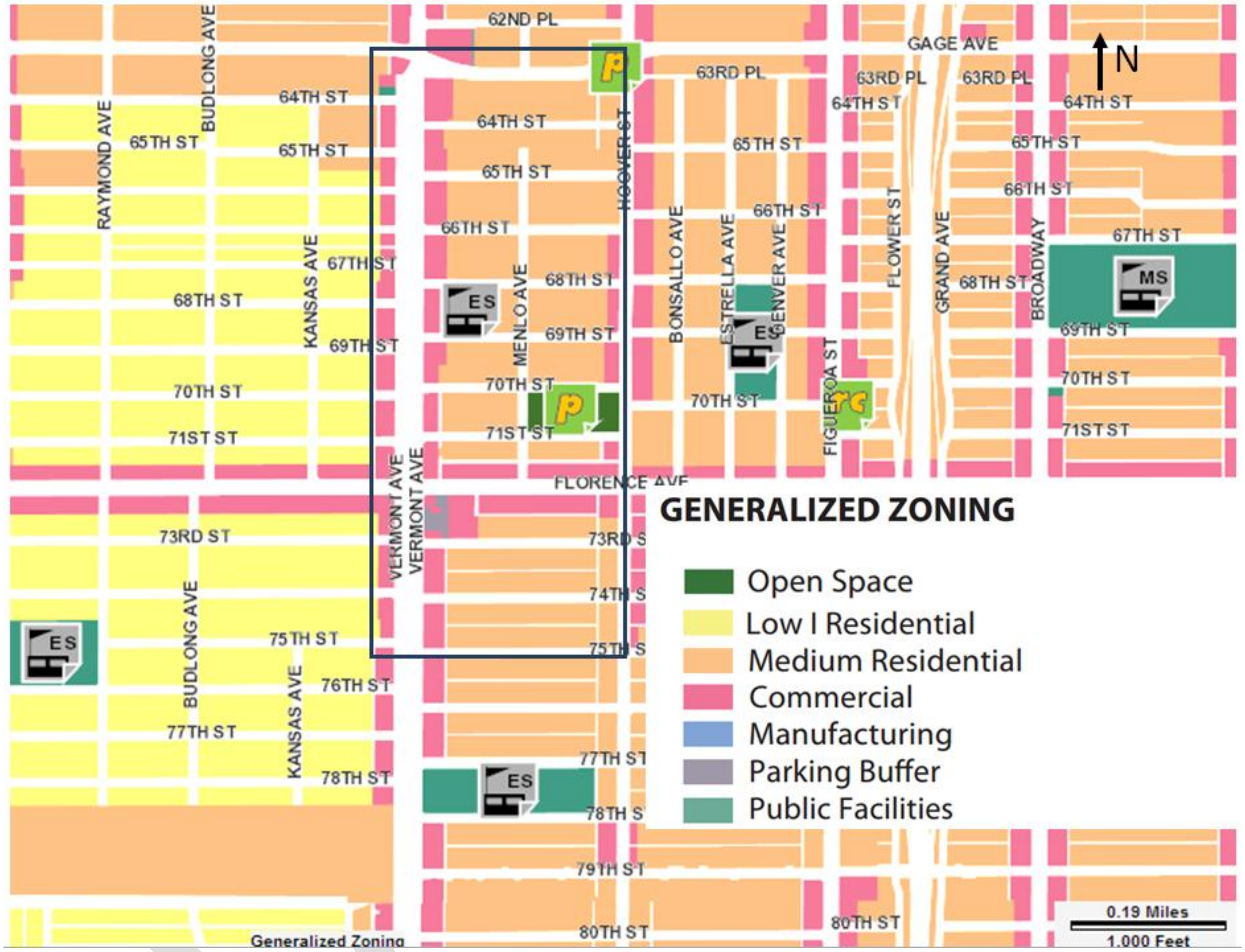
This information has been further refined by the Community Redevelopment Agency in their ***Geotechnical Exploration Report Proposed Median Project Vermont Avenue from Gage Avenue to Manchester Avenue, Los Angles California*** (November 20, 2009) and is being considered by the design team to formulate this proposal.

The land uses in the area are as follows:

- High Density Single Family (19%),
- Light Industrial (7%),
- Vacant (3%),
- Retail (17%),

- ❖ Multi-family Residential (4%),
- ❖ Transportation (13%),
- ❖ Education (3%),
- ❖ and Mixed-residential (46%).

The following figure shows the general zoning designations for the project area:



Generalized Zoning of Project Area. Source: ZIMAS http://zimas.lacity.org/ accessed 1/3/2012

The project area was originally chosen to compliment a project proposed by the former Community Redevelopment Agency, which would have placed a park in the center median of Vermont Avenue along the stretch of the street spanning from Gage Avenue south to Manchester Avenue. The area of this project spans from the north end at Gage Avenue to Florence Avenue at the south. Catch basins in this area drain to Ballona Creek. Subwatersheds that encompass side streets that drain toward Vermont and terminate at storm drains at or near Vermont Avenue, were also evaluated. Flows from as far east as Hoover Street flow westward toward Vermont Avenue, while areas on the west side of Vermont Avenue and western side streets drain westward, away from Vermont Avenue. Thus, subwatersheds on the east side of Vermont are prioritized due to a potential for greater treatment and capture volumes. Of these subwatersheds, three areas have been identified for project implementation based on the following desirable characteristics:

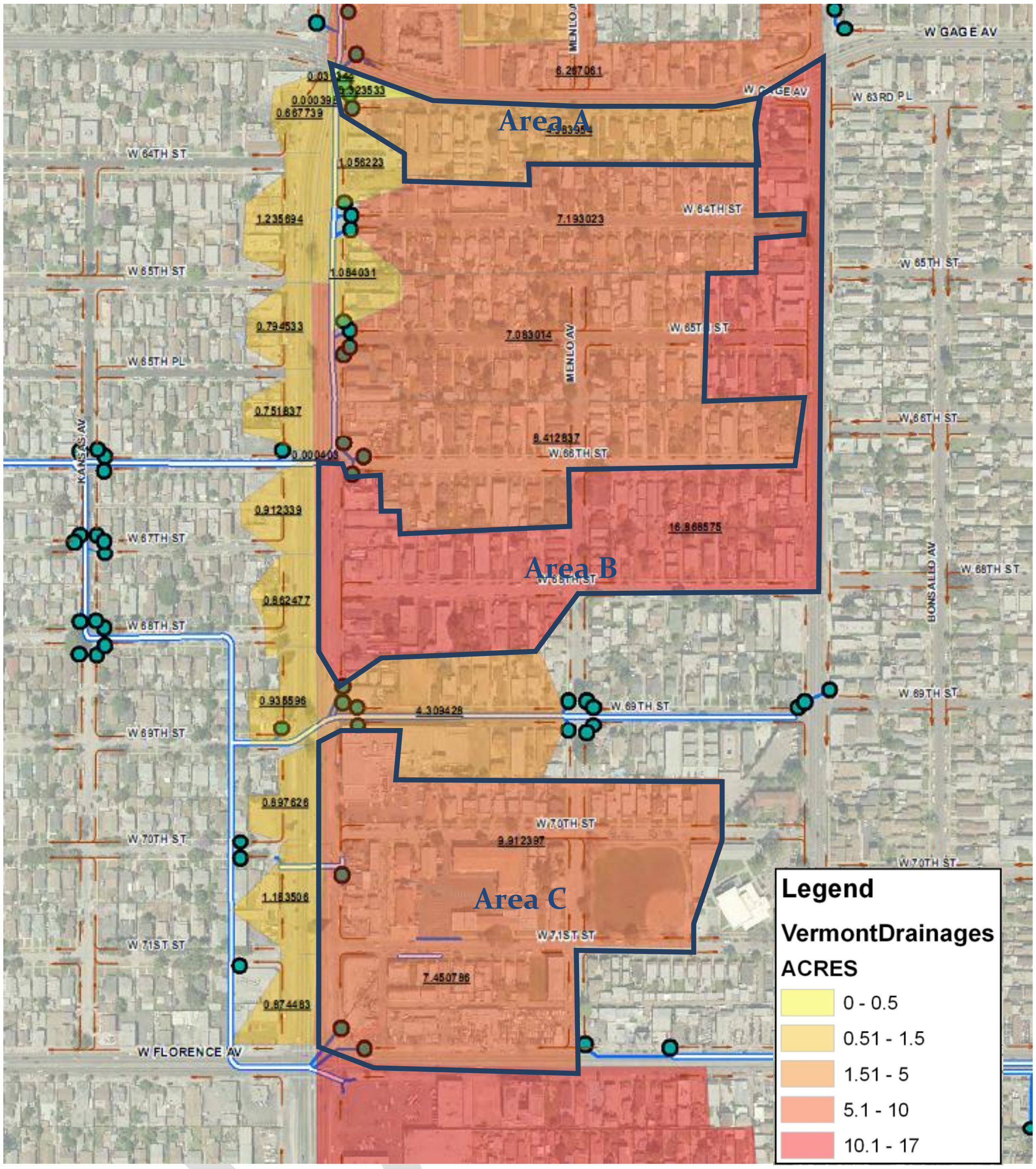
- Amount of area in the public right away available to capture/treat runoff
- Pollution/volume reduction benefits (i.e. size of catchment, land uses)
- Planning purposes/Community partnership potential within the area- proximity to schools and other community hubs, as well as visibility in the community.

Below is a map of the project drainage area evaluated on Vermont Avenue encompassing the 100+-acre drainage area. The various shades of orange delineate the boundaries of subwatershed areas, with lighter shades illustrating smaller drainages and darker shades indicating larger drainages, the largest of which is located just south of Florence Avenue, covers over 20 acres. The blue circles denote existing stormdrain inlets within the project area. The outlined areas (Area A, Area B, and Area C) are the prioritized subwatersheds on which this project will focus.

Area A totals approximately 4.7 acres and contains mainly multi-family residential dwellings near a traffic median. This area was selected because it contains a median in the public right-of-way that can be used to capture and treat the ¾" or 85th percentile storm event. This sub-watershed runs parallel to Gage Avenue, a busy street where high pollutant loadings from vehicles are anticipated. The median is ideal for siting a biofiltration swale and based on further geotechnical data, a potential dry-well. This project will aim to capture and treat the entire design storm in the public right of way, which includes this median. Across Vermont from the Median is a school called the Garr Child Care Learning Center. South of the school on the west side of Vermont is the John Muir Library. These facilities will be evaluated for potential community partnerships.

Area B was chosen for it's estimated pollutant loads. It is one of the largest subwatersheds in the project area. Water drains along both local (68th Street) and major highways (Hoover and Vermont). BMPs in this area will utilize both the public right-of-way and private property to capture and/or treat the design storm. This area is favorable because it contains a public school that has been approached for participation in educational outreach. As with areas A & C, BMPs will be implemented in the public right of way. However, in order to address more drainage acreage, private participation will be encouraged. To this end, public outreach and education will be pursued by Heal the Bay with partnerships that involve property owned by residential participants, educational institutions (LAUSD Elementary School Number 11) as well as commercial property owners (AT&T offices).

Area C is located at the northeast corner of Vermont and Florence, a very large and busy intersection. This area constitutes two subdrainages totaling 17.4 acres and is prone to nuisance flooding. It contains a private school and church that present the opportunity for key community partnerships. Similar to Area B, a combination of both public outreach and on-site BMPs will be utilized in this area to capture the design storm.



Subwatershed areas prioritized for project

	Acres	Runoff Capture Target Capacity (Cubic Feet)	Right-of-Way BMP Target Capacity[2] (Cubic Feet)
Area A	4.71	8567[3]	3000
Area B	16.9	12796[4]	4500
Area C	17.4	15302[5]	5400
Total	***39***	***36665***	***12900***
Acreage of total runoff capture potential[6]			**85.6 acres**
Minimum Acreage of 0.75"storm capture[7]			**20.5 acres**

Regulatory Background and Pollutant Loads

The City of Los Angeles has undertaken the implementation of stormwater BMPs citywide to aid in compliance with regulated water quality standards. As mandated by the Clean Water Act (CWA) the California Water Quality Control Board, Los Angeles Region sets water quality standards for the region, which includes assessment of beneficial uses for surface and ground water, and numeric and narrative objectives or Total Maximum Daily Loads (TMDLs) necessary to support beneficial uses and to protect receiving waters in the region. A TMDL defines the maximum amount of a pollutant that a waterbody can receive and still meet the applicable water quality standards for that pollutant or receiving water, and a TMDL Implementation Plan (IP) defines projects and strategies for meeting the TMDLs.

TMDLs were developed for coliform bacteria, heavy metals, estuary toxics, and trash in Ballona Creek. The City of Los Angeles submitted a TMDL Implementation Plan strategizing how the City and other agencies intended to meet the water quality standards in Ballona Creek. Individual Implementation Projects propose structural measures (such as BMP's) and institutional measures (such as source control and public outreach) for removing pollutants throughout the watershed. The City has identified eight large-scale or regional structural BMP project locations and 27 smaller or distributed BMP projects throughout the Ballona watershed. BMPs were identified and developed in collaboration with the watershed stakeholders. Results of this collaborative effort will be used by the Ballona Creek IP to streamline current proposals in the right of way. The Vermont Avenue project data can be used to assist in the implementation of identified distributed measures throughout the Ballona and LA River watersheds by serving as an example and providing modeling data as mentioned earlier. Appendix A includes pollutant load calculations for the SUSMP event for Area A, Area B, and Area C, as well as annual pollutant loadings for the general project area.

[2] Assume BMP porosity of 0.35
[3] Targeted runoff capture for entire 4.71 acre drainage
[4] Targeted runoff capture for right-of-way (transportation estimated 34 percent of watershed area)
[5] Targeted runoff capture for right-of-way (transportation estimated 39.5 percent of watershed area)
[6] Total acreage of drainages where BMPs installations are planned.
[7] Acreage of entire Area A, right-of-way for Areas B & C, and a portion of Vermont Avenue assuming poor soil infiltration and siting constraints

New School Construction site near 70th Street and Vermont Avenue

Project Elements

Pre-Design

One of the purposes of the project is to provide the City with information on how much water can realistically be captured in the public right-of way of a highly urbanized and hardscaped area. This information will assist the city in planning BMPs to be installed in a given watershed. This project will build on existing BMP prioritization algorithms and utilize lessons learned from existing projects.

Prior to design, a literature review will be undertaken as well as a case study of existing projects to gather information and to aid in the siting and installation of project elements. Existing projects that utilize decentralized BMPs will be identified, and a project review of monitoring analyses will be examined. Project managers will be contacted to discuss issues in construction of their projects. Both positive attributes and shortcomings for projects will assist designers in selecting the BMPs used for this project. This project will also utilize existing decision support tools, such as SBPAT, as well as community input as considerations for the selection of BMPs.

BMP Tool Box

This project will utilize combinations of distributed BMPs from the BMP Toolbox explained below including Green Street Standard Plan BMPs installed in the public right-of way, mostly between curbs and property lines, and other BMPs of larger scales, onsite low impact development (LID) BMPs installed by property owners, and institutional BMPs, which include public education and outreach. This education will be focused on local schools at first, then branch out to the surrounding neighborhood.

Favorably located side streets for both stormwater and public benefits will be incorporated into the project for additional capacity. As an example, a site allowing a 10-foot wide x 5-foot deep infiltration basin is proposed under targeted walkways and planters, allowing 40% void space offers 20 cubic feet of storage per linear foot of roadway. A local street with a narrower road and sidewalk might only require 1.8 cubic feet of storage per linear foot to capture a 3/4" event from its surface. The 18.2 cubic feet of additional capacity within the project could assist in offsetting the storage deficit anticipated on Vermont. Additional greening benefits such as planting and tree shading add to the value of the BMP.

Green Street Standard Plans

Specific BMPs that will be considered and proposed with design include but are not limited to the following adopted and/or draft City Green Street Standard Plans (shown in Appendix A):

- **Sidewalk Culvert (Standard Plan S-322)**
- **Parkway Swale (Standard Plan S-482)**
- **Parkway Swale-No Parking Zone (Standard Plan S-483)**
- **Vegetated Stormwater Curb Extension (Standard Plan S-484)**
- **Vehicular Alleys (Standard Plan S-485)**
- **Tree Well Watering Device (Standard Plan S-457)**
- **Trench Drain (Standard Plan S-490)**
- **Green Street Infiltration System (Standard Plan S-489)**
- **Bottomless Catch Basin inlet w/filter insert (Standard Plan S-491)**
- **Dry-well (Standard Plan S-494)**

The City of Los Angeles, Department of Public Works Green Street Standard Plan for Vehicular Alleys (S-485) will be installed on one alley parallel to Vermont, from 70th Street to 71st Street and from 71st Street to Florence. This standard plan will allow stormwater runoff to be filtered and/or infiltrated before overflowing back to the storm drain system. Small catch basins may be installed in streets intersecting the alleys in order to divert the street runoff into the alleyway and thus increasing the tributary drainage area.

The northern project reach is located at Gage Avenue where curb inlets and gutter modifications on an existing triangular-shaped median island will be used to divert flow from the street into the median to create an offline bio-filter that connects to a multiple-chambered dry well, and adds system storage capacity and relieves nuisance flooding as it reaches design capacity, and overflows back the storm drain system. The entire median and all project planting areas will be landscaped with appropriate drought and/or inundation tolerant plant materials and irrigated.

Proposed median bioswale at the intersection of Vermont Avenue and Gage Avenue

South of Gage, distributed BMPs in the right-of-way will be sited between the curbs and property lines and infiltration galleries will range in depth from 1.5 to 5 feet. BMP widths range from 2.5 to 5 feet. Combinations of these BMP elements with varied depths and alignments will be designed to maximize storage capacity and permeability within the space available. Where existing infrastructure prevents the installation of a larger capacity Standard Plan, tree wells with watering device inlets will be constructed. Where feasible these will offer additional sub-surface storage within perforated pipes that distribute the incoming flows and return overflows to the stormdrain system.

Pending additional soils review, a design detail similar to that used at Riverdale will be considered for use along 68th Street across from the LAUSD site, which will enhance the environment near the elementary school. Draft details following the Riverdale Project are S-489 & S-491: Green Street Infiltration System & Catch Basin inlet.

Onsite BMPs: Downspout Disconnect and Parcel- Scale Runoff Reduction

Project partners will implement a low-cost, low-tech Best Management Practice (BMP) program targeted to businesses, schools, and residential community members along the Vermont Corridor neighborhood (between Gage Ave. and Florence Ave.) in association with the proposed project. The program provides participants support through education on how to reduce their contribution of stormwater runoff to the Vermont Corridor by providing participants with resources that encourage installation of BMPs such as rain barrels, rain gardens, downspout disconnections or related BMPs to install on their property. In addition, workshops will be conducted by Heal the Bay to assist and facilitate greater participation in the program, as well as to provide for educational opportunities associated with watershed and stormwater protection, and overarching project support for installed BMPs. The objectives of this public education and outreach program are outlined below.

Examples of climate-appropriate native plant species that will be considered for use in this project

Institutional BMPs: Public Education and Outreach

Community outreach and education is an important component of the Vermont Project. There will be a number of objectives addressed through this community outreach element, which include:

- Providing general education and awareness of the project
- Providing general education on watersheds, water quality, the local storm drain system, local biodiversity, and watershed issues affecting the community
- Providing opportunities for community participation in addressing watershed issues by providing information to encourage the installation of BMPs on private property;
- Encouraging community support for City of Los Angeles identified BMP project and soliciting input on project design elements;
- Engaging community leaders, businesses, and non-profits to support decentralized BMPs implementation; and
- Conducting pre- and post-project public surveys to gage change in public knowledge, perception, and behavior towards watershed issues, BMP implementation, and of this project.

Outreach and education for this project will focus on schools within the project area, and branch out into the larger community. School outreach has begun with Saint Raphael School. Heal the Bay has partnered with school administrators to have students participate in existing programmatic resources offered by Heal the Bay, such as Coastal Clean Up Day and "Lunch and Learn" events. School administrators have been informed of the project and have written a letter in support (see Attachment 1). Prior to the start of construction, Heal the Bay will attempt to partner with St. Raphael School and LAUSD Elementary School #11 to perform a water audit of the campus with students. This will be presented as an educational opportunity that allows students to learn how to map a site, identify pervious and impervious areas, and to calculate runoff volumes, as they learn how to size BMPs to capture that volume. The results of this audit will be used to help residents design BMPs and will help to identify other actions that can be implemented on campus to reduce runoff. The results of the audits from the two schools will be compared and will help to assess attributes of the two campuses that favor runoff reduction. Students will be taught about native plant species and related fauna, and will be encouraged to adopt a native organism or "totem" For their schools or neighborhoods. Students will learn how to select and to grow plants that provide habitat to support these species. Project proponents may consider these totems in the selection of plant species for vegetated BMPs on side streets, and adding the choices of multiple side streets within the plant palette along Vermont Avenue. Heal the Bay will also guide students in a preliminary and post project fauna/flora survey of the surrounding neighborhood. These efforts will be used to teach stewardship and to foster community partnerships. Efforts at schools will also provide an avenue for community education to be administered by reversing roles and allowing teaching from students-to-parents with take home surveys such as are described below for parents to help fill out as part of a homework assignment. These campus efforts will be used as a litmus test for the rest of the neighboring community.

The public education and outreach program elements will include a combination of outreach mechanisms. Outreach can include simple measures such as the distribution of fliers and doorhangers, or may be more involved, such as developing school lesson plans, workshops, community forums, tabling events, speaking presentations, and neighborhood clean-ups. The objectives of this public education and outreach program are to create educational opportunities for school children and the surrounding neighborhood, while developing social capital for current and future efforts related to water quality programs and projects.

Social capital typically consists of three main components: trust, networks, and cooperation amongst members in the partnership. Coleman defined social capital as "the extent and completeness of horizontal relations within a community and its role is to enhance the power and efficient allocation of social sanctions."[8] Putnam provided another definition of social capital – the

[8] Coleman, J. *Foundations of Social Theory*. Cambridge, Mass: Harvard University Press. 1990.

"features of social life – networks, norms, and trust – that enable participants to act together more effectively to pursue shared objectives."[9]. Social capital allows for a reduced transaction costs, greater dissemination of information, increased interaction, and an increased political and economic leverage when used. Development of social capital lays the groundwork for the project success in the long-term by keeping the surrounding community aware and engaged in project development. In addition, signage and other informative visual elements can be used to adorn the project and create a sense of personal space for a neighborhood and for a community. Surveys distributed pre- and post- project will be used to gage effectiveness of public outreach and education efforts.

Community Surveys

A minimum of two surveys will be administered for the project in order to gather baseline data as well as data on the public responses to the completed project. Surveys will be administered in the language preferred by the community members, likely in Spanish or English. A number of methods may be employed to distribute the surveys, including but not limited to surveys given to students to take home as an assignment, surveys given at community events or meetings, and surveys distributed through door-to-door canvassing. These surveys can serve as a template for collecting data, and their results and lessons can be used to inform future projects.

Survey 1

The purpose of the first Survey will be to collect baseline knowledge and willingness of residents to host onsite BMPs. Some of the baseline information gathered will include but is not limited to residents' knowledge of stormwater, specifically their understanding of their own watershed and the stormwater system, what they perceive to be the biggest sources of pollution, and their familiarity with stormwater BMPs. It will also determine a baseline for the understanding of biodiversity in the area, such as the types of birds and bug species initially known, as well as the known plant species, whether they be food crops, natives, ornamentals or "weeds". It will also be used to assess initial community interest and support for the project, both as installed by the city and/or extended to private residents. It will gage their interest in hosting their own onsite BMPs. Participating community members will be given information on a variety of BMPs as well as an option that offers an incentive for doing their own installation.

Following Survey 1, Heal the Bay will initiate a community education component of the project in the prioritized subwatersheds to inform residents of water quality issues in their areas utilizing tablings, outreach events, creek education, community meetings and speakers that come to classrooms within the area. Community members will be educated in topics that include both stormwater and biodiversity. Education to private property owners will inform them of options for decentralized BMPs that can be implemented and maintained on their property within the right of way. Quarterly outreach will be performed during project construction.

[9] Putnam, R. Tuning in, Tuning out: The strange disappearance of social capital in America. Political Science and Politics, 28(4): 664-65. 1995

Survey 2

Following community education, survey 2 will be used to assess the willingness of residents to install decentralized BMPs on their own property. Participating community members will be informed of a variety of BMP options to choose from the "BMP Toolbox", and will be educated and encouraged to perform their own installations of a selected BMP device, such as a rain barrel or downspout redirector. This survey will also seek to see which BMPs are preferred by the residents, and why. It will also seek to identify reasons for unwillingness to participate or any barriers to implementation of BMPs from the toolbox.

Survey 3

Survey 3 will be used to gage community response to the Vermont Stormwater Capture and Green Street Beautification Project. It will incorporate similar questions as the first survey to see if basic knowledge and education of the watershed, biodiversity, and stormwater has increased as a result of the project, and if the community has general knowledge of the project. Survey 3 will also include questions as follow up to the on-site BMPs installed in order to determine project success and/or any barriers to participation or BMP effectiveness. This survey will also compare operation and maintenance performed by private property owners who have employed onsite BMPs, as well as sense of ownership for the BMPs chosen. Survey 3 will also attempt to assess other outcomes of the project, such as impact on neighborhood aesthetics, safety, and economic impacts.

Performance Analyses

Project proponents will evaluate results from the public surveys. Results will be analyzed to see which BMPs worked best, and which fell short, as well as the reasons for these shortcomings. In addition, results of surveys and data collected on social impacts of the project will be analyzed in order to answer the following questions:

- Does the community feel a sense of ownership of the project? How might this affect long term effectiveness of the project?
- How effective was public outreach for the project in terms of increasing awareness of stormwater issues and/or environmental stewardship?
- What was the level (percentage) of community participation in private property retrofits?
- To what extent did the project increase the public's knowledge of stormwater pollutant reduction?
- Has there been a change in community behavior and/or attitude toward stormwater pollution due to the project?
- Which aspects of this project design, education, outreach or surveys can now serve as a template for other areas of the City?

Water Quality Monitoring Plan

The purpose of the monitoring program is to evaluate the performance and operation of the *Vermont Avenue Stormwater Capture and Green Street Project*, in terms of pollutant reduction. Wet weather is recognized as a critical condition for evaluating the structural BMPs installed in this project. The overall strategy will involve water quality and flow measurements and on-site inspections/observations of the system during and after rainstorms. This monitoring program will examine water quality benefits to receiving waters and the capture capacity of the infiltration system.

Specific study questions are detailed below:

1. What are the pre and post project pollutant concentrations in stormwater runoff at the project site?
2. For the targeted ¾"design storm, what is the pollutant load the project prevents from entering receiving waters (Ballona Creek)? (volume collected x concentration of runoff)
3. What flow volume is detained from the storm drain system? (volume collected and/or released or infiltrated)
4. What size/intensity of storm can effectively be captured by the BMPs monitored in the Vermont Project? (volumes and durations)
5. How do the chosen BMPs perform within a given subwatershed?
6. How well does the chosen subwatershed approach perform in comparison to approach used in other subwatersheds?
7. What maintenance/design issues were revealed during on-site monitoring visits (e.g., clogged infiltration pipes, excessive trash, odor problems, vandalism, etc.)? (cost ($)/ linear foot)
8. What is the community's awareness and response to the project?

To determine the pollutant concentration in stormwater runoff (study question 1), crews will perform baseline sampling prior to project installation at targeted areas. Crews will collect samples post-construction at these same targeted locations. This will be essential for documenting pollutant load reduction to receiving waters (study question 2). In addition, samples will be collected from drywells placed at 68th Street and in the Vermont/Gage median to assess pollutant concentration in runoff that has entered the well after flowing through preceding BMPs (Infiltration swales along 68th Street, BMPs along Gage, and the bioswale within the Vermont/Gage Median). Flow meters and autosamplers may be placed in pipes leading from the infiltration swales into drywells, and from the gutter to the median swale. Flow meters may also be placed in the storm drains before and after construction to assess how much flow installed BMPs will reduce (study question 3). If possible, automated sampling pumps (autosamplers) will be programmed to collect composite samples so that input samples represent the Event Mean Concentration (EMC) for each monitored storm event.

Monitoring *output* samples will be collected at locations where runoff exits the BMP system and before it enters the Ballona Creek stormdrain system. These samples will be an important component for assessing load and flow reduction (study questions 2 and 3), and capture capacity (study question 4).

Rainfall data will be collected from a nearby rain gage. This information will also assist in the calculation of pollutant load reduction and capture capacity.

Water sampling will be conducted during at least two significant rain events per storm season (preferably one early season storm and one late season storm), over a three-year period following construction of the project. Sampling crews will target storms that have a predicted rainfall greater than 0.1 inch within a twenty-four hour period. Water quality samples will be analyzed for following parameters:

- Total Suspended Solids (TSS)
- Metals (cadmium, copper, lead, nickel, zinc and hardness)
- Fecal indicator bacteria
- Nutrients (Total Nitrogen, Total Phosphorus)

Depending on infiltration rates, *monitoring well* samples may be collected after a storm has passed; whereas, *input/output* samples will be collected during rainfall.

As more information about the Vermont Avenue Project becomes available, amendments to this monitoring plan may be necessary. Significant deviations from this monitoring plan will be documented and explained, if necessary. Safety of field personnel is always the primary concern, and takes precedence over strict adherence to any monitoring plan (*Safety first!*). Due to the nature of this demonstration project, there may additional research questions that arise as a result of initial findings, which could result in significant changes in the approach to monitoring. The Watershed Protection Division and Heal the Bay retains the right/responsibility to make significant changes to this monitoring plan, even after monitoring has commenced.

Water Quality sampling will be conducted over a three year period, at a frequency of at least 1 storm event per wet season. *Input* samples will be collected at two locations: the inlet to the Gage Median Bioswale area, and at the catch basin inlet to the infiltration swale furthest east on 68th Street (refer to concept layout Page 4). If site conditions allow, autosamplers will be installed to collect these samples, otherwise samples will be collected manually.

If significant flow is discharging from the system, samples will be collected at the drywell or subsequent stormdrain catch basin located on the corner of Vermont and 68th Street and at the outlet of the Gage median bioswale.

Monitoring wells will be placed within infiltration areas along Vermont Avenue and favorable side streets. Grab samples will be collected at each of these wells after rainfall has occurred. These samples will represent water that has infiltrated through the soil adjacent to the infiltration basins. The intent to determine potential effects of captured runoff on groundwater quality. The timing and quantity of the samples will depend on storm intensity, storm duration, and subsequent infiltration rates. It will likely be necessary to composite these *monitoring well* samples into a single sample in order to meet minimum sample volume requirements.

Project Assessment and Analysis

Results of the monitoring program will be analyzed to assess the results of the project. From the data collected, sample results will be analyzed to see if the project was able to meet its goal of capturing the ¾” inch storm in prioritized watersheds, percentage of load reduction achieved along Vermont using Green Street BMPs, as well as a comparison of pollutant removal efficiency of Structural BMPs installed. Results from the prioritized subwatersheds will be compared to analyze which BMPs worked best, and which fell short, as well as the reasons for these shortcomings. In addition, results of surveys and data collected on social impacts of the project will be analyzed in order to answer the following questions:

1. Does the community feel a sense of ownership of the project? How does this affect long term effectiveness of the project?
2. How effective was public outreach for the project?
3. What was the level (percentage) of community participation in private property retrofits?
4. Does the project increase the public’s knowledge of stormwater pollution reduction? If so, to what extent?
5. Has the community’s behavior and attitude toward stormwater pollution changed in response to the project?

Project Schedule

Construction is estimated for 18-months, and the schedule offers an adjustable start date pending project funding approval.

Baseline sampling/surveys will be conducted following award notification (10-13-13 to 5-13-14).

Final Project Design will begin after funding is awarded (9-13-13 to 12-13-14)

MOU between project partners will be developed (11-14)

Environmental Documents will be completed (3-1-14 to 5-13-14)

Permitting (7-1-14 to 7-1-15)

Bid and Award (12-13-14 to 4-13-15)

Construction (4-13-15 to 10-13-16)

Closeout (8-13-16 to 11-13-16)

Community Meeting #1 10-2013

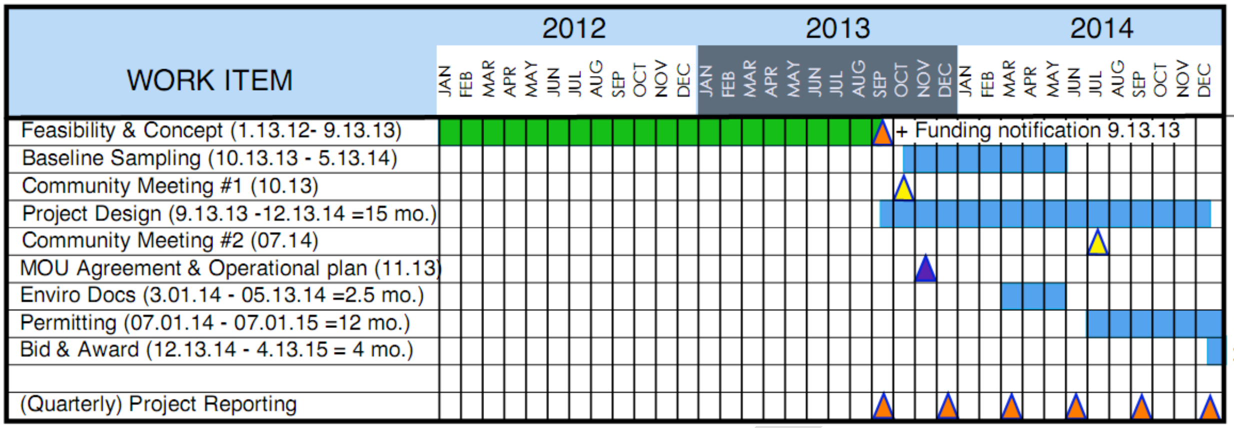
Survey #1 10-2013 (during first community meeting)

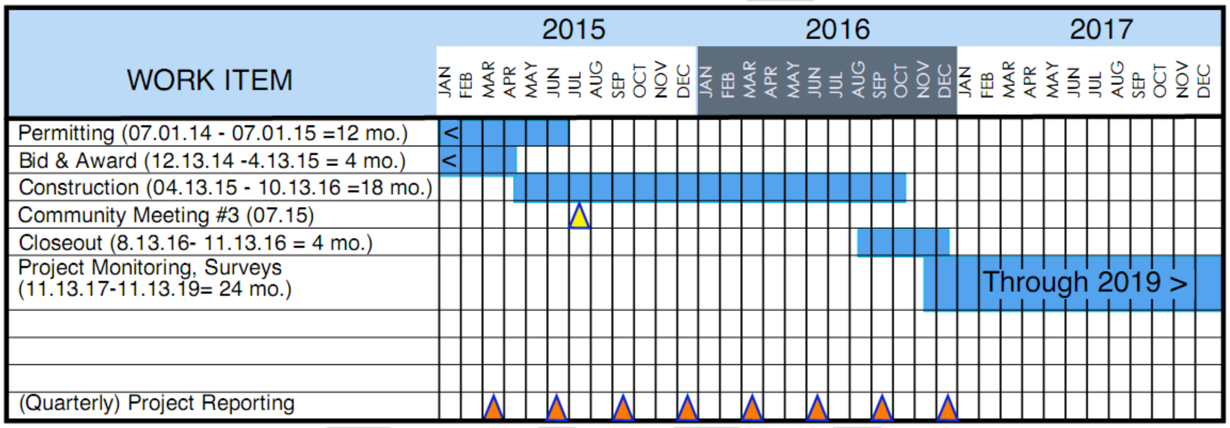
Survey #2 4-2014 (during baseline sampling period)

Community Meeting #2 7-2014

Community Meeting #3 7-2015

Survey #3 7-2016





Project Partners and Roles

City of Los Angeles, Department of Public Works, Bureau of Sanitation will provide project management, preparation of construction plans, and construction management, with support from Heal the Bay. Either the Bureau of Street Services or a private contractor chosen through a bid-and-award process will construct the project.

The project team currently consists of the following partners:

Los Angeles Council District 8

The entire project area resides in Council District Eight. Further district involvement has been requested following funding allocation:

> Bernard Parks, *Council member*
> Purvi Doshi, *Legislative Deputy, Public Works Liason*
> Christine Dixon, *District Deputy*

The City of Los Angeles Department of Public Works, Bureau of Sanitation (LABOS)

The Bureau of Sanitation, Watershed Protection Division is responsible for the City's compliance with municipal stormwater regulations, including but not limited to the National Pollutant Discharge Elimination System permit issued by the California Regional Water Quality Control Board to the County of Los Angeles. In order to meet the Total Daily Maximum Load (TMDL) limits, as set by the Regional Water Quality Control Board, for trash, bacteria, metals and toxics in the receiving water bodies (the Los Angeles River and the Pacific Ocean), the Watershed Protection Division is proposing to intercept stormwater runoff and to infiltrate it into bio-filters or suitably infiltrative soils to reduce the amount of stormwater pollutants that are currently flowing into the rivers, oceans and other water bodies.

LABOS engineering staff will oversee drafting and design preparation of design plans (construction documents) for the project. LABOS will take the lead in funding requisition and the bid and award to a private contractor, if needed. LABOS will provide construction documents and specifications for review prior to start of construction. For the duration of the project, LABOS will attend weekly on-site meetings to discuss construction related issues LABOS will submit 50% and 90% complete plans for review and approval by the City of Los Angeles, Department of Public Works, Bureau of Street Services (LABSS). LABOS will also be responsible for construction project management of city forces, and for construction management services.

<u>Project Team Leads:</u>

Shahram Kharaghani, *BOS-Watershed Protection Division Manager*
Deborah Deets, *Project Coordinator*
Oscar Figueroa, *GIS Specialist*

Heal The Bay, 501(c)(3)

Heal The Bay staff are working with City of Los Angeles engineering and landscape architecture staff to develop a funding proposal, provide support in design, planning of the project, develop community partnerships, and outreach to the public regarding the project.

<u>Project Team Leads:</u>

Alix Hobbs, *Associate Director*
James Alamillo, *Healthy Neighborhoods, Healthy Environment Coordinator*
Meredith McCarthy, *Director of Programs*
Kirsten James, *Water Quality Director*
Susie Santilena, *Environmental Engineer in Water Quality*

City of Los Angeles Department of Public Works, Bureau of Street Services (LABSS)

LABSS will review the design plans and provide comments and/or revisions as required to LABOS. If LABSS is retained by HTB to perform construction, LABSS will purchase material, provide construction staff, and construct the Project pursuant to the approved construction documents. Project Leads will be assigned if BSS is to construct project.

Project Team Leads:

Alice Gong, *BSS- Design Engineer*

Educational Institutions

The participation of local schools is critical for the project for a number of reasons. Schools are central community hubs where information related to the project can be disseminated to both children in the area and their parents. Also, schools in the area contain much impervious area, and thus contribute significantly to runoff volumes. Encouraging schools to implement BMPs can have a large impact. Finally, this project serves to benefit students by providing unique learning experiences and adding green elements that will improve their commute. Potential educational partners include:

- Saint Raphael Catholic School
- LAUSD Elementary School #11
- Garr Child Care Learning Center

Neighbors

This project aims to propose and incentivize the construction of BMPs on private property, thus the participation and commitment of property owners and other community members is a critical component of this project.

Other Potential Project Partners

In an effort to build on existing efforts to encourage low impact development throughout Los Angeles, project proponents may solicit the partnerships of other agencies and non-profit organizations to aid in execution of various project elements. For instance, G3, Surfrider, the Los Angeles River Project, or TreePeople may be approached to conduct rainwater harvesting workshops in the area. Urban Semillas may be approached to train community youth to aid in sampling events.

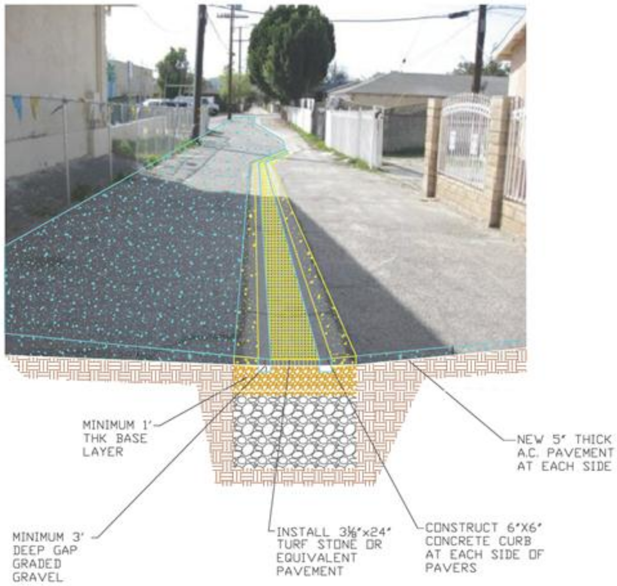
Assessing the Economics of a Distributed Capture Approach

This project will provide real-cost and feasibility data for a major transportation corridor. When combined with existing data from other street type installations, the project data can be used to estimate a static regional/citywide capacity of distributed measures that can be combined with models and soils maps to calculate dynamic capacity. The statistical volume "tie" to necessary pollutant load reductions for TMDL compliance will indicate the remaining capacities needed for water quality standard attainment, which can be used to support land acquisition decisions and help develop costs for the remainder of regional green and/or infrastructural BMPs needed for compliance.

An example follows of the cost comparisons proposed for this project using a cross section of a green alleyway to be installed in North Hollywood from Oxnard to Tiara Street. The project created an infiltration trench at the site of an existing concrete swale which was removed along with a portion of the existing asphalt paving along each side of the concrete swale.

The final cost of the North Hollywood Alley Project for all four of the 20 foot by 270 foot long segments will be $700,000. The project was constructed by The Bureau of Street Services (BSS) and the cumulative alley length is approximately 1072 feet. The alleys were constructed per Standard Plan S-485 except that the width of the permeable paver and infiltration trench is 3 feet in lieu of the 5 feet shown on Standard Plan S-485, therefore with a 40% storage to volume ratio the actual stormwater capacity is 6 CF per LF, and cost per LF is $653.00 ($108 per CF of storage).

Standards for defining plant maintenance requirements for function and aesthetics based on community input will be considered with planting palette updates for S-484. Sediment removal and landscape maintenance activities are the primary costs for O&M on green infrastructure and stormwater BMPs. Since aesthetics can be subjective, a recommendation will be made for *functionality* to be a requirement, namely *if an enhancement is provided along the public-frontage of a private-parcel and effluent from such a BMP is substandard due to a lack of maintenance, the* ***owner*** *who also receives the property value enhancements, should be held responsible. Whether by assessment, tax, fee or other means, cities promoting and installing green infrastructure must insure that a mechanism for ongoing functionality is available in order to justify installation.*



Cross Section of North Hollywood Green Street Standard BMP for Vehicular Alleys (S-485)

The project scope includes a BMP costs analysis and a final written post-project evaluation for:

- Stormwater Capacity (Cubic Foot)
- Cost ($/Cubic Foot)
- Ease of integration as retrofit or with existing infrastructure
- Maintainability
- Partner support

Project team designers will continue to confer with Bureau of Engineering geotechnical and stormwater engineering staff to discuss soil constraints and site constraints, as well as BMP feasibility. Soil quality is a critical variable in determining the site potential for water quality improvement, whether by filtration and/or infiltration. Achieving a maximum storage capacity is an objective for infiltration, however where soils conditions are not conducive to infiltrate runoff, surface bio-filtration and vegetative enhancements to a depth of 18" will be proposed for all planter areas.

Project Budget

The estimated total project costs are close to 5 million dollars, including hard and soft costs. Attached is a budget summary based on complete removal and installation costs of the individual project components on both along Vermont Avenue and in the prioritized project subdrainages.

	Budget Category	Total Cost
(1)	Direct Project Administration	$83,720
(2)	Reporting	$33,952
(3)	Assessment and Evaluation	$33,500
(4)	Project Design	$468,820
(5)	Environmental Documentation	$12,000
(6)	Permitting	$88,000
(7)	Construction Contracting	$67,000
(8)	Construction	$3,281,800
(9)	Environmental Performance Sampling and analysis	$167,440
(10)	Construction Administration	$100,464
(11)	DWR Requirements	$18,000
(12)	Standards Development and Project Integration.	$267,904
(13)	Construction/Implementation Contingency	$334,880
(14)	**Grand Total**	**$4,957,480**

Appendix A: Pollutant load calculations

Area A- Pollutant loadings from ¾" Storm

1- Hydraulic Characteristics:

Drainage Area (acres)	4.71
85th %ile Rainfall (inches)	0.75

2- Landuse Constituents (%): / 4- Imperviousness (%) / Runoff Coefficient: / Runoff Volume (cu.ft):

Land use	Landuse Constituents (%)	Imperviousness (%)	Runoff Coefficient	Runoff Volume (cu.ft)
High Density Single Family	0	42	0.38	0
Light Industrial	0	91	0.82	0
Vacant	6.8	2	0.02	16
Retail/Commercial	10.0	96	0.86	1106
Multi-family Residential	66.2	74	0.67	5658
Transportation	17.0	91	0.82	1786
Education	0	82	0.74	0
Mixed Residential	0	59	0.53	0

Pollutant Loadings:

TSS	13.5	Kg/event
TP	0.1	Kg/event
TN	0.5	Kg/event
F Coli	1821.8	Colonies/event
F Enteroc	1053.2	Colonies/event
F Strept	2126.2	Colonies/event
T Coliform	2883.3	Colonies/event
Cu	0.0	Kg/event
Pb	0.0	Kg/event
Zn	0.0	Kg/event

3- Pollutant Removal Efficiencies (%):

TSS	85
TP	80
TN	55
F Coli	90
F Enteroc	90
F Strept	90
F Strept	90
T Coliform	90
Cu	80
Pb	80
Zn	80

Runoff Characteristics:

Overall Runoff Coefficient:	0.67	
Runoff Volume:	8567	cu.ft/event

Pollutant Loading Reductions: / Mean Concentrations:

	Pollutant Loading Reductions	Unit	Mean Concentrations	Unit
TSS	11.441	Kg/event	55.5	mg/l
TP	0.039	Kg/event	0.3	mg/l
TN	0.290	Kg/event	2.2	mg/l
F Coli	1639.648	Colonies/event	7.5	1000 Col/ml
F Enteroc	947.858	Billion Colonies/event	4.3	1000 Col/ml
F Strept	1913.555	Colonies/event	8.8	1000 Col/ml
T Coliform	2595.000	Colonies/event	11.9	1000 Col/ml
Cu	0.005	Kg/event	24.7	ug/l
Pb	0.002	Kg/event	8.4	ug/l
Zn	0.037	Kg/event	188.3	ug/l

Constituents	TSS	TP	TN	F Coli	F Entero	F Strepto	T Coliform	Cu	Pb	Zn
	mg/l	mg/l	mg/l	1,000col/ml	1,000col/ml	1,000col/m	1,000col/m	ug/l	ug/l	ug/l
HDSF	95	0.39	3	9.3	6.1	12.3	13.6	15	10	79
Light Industrial	240	0.41	3	3.4	1.29	2.5	4.5	32	17	639
Vacant	186	0.16	0.8	0.01	0.007	0.02	0.1	15	5	46
Retail/Comm	66	0.39	3.4	5.3	0.86	2.1	11.4	39	18	241
MFR	46	0.19	2	9.3	6.1	12.3	13.6	12	6	146
Transportation	78	0.44	2	3.3	0.98	1.8	6.9	56	10	291
Educational	95	0.31	1.6	0.02	0.01	0.04	0.2	24	5	138
Mixed Resident.	63	0.26	2.5	9.3	6.1	12.3	13.6	19	11	203

1994-2000 storm season (LA County Land Use Results by Site)

Estimated (best engineering judgment)

Area B- Pollutant loadings from ¾" Storm

1- Hydraulic Characteristics:

12.5558917 67.54411

Drainage Area (acres)	16.9
85th %ile Rainfall (inches)	0.75

2- Landuse Constituents (%): **4- Imperviousness (%)** **Runoff Coefficient:** **Runoff Volume (cu.ft):**

	2- Landuse Constituents (%)	4- Imperviousness (%)	Runoff Coefficient	Runoff Volume (cu.ft)
High Density Single Family	0	42	0.38	0
Light Industrial	0	91	0.82	0
Vacant	0	2	0.02	0
Retail/Commercial	17.8	98	0.86	7067
Multi-family Residential	0	74	0.67	0
Transportation	34	91	0.82	12796
Education	12.5	82	0.74	4239
Mixed Residential	35.7	59	0.53	8714

Pollutant Loadings:

TSS	68.4	Kg/event
TP	0.3	Kg/event
TN	2.2	Kg/event
F Coli	4550.7	Colonies/event
F Enteroc	2032.3	Colonies/event
F Strept	4109.7	Colonies/event
T Coliform	8156.2	Colonies/event
Cu	0.0	Kg/event
Pb	0.0	Kg/event
Zn	0.2	Kg/event

3- Pollutant Removal Efficiencies (%):

TSS	85
TP	60
TN	55
F Coli	90
F Enteroc	90
F Strept	90
F Strept	90
T Coliform	90
Cu	80
Pb	80
Zn	80

Runoff Characteristics:

Overall Runoff Coefficient:	5.34	
Runoff Volume:	245458	cu.ft/event

Pollutant Loading Reductions: **Mean Concentrations:**

	Pollutant Loading Reductions		Mean Concentrations	
TSS	58.121	Kg/event	9.8	mg/l
TP	0.203	Kg/event	0.0	mg/l
TN	1.217	Kg/event	0.3	mg/l
F Coli	4095.604	Colonies/event	0.7	1000 Col/ml
F Enteroc	1829.078	Billion Colonies/event	0.3	1000 Col/ml
F Strept	3698.760	Colonies/event	0.6	1000 Col/ml
T Coliform	7340.556	Colonies/event	1.2	1000 Col/ml
Cu	0.032	Kg/event	5.1	ug/l
Pb	0.008	Kg/event	1.5	ug/l
Zn	0.176	Kg/event	31.7	ug/l

Constituents	TSS	TP	TN	F Coli	F Entero	F Strepto	T Coliform	Cu	Pb	Zn
	mg/l	mg/l	mg/l	1,000col/m	1,000col/m	1,000col/m	1,000col/m	ug/l	ug/l	ug/l
HDSF	95	0.39	3	9.3	6.1	12.3	13.6	15	10	79
Light Industrial	240	0.41	3	3.4	1.29	2.5	4.5	32	17	639
Vacant	186	0.16	0.8	0.01	0.007	0.02	0.1	15	5	46
Retail/Comm	66	0.39	3.4	5.3	0.86	2.1	11.4	39	18	241
MFR	46	0.19	2	9.3	6.1	12.3	13.6	12	6	146
Transportation	78	0.44	2	3.3	0.98	1.8	6.9	56	10	291
Educational	95	0.31	1.6	0.02	0.01	0.04	0.2	24	5	138
Mixed Resident.	63	0.26	2.5	9.3	6.1	12.3	13.6	19	11	203

1994-2000 storm season (LA County Land Use Results by Site)

Estimated (best engineering judgment)

Area C- Pollutant loadings from ¾" Storm

1- Hydraulic Characteristics:

Drainage Area (acres)	17.4
85th %ile Rainfall (inches)	0.75

2- Landuse Constituents		4- Imperviousness (%)	Runoff Coefficient:	Runoff Volume (cu.ft):
High Density Single Family	0	42	0.38	0
Light Industrial	0	91	0.82	0
Vacant	12.1	2	0.02	106
Retail/Commercial	13.8	98	0.86	5840
Multi-family Residential	0	74	0.67	0
Transportation	39.5	91	0.82	15302
Education	13.4	82	0.74	4678
Mixed Residential	21.2	59	0.53	5328

Pollutant Loadings:

TSS	66.9	Kg/event
TP	0.3	Kg/event
TN	2.0	Kg/event
F Coli	3679.4	Colonies/event
F Enteroc	1482.5	Colonies/event
F Strept	2974.1	Colonies/event
T Coliform	6884.2	Colonies/event
Cu	0.0	Kg/event
Pb	0.0	Kg/event
Zn	0.2	Kg/event

3- Pollutant Removal Efficiencies

TSS	85
TP	60
TN	55
F Coli	90
F Enteroc	90
F Strept	90
F Strept	90
T Coliform	90
Cu	80
Pb	80
Zn	80

Runoff Characteristics:

Overall Runoff Coefficient:	4.91	
Runoff Volume:	232265	cu.ft/event

Pollutant Loading Reductions:

TSS	56.900	Kg/event
TP	0.200	Kg/event
TN	1.100	Kg/event
F Coli	3311.504	Colonies/event
F Enteroc	1334.234	Billion Colonies/event
F Strept	2676.658	Colonies/event
T Coliform	6195.798	Colonies/event
Cu	0.033	Kg/event
Pb	0.008	Kg/event
Zn	0.171	Kg/event

Mean Concentrations:

10.2	mg/l
0.1	mg/l
0.3	mg/l
0.6	1000 Col/ml
0.2	1000 Col/ml
0.5	1000 Col/ml
1.0	1000 Col/ml
5.6	ug/l
1.5	ug/l
32.5	ug/l

Constituent	TSS	TP	TN	F Coli	F Entero	F Strepto	T Coliform	Cu	Pb	Zn
	mg/l	mg/l	mg/l	1,000col/m	1,000col/m	1,000col/m	1,000col/m	ug/l	ug/l	ug/l
HDSF	95	0.39	3	9.3	6.1	12.3	13.6	15	10	79
Light Industri	240	0.41	3	3.4	1.29	2.5	4.5	32	17	639
Vacant	186	0.16	0.8	0.01	0.007	0.02	0.1	15	5	46
Retail/Comm	66	0.39	3.4	5.3	0.86	2.1	11.4	39	18	241
MFR	46	0.19	2	9.3	6.1	12.3	13.6	12	6	146
Transportati	78	0.44	2	3.3	0.98	1.8	6.9	56	10	291
Educationa	95	0.31	1.6	0.02	0.01	0.04	0.2	24	5	138
Mixed Reside	63	0.26	2.5	9.3	6.1	12.3	13.6	19	11	203

1994-2000 storm season (LA County Land Use Results by Site)

Estimated (best engineering judgment)

General Project Area- Annual Pollutant Loading and Runoff Calculation

1- Hydraulic Characteristics:

Drainage Area (acres)	98.00
Mean Annual Rainfall (inches)	12

2- Landuse Constituents (%): / 4- Imperviousness (%) / Runoff Coefficient: / Runoff Volume (cu.ft):

Landuse	Landuse Constituents (%)	Imperviousness (%)	Runoff Coefficient	Runoff Volume (cu.ft)
High Density Single Family	19.09	42	0.38	308451
Light Industrial	6.75	91	0.82	236138
Vacant	2.85	2	0.02	2251
Retail/Commercial	17.29	98	0.86	638078
Multi-family Residential	4.2	74	0.67	119499
Transportation	12.9	91	0.82	451287
Education	3.24	82	0.74	102143
Mixed Residential	46	59	0.53	1043698

Pollutant Loadings:

TSS	6923.9	Kg/yr
TP	28.0	Kg/yr
TN	218.5	Kg/yr
F Coli	547953.7	Billion Colonies/yr
F Enteroc	290746.2	Billion Colonies/yr
F Strept	589999.2	Billion Colonies/yr
T Coliform	891044.2	Billion Colonies/yr
Cu	2.4	Kg/yr
Pb	1.0	Kg/yr
Zn	19.9	Kg/yr

3- Pollutant Removal Efficiencies (%):

TSS	85
TP	60
TN	55
F Coli	90
F Enteroc	90
F Strept	90
F Strept	90
T Coliform	90
Cu	80
Pb	80
Zn	80

Runoff Characteristics:

Overall Runoff Coefficient:	0.68	
Runoff Volume:	2901545	cu.ft/yr

Pollutant Loading Reductions: / Mean Concentrations:

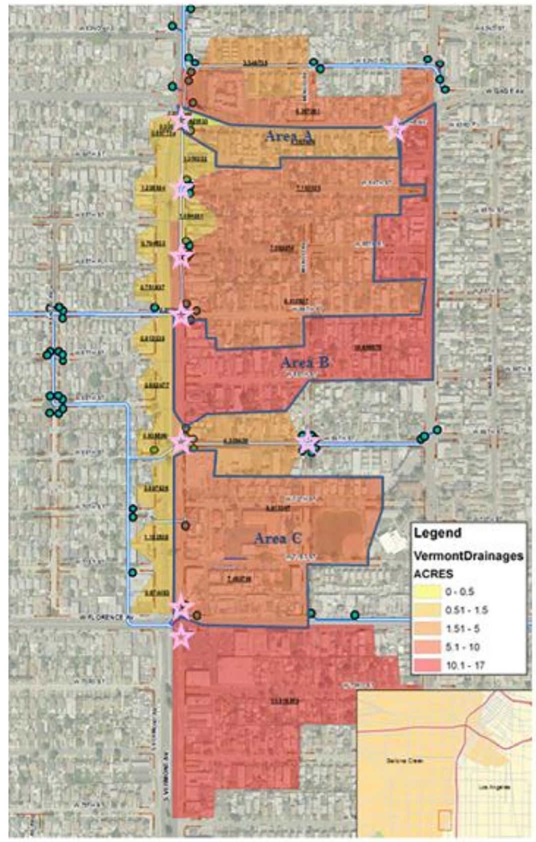
	Pollutant Loading Reductions	Unit	Mean Concentrations	Unit
TSS	5885.339	Kg/yr	84.3	mg/l
TP	16.821	Kg/yr	0.3	mg/l
TN	120.151	Kg/yr	2.7	mg/l
F Coli	493158.363	Billion Colonies/yr	6.7	1000 Col/ml
F Enteroc	261671.558	Billion Colonies/yr	3.5	1000 Col/ml
F Strept	530999.244	Billion Colonies/yr	7.2	1000 Col/ml
T Coliform	801939.742	Billion Colonies/yr	10.9	1000 Col/ml
Cu	2.193	Kg/yr	29.7	ug/l
Pb	0.811	Kg/yr	12.3	ug/l
Zn	15.936	Kg/yr	242.6	ug/l

Constituents	TSS	TP	TN	F Coli	F Entero	F Strepto	T Coliform	Cu	Pb	Zn
	mg/l	mg/l	mg/l	1,000col/ml	1,000col/ml	1,000col/m	1,000col/m	ug/l	ug/l	ug/l
HDSF	95	0.39	3	9.3	6.1	12.3	13.6	15	10	79
Light Industrial	240	0.41	3	3.4	1.29	2.5	4.5	32	17	639
Vacant	186	0.16	0.8	0.01	0.007	0.02	0.1	15	5	46
Retail/Comm	66	0.39	3.4	5.3	0.86	2.1	11.4	39	18	241
MFR	46	0.19	2	9.3	6.1	12.3	13.6	12	6	146
Transportation	78	0.44	2	3.3	0.98	1.8	6.9	56	10	291
Educational	95	0.31	1.6	0.02	0.01	0.04	0.2	24	5	138
Mixed Resident.	63	0.26	2.5	9.3	6.1	12.3	13.6	19	11	203
1994-2000 storm season (LA County Land Use Results by Site)										
Estimated (best engineering judgment)										

Appendix B: Map of Tentative Water Quality Monitoring/Sampling Locations

Vermont Corridor Green Street & Stormwater Capture Project

☆ Tentative Monitoring Locations



Appendix C: Green Street Standard Plans and Cost Sheets

(insert PDF)

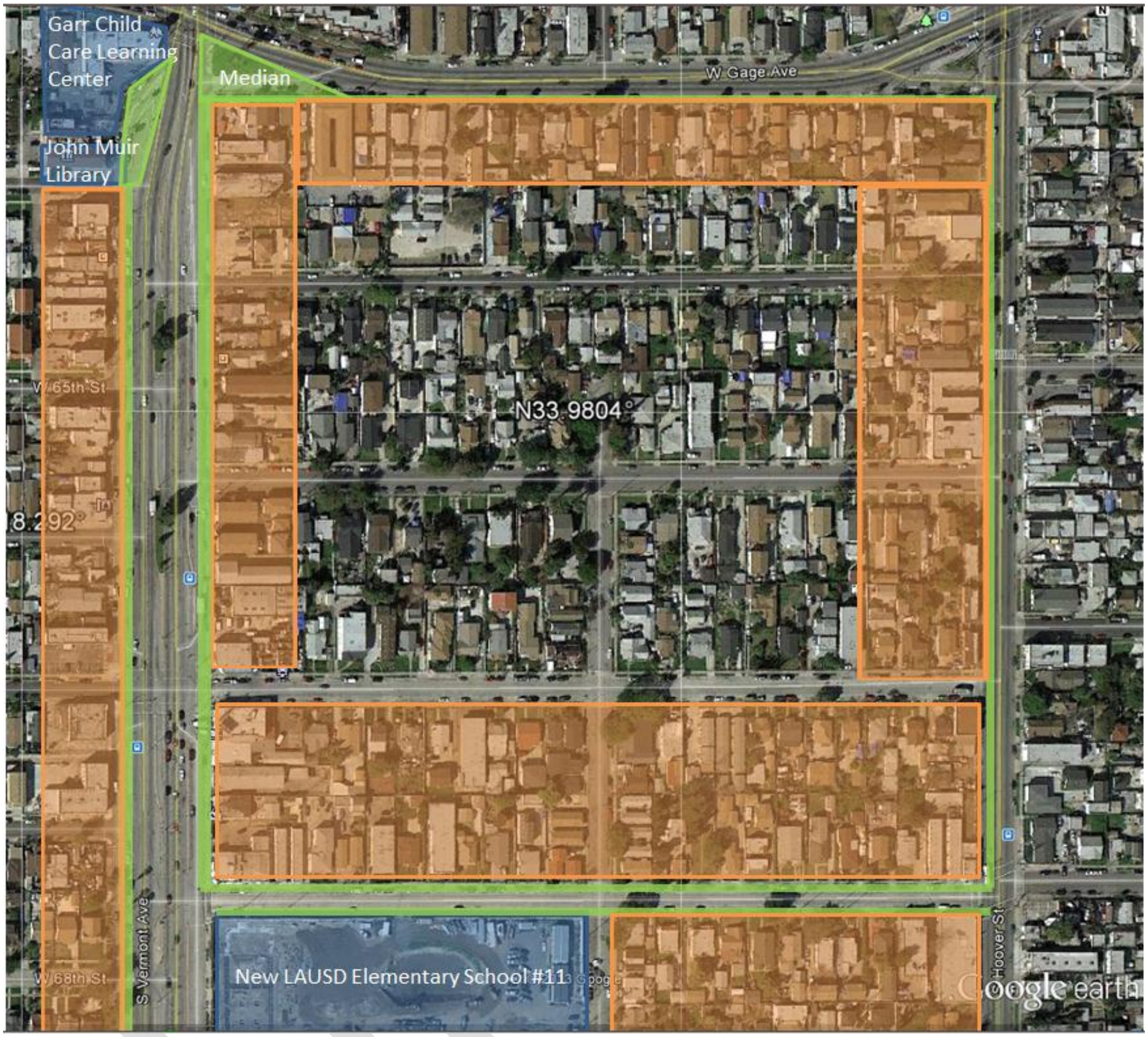
Appendix D: Targeted BMP Placement Options

Educational Institution/ Community Hub

Large Impervious Property Targeted for Potential On-site BMPs

Potential Right-of-way BMP Location

Residential/Business Area Targeted for General Community Outreach and/or Potential On-site BMPs


Garr Child Care Learning Center
John Muir Library
Median
W Gage Ave
W 65th St
N33.9804°
8.292°
S Vermont Ave
W 68th St
New LAUSD Elementary School #11
Hoover St
Google earth


W 69th St
AT&T Office
W 70th St
Saint Raphael
School K-8
Mt. Carmel Recreation
Center
Menlo Av
Bonsallo Ave
Super Buy &
O'Reilly
Commercial
Complex
N33.9732°
S Vermont Ave
S Hoover St
W 75th St
© 2013 Google
Google earth
lat 33.974387 lon -118.289540 elev 144 ft
Eye alt 2227 ft

Appendix E- St. Raphael School support letter

(insert PDF)

This page intentionally left blank.

Attachment A to Resolution No. R2007-015

Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the Ballona Creek Metals TMDL

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on September 6, 2007.

Amendments:

Table of Contents
Add:

List of Figures, Tables and Inserts
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries, Section 7-12 (Ballona Creek Metals TMDL)
Add:

This TMDL was adopted by the Regional Water Quality Control Board on September 6, 2007.

This TMDL was approved by:

The State Water Resources Control Board on [*insert date*].
The Office of Administrative Law on [*insert date*].
The U.S. Environmental Protection Agency on [*insert date*].

The following tables include the elements of this TMDL.

Table 7-12.1. Ballona Creek Metals TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Ballona Creek is on Clean Water Act Section 303(d) list of impaired waterbodies for dissolved copper, dissolved lead, total selenium, and dissolved zinc and Sepulveda Canyon Channel is 303(d) listed for lead. The metals subject to this TMDL are toxic pollutants, and the existing water quality objectives for the metals reflect national policy that the discharge of toxic pollutants in toxic amounts be prohibited. When one of the metals subject to this TMDL is present at levels exceeding the existing numeric objectives, then the receiving water is toxic. The following designated beneficial uses are impaired by these metals: water contact recreation (REC1); non-contact water recreation (REC2); warm freshwater habitat (WARM); estuarine habitat (EST); marine habitat (MAR); wildlife habitat (WILD); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); and shellfish harvesting (SHELL). TMDLs are developed for reaches on the 303(d) list and metal allocations are developed for tributaries that drain to impaired reaches. This TMDL address dry- and wet-weather discharges of copper, lead, selenium and zinc in Ballona Creek and Sepulveda Canyon Channel.
Numeric Target *(Interpretation of the narrative and numeric water quality objective, used to calculate the load allocations)*	Numeric water quality targets are based on the numeric water quality standards established for metals by the California Toxics Rule (CTR). The targets are expressed in terms of total recoverable metals. There are separate numeric targets for dry and wet weather because hardness values and flow conditions in Ballona Creek and Sepulveda Canyon Channel vary between dry and wet weather. The dry-weather targets apply to days when the maximum daily flow in Ballona Creek is less than 40 cubic feet per second (cfs). The wet-weather targets apply to days when the maximum daily flow in Ballona Creek is equal to or greater than 40 cfs. **Dry Weather** The dry-weather targets are based on the chronic CTR criteria. The copper, lead and zinc targets are dependent on hardness to adjust for site-specific conditions and require conversion factors to convert between dissolved and total recoverable metals. These targets are based on the 50th percentile hardness value of 300 mg/L and the CTR default conversion factors. The conversion factor for lead is hardness dependent, which is also based on a hardness of 300 mg/L. The dry-weather target for selenium is independent of hardness and expressed as total recoverable metals. **Dry-weather numeric targets (µg total recoverable metals/L)** Columns: Dissolved / Conversion Factor / Total Recoverable Copper: 23 / 0.96 / 24 Lead: 8.1 / 0.631 / 13 Selenium: – / – / 5 Zinc: 300 / 0.986 / 304

Dry-weather numeric targets (µg total recoverable metals/L)

	Dissolved	Conversion Factor	Total Recoverable
Copper	23	0.96	24
Lead	8.1	0.631	13
Selenium			5
Zinc	300	0.986	304

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>
Wet Weather
The wet-weather targets for copper, lead and zinc are based on the acute CTR criteria and the 50th percentile hardness value of 77 mg/L for storm water collected at Sawtelle Boulevard. Conversion factors for copper and zinc are based on a regression of dissolved metal values to total metal values collected at Sawtelle. The CTR default conversion factor based on a hardness value of 77 mg/L is used for lead. The wet-weather target for selenium is independent of hardness and expressed as total recoverable metals.
Wet-weather numeric targets (µg total recoverable metals/L)
<table>
<tr><th></th><th>Dissolved</th><th>Conversion Factor</th><th>Total Recoverable</th></tr>
<tr><td>Copper</td><td>11</td><td>0.62</td><td>18</td></tr>
<tr><td>Lead</td><td>49</td><td>0.829</td><td>59</td></tr>
<tr><td>Selenium</td><td></td><td></td><td>5</td></tr>
<tr><td>Zinc</td><td>94</td><td>0.79</td><td>119</td></tr>
</table>
</td></tr>
<tr><td>Source Analysis</td><td>
There are significant difference in the sources of copper, lead, selenium and zinc loadings during dry weather and wet weather. 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. During dry years, dry-weather loadings account for 25-35% of the annual metals loadings. Additional sources of dry weather flow and metals loading include groundwater discharge and flows from other permitted NPDES discharges within the watershed.
During wet weather, most of the metals loadings in Ballona Creek are in the particulate form and are associated with wet-weather storm water flows. On an annual basis, storm water contributes about 91% of the copper loading and 92% of the lead loading to Ballona Creek. Storm water flow is permitted through the municipal separate storm sewer system (MS4) permit issued to the County of Los Angeles, a separate Caltrans storm water permit, a general construction storm water permit, and a general industrial storm water permit.
Non-point sources are not considered to be a significant source in this TMDL. Direct atmospheric deposition of metals is insignificant relative to the annual dry-weather loading or the total annual loading. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during storm events and delivered to Ballona Creek and its tributaries. The loading of metals associated with indirect atmospheric deposition are accounted for in the estimates of the storm water loading.
</td></tr>
</table>

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Loading Capacity</td><td>TMDLs are developed for copper, lead, selenium and zinc for Ballona Creek and Sepulveda Canyon Channel.

Dry Weather

Dry-weather loading capacities for Ballona Creek and Sepulveda Canyon Channel are equal to the dry-weather numeric targets multiplied by the critical dry-weather flow for each waterbody. Based on long-term flow records for Ballona Creek at Sawtelle the median dry-weather flow is 14 cfs. The median dry-weather flow for Sepulveda Canyon Channel, based on measurements conducted in 2003, is 6.3 cfs.

<u>Dry-weather loading capacity (grams total recoverable metals/day)</u>
<table><tr><th></th><th>Copper</th><th>Lead</th><th>Selenium</th><th>Zinc</th></tr><tr><td>Ballona Creek</td><td>821</td><td>440</td><td>171</td><td>10,423</td></tr><tr><td>Sepulveda Channel</td><td>371</td><td>199</td><td>77</td><td>4,712</td></tr></table>
Wet Weather

Wet-weather loading capacities are calculated by multiplying the daily storm volume by the wet-weather numeric target for each metal.

<u>Wet-weather loading capacity (total recoverable metals)</u>
<table><tr><th>Metal</th><th>Load Capacity</th></tr><tr><td>Copper</td><td>Daily storm volume x 18 μg/L</td></tr><tr><td>Lead</td><td>Daily storm volume x 59 μg/L</td></tr><tr><td>Selenium</td><td>Daily storm volume x 5 μg/L</td></tr><tr><td>Zinc</td><td>Daily storm volume x 119 μg/L</td></tr></table></td></tr>
<tr><td>Load Allocations (for nonpoint sources)</td><td>Load allocations (LA) are assigned to non-point sources for Ballona Creek and Sepulveda Canyon Channel.

Dry Weather

Dry-weather load allocations for copper, lead and zinc are developed for direct atmospheric deposition. The mass-based load allocations are equal to the ratio of the length of each segment over the total length multiplied by the estimates of direct atmospheric loading for Ballona Creek (3.5 g/day for copper, 2.3 g/day for lead, and 11.7 k/day for zinc).

<u>Dry-weather direct air deposition LAs (total recoverable metals)</u>
<table><tr><th></th><th>Copper (g/day)</th><th>Lead (g/day)</th><th>Zinc (g/day)</th></tr><tr><td>Ballona Creek</td><td>2.0</td><td>1.4</td><td>6.8</td></tr><tr><td>Sepulveda Channel</td><td>0.3</td><td>0.2</td><td>0.9</td></tr></table>
Wet Weather

Wet-weather load allocations for copper, lead, selenium and zinc are developed for direct atmospheric deposition. The mass-based load allocations for direct atmospheric deposition are equal to the percent area of surface water (0.6%) multiplied by the total loading capacity.</td></tr>
</table>

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>Wet-weather direct air deposition LAs (total recoverable metals)

| | Load Allocation (grams/day) |
Copper: 1.05E-07 x Daily storm volume (L)
Lead: 3.54E-07 x Daily storm volume (L)
Selenium: 3.00E-08 x Daily storm volume (L)
Zinc: 7.14E-07 x Daily storm volume (L)</td></tr>
<tr><td>Waste Load Allocations (for point sources)</td><td>Waste load allocations (WLA) are assigned to point sources for Ballona Creek and Sepulveda Canyon Channel. A grouped mass-based waste load allocation is developed for the storm water permittees (Los Angeles County MS4, Caltrans, General Construction and General Industrial) by subtracting the load allocation from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed.

Dry Weather

Dry-weather waste load allocation for storm water is equal to the dry-weather critical flow multiplied by the dry-weather numeric target minus the load allocation for direct atmospheric deposition.

Dry-weather Storm Water WLAs
(grams total recoverable metals/day)
| | Copper | Lead | Selenium | Zinc |
Ballona Creek	818.9	438.6	171	10,416.2
Sepulveda Channel	370.7	198.8	77	4,711.1 | A waste load allocation of zero is assigned to all general construction and industrial storm water permits during dry weather. Therefore, the storm water waste load allocations are apportioned between the MS4 permittees and Caltrans, based on an areal weighting approach. Dry-weather Storm Water WLAs Apportioned between Storm Water Permits (grams total recoverable metals/day) |	Copper	Lead	Selenium	Zinc
<u>Ballona Creek</u>				
MS4 permittees	807.7	432.6	169	10,273.1
Caltrans	11.2	6.0	2	143.1
<u>Sepulveda Channel</u>				
MS4 Permittees	365.6	196.1	76	4646.4
Caltrans	5.1	2.7	1	64.7 | Concentration-based dry-weather waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations. Dry-weather WLAs for other permits (total recoverable metals) | Copper (µg/L)	Lead (µg/L)	Selenium (µg/L)	Zinc (µg/L)
24	13	5	304	</td></tr>
</table>

Element	Key Findings and Regulatory Provisions
	Wet Weather Wet-weather waste load allocation for storm water is equal to the total loading capacity minus the load allocation for direct atmospheric deposition. Wet-weather waste load allocations for the grouped storm water permittees apply to all reaches and tributaries. **Wet-weather Storm Water WLAs (total recoverable metals)** Waste Load Allocation (grams/day) Copper 1.79E-05 x Daily storm volume (L) Lead 5.87E-05 x Daily storm volume (L) Selenium 4.97E-06 x Daily storm volume (L) Zinc 1.18E-04 x Daily storm volume (L) The storm water waste load allocations are apportioned between the MS4 permittees, Caltrans, the general construction and the general industrial storm water permits based on an areal weighting approach. **Wet-weather Storm Water WLAs Apportioned Between Storm Water Permits (total recoverable metals)** Waste Load Allocation (grams/day) Copper MS4 Permittees 1.70E-05 x Daily storm volume (L) Caltrans 2.37E-07 x Daily storm volume (L) General Construction 4.94E-07 x Daily storm volume (L) General Industrial 1.24E-07 x Daily storm volume (L) Lead MS4 Permittees 5.58E-05 x Daily storm volume (L) Caltrans 7.78E-07 x Daily storm volume (L) General Construction 1.62E-06 x Daily storm volume (L) General Industrial 4.06E-07 x Daily storm volume (L) Selenium MS4 Permittees 4.73E-06 x Daily storm volume (L) Caltrans 6.59E-08 x Daily storm volume (L) General Construction 1.37E-07 x Daily storm volume (L) General Industrial 3.44E-08 x Daily storm volume (L) Zinc MS4 Permittees 1.13E-04 x Daily storm volume (L) Caltrans 1.57E-06 x Daily storm volume (L) General Construction 3.27E-06 x Daily storm volume (L) General Industrial 8.19E-07 x Daily storm volume (L) Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>
Individual per Acre WLAs for General Construction or Industrial Storm Water Permittees (total recoverable metals)
<table>
<tr><th></th><th>Waste Load Allocation (grams/day/acre)</th></tr>
<tr><td>Copper</td><td>2.20E-10 x Daily storm volume (L)</td></tr>
<tr><td>Lead</td><td>7.20E-10 x Daily storm volume (L)</td></tr>
<tr><td>Selenium</td><td>6.10E-11 x Daily storm volume (L)</td></tr>
<tr><td>Zinc</td><td>1.45E-09 x Daily storm volume (L)</td></tr>
</table>
Concentration-based wet-weather waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations.
Wet-weather WLAs for other permits (total recoverable metals)
<table>
<tr><th>Copper (µg/L)</th><th>Lead (µg/L)</th><th>Selenium (µg/L)</th><th>Zinc (µg/L)</th></tr>
<tr><td>18</td><td>59</td><td>5</td><td>119</td></tr>
</table>
</td></tr>
<tr><td>Margin of Safety</td><td>There is an implicit margin of safety through the use of conservative values for the conversion from total recoverable metals to the dissolved fraction during dry and wet weather. In addition, the TMDL includes a margin of safety by evaluating dry-weather and wet-weather conditions separately and assigning allocations based on two disparate critical conditions.</td></tr>
<tr><td>Implementation</td><td>
The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the State of California Department of Transportation (Caltrans) Storm Water Permit, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, and general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in Sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board’s Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement.
The Regional Board shall reconsider this TMDL by January 11, 2011 based on additional data obtained from special studies. Table 7-12.2 presents the implementation schedule for the responsible permittees.
Minor NPDES Permits and General Non-Storm Water NPDES Permits:
Permit writers may translate applicable waste load allocations into effluent limits for the minor and general NPDES permits by applying the effluent limitation procedures in Section 1.4 of the State Water Resources Control Board’s Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2000) or other applicable engineering practices authorized
</td></tr>
</table>

Element	Key Findings and Regulatory Provisions
	under federal regulations. Compliance schedules may be established in individual NPDES permits, allowing up to 5 years within a permit cycle to achieve compliance. Compliance schedules may not be established in general NPDES permits. A discharger that can not comply immediately with effluent limitations specified to meet waste load allocations will be required to apply for an individual permit, in order to, demonstrate the need for a compliance schedule. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs. **General Industrial Storm Water Permits:** The Regional Board will develop a watershed specific general industrial storm water permit to incorporate waste load allocations. <u>Dry-weather Implementation</u> Non-storm water flows authorized by Order No. 97-03 DWQ, or any successor order, are exempt from the dry-weather waste load allocation equal to zero. Instead, these authorized non-storm water flows shall meet the concentration-based waste load allocations assigned to the other NPDES Permits. The dry-weather waste load allocation equal to zero applies to unauthorized non-storm water flows, which are prohibited by Order No. 97-03 DWQ. It is anticipated that the dry-weather waste load allocations will be implemented by requiring improved best management practices (BMPs) to eliminate the discharge of non-storm water flows. However, the permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. <u>Wet-weather Implementation</u> The general industrial storm water permittees are allowed interim wet-weather concentration-based waste load allocations based on benchmarks contained in EPA's Storm Water Multi-sector General Permit for Industrial Activities. The interim waste load allocations apply to all industry sectors until no later than January 11, 2016. **<u>Interim Wet-Weather WLAs for General Industrial Storm Water Permittees (total recoverable metals)</u>** Copper (µg/L): 63.6; Lead (µg/L): 81.6; Selenium (µg/L): 238.5; Zinc (µg/L): 117 Until January 11, 2011, interim waste load allocations will not be interpreted as enforceable permit conditions. If monitoring demonstrates that interim waste load allocations are being exceeded, the

Element	Key Findings and Regulatory Provisions
	permittee shall evaluate existing and potential BMPs, including structural BMPs, and implement any necessary BMP improvements. It is anticipated that monitoring results and any necessary BMP improvements would occur as part of an annual reporting process. After January 11, 2011, interim waste load allocations shall be translated into enforceable permit conditions. Compliance with permit conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. If this method of compliance is chosen, permit writers must provide adequate justification and documentation to demonstrate that BMPs are expected to result in attainment of interim waste load allocations. The general industrial storm water permits shall achieve final wet-weather waste load allocations no later than January 11, 2016, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs if adequate justification and documentation demonstrate that BMPs are expected to result in attainment of waste load allocations. **General Construction Storm Water Permits:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. <u>Dry-weather Implementation</u> Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ. <u>Wet-weather Implementation</u> By January 11, 2013, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration by January 11, 2014. General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs by January 11, 2015. If no

Element	Key Findings and Regulatory Provisions
	effectiveness studies are conducted and no BMPs are approved by the Regional Board by January 11, 2014, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations. **MS4 and Caltrans Storm Water Permits:** The County of Los Angeles, City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood are jointly responsible for meeting the mass-based waste load allocations for the MS4 permittees. Caltrans is responsible for meeting their mass-based waste load allocations, however, they may choose to work with the MS4 permittees. The primary jurisdiction for the Ballona Creek watershed is the City of Los Angeles. Applicable CTR limits are being met most of the time during dry weather, with episodic exceedances. Due to the expense of obtaining accurate flow measurements required for calculating loads, concentration-based permit limits may apply during dry weather. These concentration-based limits would be equal to the dry-weather concentration-based waste load allocations assigned to the other NPDES permits. Each municipality and permittee will be required to meet the storm water waste load allocation at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the stormwater waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocations. The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach, with compliance to be achieved in prescribed percentages of the watershed, with total compliance to be achieved within 15 years.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for dry weather and wet weather. Based on long-term flow records, dry-weather flows in Ballona Creek are estimated to be 14 cubic feet per second (cfs). Since, this flow has been very consistent, 14 cfs is used to define the critical dry-weather flow for Ballona Creek at Sawtelle Boulevard (upstream of Sepulveda Canyon Channel). There are no historic flow records to determine the average long-term flows for Sepulveda Canyon Channel. Therefore, in the absence of historical records the 2003 dry-weather characterization study measurements are assumed reasonable estimates of flow for this channel. The critical dry-weather flow for Sepulveda Canyon Channel is defined as the average flow of 6.3 cfs. Wet-weather allocations are developed using the load-duration curve

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>concept. The total wet-weather waste load allocation varies by storm, therefore, given this variability in storm water flows, no justification was found for selecting a particular sized storm as the critical condition.</td></tr>
<tr><td>Monitoring</td><td>Effective monitoring will be required to assess the condition of the Ballona Creek and to assess the on-going effectiveness of efforts by dischargers to reduce metals loading to Ballona Creek. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer.

Ambient monitoring

An ambient monitoring program is necessary to assess water quality throughout Ballona Creek and its tributaries and the progress being made to remove the metals impairments. The MS4 and Caltrans storm water NPDES permittees are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall analyze samples for total recoverable metals and dissolved metals, including cadmium and silver, and hardness once a month at each monitoring location. The reported detection limits shall be lower than the hardness adjusted CTR criteria to determine if water quality objectives are being met. There are three ambient monitoring locations.

Ambient Monitoring Locations
<table>
<tr><th>Waterbody</th><th>Location</th></tr>
<tr><td>Ballona Creek</td><td>At Sawtelle Boulevard</td></tr>
<tr><td>Sepulveda Channel</td><td>Just Above the Confluence with Ballona Creek</td></tr>
<tr><td>Ballona Creek</td><td>At Inglewood Boulevard</td></tr>
</table>

TMDL Effectiveness Monitoring

The MS4 and Caltrans storm water NPDES permittees are jointly responsible for assessing the progress in reducing pollutant loads to achieve the TMDL. The MS4 and Caltrans storm water NPDES permittees are required to submit for approval of the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL, which requires attainment of the applicable waste load allocations in prescribed percentages of the watershed over a 15-year period. The monitoring locations specified for the ambient monitoring program may be used as the effectiveness monitoring locations.

The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentrations or load at the first downstream monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet</td></tr>
</table>

Element	Key Findings and Regulatory Provisions
	based on the concentration-based waste load allocation for the receiving water. For storm drains that discharge to other storm drains, the waste load allocation will be based on the waste load allocation for the ultimate receiving water for that storm drain system. The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting the wet-weather waste load allocations if the loading at the most downstream monitoring location is equal to or less then the wet-weather waste load allocation. Compliance with individual general construction and industrial storm water permittees will be based on monitoring of discharges at the property boundary. Compliance may be assessed based on concentration and/or load allocations. The general storm water permits shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general permits shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities under their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in metals loads to the MS4 system. **Special studies** The implementation schedule, Table 7-12.2, allows time for special studies that may serve to refine the estimate of loading capacity, waste load and/or load allocations, and other studies that may serve to optimize implementation efforts. The Regional Board will re-consider the TMDL by January 11, 2011 in light of the findings of these studies. Studies may include: • Refinement of hydrologic and water quality model • Additional source assessment • Refinement of potency factors correlation between total suspended solids and metals loadings during dry and wet weather • Correlation between short-term rainfall intensity and metals loadings for use in sizing in-line structural BMPs • Correlation between storm volume and total recoverable metals loading for use in sizing storm water retention facilities • Refined estimates of metals partitioning coefficients, conversion factors, and site-specific toxicity. • Evaluation of potential contribution of aerial deposition and sources of aerial deposition.

Table 7-12.2. Ballona Creek Metals TMDL: Implementation Schedule

Date	**Action**
January 11, 2006	Regional Board permit writers shall incorporate the waste load allocations into the NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance or re-issuance.
January 11, 2010	Responsible jurisdictions and agencies shall provide to the Regional Board results of the special studies.
January 11, 2011	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
MINOR NPDES PERMITS AND GENERAL NON-STORM WATER NPDES PERMITS	
Upon permit issuance or renewal	The non-storm water NPDES permittees shall achieve the waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Compliance schedules may allow up to five years in individual NPDES permits to meet permit requirements. Compliance schedules may not be established in general NPDES permits. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs.
GENERAL INDUSTRIAL STORM WATER PERMITS	
Upon permit issuance or renewal	The general industrial storm water NPDES permittees shall achieve dry-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin to install and test BMPs to meet the interim wet-weather WLAs. BMP effectiveness monitoring will be implemented to determine progress in achieving interim wet-weather waste load allocations.
January 11, 2011	The general industrial storm water NPDES permittees shall achieve the interim wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin an iterative BMP process including BMP effectiveness monitoring to achieve compliance

Date	Action
	with final wet-weather WLAs.
January 11, 2016	The general industrial storm water NPDES permittees shall achieve the final wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
GENERAL CONSTRUCTION STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather waste load allocations of zero. Waste load allocations shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
January 11, 2013	The construction industry will submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
January 11, 2014	The Regional Board will consider results of the wet-weather BMP effectiveness studies and consider approval of BMPs.
January 11, 2015	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
January 11, 2007	In response to an order issued by the Executive Officer, the MS4 and Caltrans storm water NPDES permittees must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both ambient monitoring and TMDL effectiveness monitoring. Once the coordinated monitoring plan is approved by the Executive Officer ambient monitoring shall commence within 6 months.
January 11, 2010 (Draft Report) July 11, 2010 (Final Report)	MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining the drainage areas to be address and how these areas will achieve compliance with the waste load allocations. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL

Date	Action
	effectiveness monitoring plan.
January 11, 2012	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations and 25% of the total drainage area served by the MS4 system is effectively meeting the wet-weather waste load allocations.
January 11, 2014	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations.
January 11, 2016	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations and 50% of the total drainage area served by the MS4 system is effectively meeting the wet-weather waste load allocations.
January 11, 2021	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting both the dry-weather and wet-weather waste load allocations.

This page intentionally left blank.

Attachment A to Resolution No. 06-011

Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the TMDL for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel.

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on June 8, 2006.

Amendments:

Table of Contents
Add:

List of Figures, Tables and Inserts
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries, Section 7-21 (Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL)

This TMDL was adopted by the Regional Water Quality Control Board on June 8, 2006.

This TMDL was approved by:

The State Water Resources Control Board on [Insert Date].
The Office of Administrative Law on [Insert Date].
The U.S. Environmental Protection Agency on [Insert Date].

The following table includes all the elements of this TMDL.

Table 7-21.1. Ballona Creek, Estuary, and Tributaries s Bacteria TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use designated for Ballona Estuary and Sepulveda Channel, limited water contact recreation (LREC) designated for Ballona Creek Reach 2, and non-contact recreation (REC-2) beneficial uses of Ballona Creek Reach 1. Recreating in waters with elevated bacterial indicator densities has long been associated with adverse human health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target *(Interpretation of the numeric water quality objective, used to calculate the waste load allocations)*	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh water to protect the contact and non-contact recreation uses. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: In Marine Waters Designated for Water Contact Recreation (REC-1) <u>1. Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1. In Fresh Waters Designated for Water Contact Recreation (REC-1) 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 235/100 ml. b. Fecal coliform density shall not exceed 400/100 ml.

[1] The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

Element	Key Findings and Regulatory Provisions
	In Fresh Waters Designated for Limited Water Contact Recreation (LREC-1)[2] 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 576/100 ml. In Fresh Waters Designated for Non-Contact Water Recreation (REC-2) 1. Geometric Mean Limits a. Fecal coliform density shall not exceed 2000/100 ml. 2. Single Sample Limits a. Fecal coliform density shall not exceed 4000/100 ml. The targets apply throughout the year. Determination of attainment of the targets will be at in-stream monitoring sites to be specified in the compliance monitoring report. Implementation of the above REC-1 and LREC-1 bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach subject to antidegradation policies' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, and load allocations are the vehicles for implementation of the Region's standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas.

[2] The bacteriological objectives for the LREC-1 use designation were provided in a Basin Plan Amendment adopted by State Board on January 20, 2005, and subsequently approved by the Office of Administrative Law and finally by U.S. EPA on February 17, 2006

Element	Key Findings and Regulatory Provisions
	The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.) Implementation of the REC-2 target will be as specified in the Basin Plan. The REC-2 bacteria objectives allow for a 10% exceedance frequency of the single sample limit in samples collected during a 30-day period. This allowance, which is based on an acceptable level of health risk, will be applied in lieu of the allowable exceedance days discussed earlier. As with the other REC-1 and LREC-1 objectives, the geometric mean target for REC-2, which is based on a rolling 30-day period, will be strictly adhered to and may not be exceeded at any time.
Source Analysis	The major contributors of flows and associated bacteria loading to Ballona Creek and Estuary, are dry- and wet-weather urban runoff discharges from the storm water conveyance system. Run-off to Ballona Creek is regulated as a point source under the Los Angeles County MS4 Permit, the Caltrans Storm Water Permit, and the General Construction and Industrial Storm Water Permits. In addition to these regulated point sources, the Ballona Estuary receives input from the Del Rey Lagoon and Ballona Wetlands through connecting tide gates. Preliminary data suggest that the Ballona Wetlands are a sink for bacteria from Ballona Creek and it is therefore not considered a source in this TMDL. Inputs to Ballona Estuary from Del Rey Lagoon, are considered non-point sources of bacterial contamination. This waterbody may be considered for a natural source exclusion if its contributing bacteria loads are determined to be as a result of wildlife in the area, as opposed to anthropogenic inputs. The TMDL will require a source identification study for the lagoon in order to apply the natural source exclusion. Other nonpoint 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.
Loading Capacity	The loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above.
Waste Load Allocations *(for point sources)*	The Los Angeles County MS4 and Caltrans storm water permittees and co-permittees are assigned waste load allocations (WLAs) expressed as the number of daily or weekly sample days that may exceed the single sample targets equal to the TMDLs established for the impaired reaches (see Table 7.21.2a), and Waste Load Allocations assigned to waters tributary to impaired reaches (Table 7.21.2b). Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample

Element	Key Findings and Regulatory Provisions
	exceedances are the most relevant to public health protection. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event). The County of Los Angeles, Caltrans, and the Cities of Los Angeles, Culver City, Beverly Hills, Inglewood, West Hollywood, and Santa Monica are the responsible jurisdictions and responsible agencies[3] for the Ballona Creek Watershed. The responsible jurisdictions and responsible agencies within the watershed are jointly responsible for complying with the waste load allocation in each reach. For the single sample objectives of the impaired REC-1 and LREC-1 reaches, the proposed WLA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. For the single sample objectives of the impaired REC-2 reach, the proposed WLA for all periods is a 10% exceedance frequency of the REC-2 single sample water quality objectives. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. In addition to assigning TMDLs for the impaired reaches, Waste Load Allocations and Load Allocations are assigned to the tributaries to these impaired reaches. These WLAs and LAs are to be met at the confluence of each tributary and its downstream reach (see Table 7.21.2b).
Load Allocations *(for nonpoint sources)*	Load allocations are expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site, along with a rolling 30-day geometric mean. Load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Del Rey Lagoon is considered a nonpoint source and is therefore subject to load allocations. The proposed LA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed load allocation for the rolling 30-day geometric mean for the responsible agencies and

[3] For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as (1) local agencies that are permittees or co-permittees on a municipal storm water permit, (2) local or state agencies that have jurisdiction over Ballona Creek and Estuary, and (3) the California Department of Transportation pursuant to its storm water permit.

Element	Key Findings and Regulatory Provisions
	jurisdictions is zero (0) days of allowable exceedances (see Table 7.21.2a). The City of Los Angeles is the responsible jurisdiction for the Del Rey lagoon, and is responsible for complying with the assigned load allocations presented in Table 7.21.2b at the tide gate(s) between the Lagoon and the Estuary. If other unidentified nonpoint sources are directly impacting bacteriological water quality and causing an exceedance of the numeric targets, within the Estuary, the permittee(s) under the Municipal Storm Water NPDES Permits are not responsible through these permits. However, the jurisdiction or agency adjacent to the monitoring location may have further obligations to identify such sources.
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the Caltrans Storm Water Permit, general NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. Each responsible jurisdictions and agency will be required to meet the storm water waste load allocations shared by the LA County MS4 and Caltrans permittees at the designated TMDL effectiveness monitoring points. An iterative implementation approach using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocation. Load allocations for nonpoint sources will be incorporated into Waste Discharge Requirements and MOUs with the responsible jurisdictional agencies. This TMDL will be implemented in two phases over a ten-year period (see Table 7-21.3). Within six years of the effective date of the TMDL, compliance with the allowable number of summer dry-weather (April 1 to October 31), winter dry-weather exceedance days (November 1 to March 31) and the rolling 30-day geometric mean targets for both periods must be achieved. Within ten years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved. In order to clearly justify an extended implementation schedule beyond 10 years and up to 14 years from the effective date of the TMDL, the responsible agencies are required to submit additional quantifiable analyses as described below to demonstrate (1) the proposed plans will meet the final WLAs and (2) the proposed implementation actions will achieve multiple water quality benefits and other public goals. The types of approaches proposed coupled with quantifiable estimates of the integrated water resources benefits of the proposed structural and non-structural BMPs included in the Implementation Plan would provide the obligatory demonstration that an integrated water resources approach is being

Element	Key Findings and Regulatory Provisions
	pursued. This demonstration shall include numeric estimates of the benefits, including but not limited to reductions in other pollutants, groundwater recharged, acres of multi-use projects and water (e.g. urban runoff) beneficially reused. The responsible jurisdictions and the responsible agencies must submit a report to the Executive Officer (see Table 7-21.3) describing how they intend to comply with the dry-weather and wet-weather WLAs. As the primary jurisdiction, the City of Los Angeles is responsible for submitting the implementation plan report described above. In addition, as the responsible agency for Del Rey Lagoon, the City of Los Angeles must submit a report detailing how it intends to comply with the load allocations assigned to this waterbody. Alternatively, the City of Los Angeles may submit data clearly demonstrating that Del Rey Lagoon is not a source, for the Regional Board's consideration.. The Regional Board intends to reconsider this TMDL, within 4 years of its effective date to incorporate modifications to the WLAs based on results of the scheduled reconsideration of the Santa Monica Bay (SMB) beaches TMDLs. The SMB beaches TMDLs are scheduled to be reconsidered in four years to re-evaluate the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; to re-evaluate the reference year used in the calculation of allowable exceedance days, and to re-evaluate the need for revision of the geometric mean implementation provision. The Regional Board also intends to re-asses the WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
Margin of Safety	By directly applying the numeric water quality standards and implementation procedures as Waste Load Allocations, there is little uncertainty about whether meeting the TMDLs will result in meeting the water quality standards.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical condition for bacteria loading to the Ballona Creek, Ballona Estuary, and Sepulveda Channel is during wet weather when monitoring data indicate greater exceedance probabilities of the single sample bacteria objectives than during dry-weather. The Santa Monica Bay Beaches Bacteria TMDL identified the critical condition within wet weather more specifically, in order to set the allowable number of exceedances of the single sample limit days. The 90th percentile storm year in terms of wet days was used as the reference year. The 90th percentile year was selected for several reasons. First, selecting the 90th percentile year avoids an untenable situation where the reference system is frequently out of compliance. Second, selecting the 90th percentile year allows responsible jurisdictions and responsible agencies to plan for a 'worst-case scenario', as a critical condition is intended to do

Element	Key Findings and Regulatory Provisions
Monitoring	The TMDL effectiveness monitoring program will assess attainment of the allowable exceedances for Ballona Creek, Ballona Estuary, and Sepulveda Channel, and the WLAs for the tributaries. Responsible jurisdictions and responsible agencies shall conduct daily or systematic weekly sampling at a minimum of two locations within Ballona Estuary and Reach 2 of Ballona Creek, at least one location each in Reach 1 of Ballona Creek and Sepulveda Channel, and at the confluence with Centinela Creek and Benedict Canyon Channel, to determine compliance. Similar monitoring at the connecting tide gates of Del Rey Lagoon is also required. Where monitoring locations are located at or close to the boundary of two reaches, data from sampling points will also be used to assess the immediate downstream reach. This will ensure that the downstream reaches, which have more stringent water quality objectives, are adequately protected. If the number of exceedance days is greater than the allowable number of exceedance days in the REC-1 and LREC-1 waters, and/or the frequency of exceedance is greater than 10% in the REC-2 waters, the responsible jurisdictions and/or responsible agencies shall be considered not to be attaining the TMDLs and/or assigned allocations (non-attaining). Responsible jurisdictions or agencies shall not be deemed non-attaining if the investigation described in the paragraph below demonstrates that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If an in-stream location is non-attaining as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling at the existing monitoring location until all single sample events meet bacteria water quality objectives.
Special Studies	Should the jurisdictional agency for Del Rey Lagoon opt for the natural source exclusion, the TMDL requires that a separate bacteria source identification study be conducted to determine its eligibility.. The study should identify all probable sources of bacteria loads, their estimated contributions to the Lagoon, and a determination of the frequency of exceedances of the single sample bacteria objectives caused by the identified natural sources.

Table 7.21.2a: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Final Allowable Exceedance Days by Reach

Time Period	Ballona Estuary, Ballona Creek Reach 2, and Sepulveda Channel *	Ballona Creek Reach 1**
Summer Dry-Weather (April 1 to October 31)	Zero (0) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Winter Dry-Weather (November 1-March 31)	Three (3) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Wet-Weather (days with ≥0.1 inch of rain + 3 days following the rain event)	17*** exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives

* Exceedance days for Ballona Estuary based on REC-1 marine water numeric targets; for Ballona Creek Reach 2 based on LREC-1 freshwater numeric targets; and for Sepulveda Channel, based on fresh water REC-1 numeric targets
**Exceedance frequency for Ballona Creek Reach 1 based on freshwater REC-2 numeric targets
*** In Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.

Table 7.21.2b: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: WLAs and LAs for tributaries to the Impaired Reaches.

Tributary	Point of Application	Water Quality Objectives	Waste Load Allocation (No. exceedance days)
Ballona Creek Reach 1	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Benedict Canyon Channel	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Ballona Creek Reach 2	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Centinela Creek	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Del Rey Lagoon	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3)winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*

*At the confluence with Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.
Sepulveda Channel was not assigned a waste load allocation at its confluence with Reach 2 since the TMDL requires the more stringent REC-1 objectives to be met in this waterbody, which should lead to the attainment of the less stringent LREC-1 objectives of the downstream reach.

Table 7.21.3 Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Significant Dates

Date	**Action**
Responsible Jurisdictions for the Waste Load Allocations	
12 months after the effective date of the TMDL	Responsible jurisdictions and responsible agencies must submit, for Regional Board approval, a comprehensive bacteria water quality monitoring plan for the Ballona Creek Watershed. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of two sampling locations (mid-stream and downstream) in Ballona Estuary, Ballona Creek (Reach 1 and 2), and their tributaries. The draft monitoring report shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once the coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.
$2^{1}/_{2}$ years after the effective date of the TMDL	Responsible jurisdictions and agencies must provide a draft Implementation Plan to the Regional Board outlining how each intends to cooperatively achieve compliance with the dry-weather and wet-weather TMDL Waste Load Allocations. The report shall include implementation methods, an implementation schedule, and proposed milestones. The description of the implementation methods and milestones shall include a technically defensible quantitative linkage to the interim and final waste load allocations (WLAs). The linkage should include target reductions in stormwater runoff and/or fecal indicator bacteria. The plan shall include quantitative estimates of the water quality benefits provided by the proposed structural and non-structural BMPs. Estimates should address reductions in exceedance days, bacteria concentration and loading, and flow in the drain and at each beach compliance monitoring location. As part of the draft plan, responsible agencies must submit results of all special studies and/or Environmental Impact Assessments, designed to determine feasibility of any strategy that requires diversion and/or reduction of Creek flows. If a responsible jurisdiction or agency is requesting a longer schedule for wet-weather compliance based on an integrated approach, the plan must include a clear demonstration that the plan meets the criteria of an IWRA, and a clear demonstration of the need for the proposed schedule. Compliance with the wet-weather allocations shall be as soon as possible but under no circumstances shall it exceed the time frame adopted in the

<table>
<tr><th>Date</th><th>Action</th></tr>
<tr><td></td><td>TMDL for non-integrated approaches or for an integrated approach.

The draft Plan shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.</td></tr>
<tr><td>3 months after receipt of Regional Board comments on the draft plan</td><td>Responsible jurisdictions and agencies submit a Final Implementation Plan to the Regional Board.</td></tr>
<tr><td colspan="2">Responsible agencies for Load Allocations</td></tr>
<tr><td>1 year after the effective date of the TMDL</td><td>Responsible agencies must submit, for Regional Board approval, separate comprehensive bacteria water quality monitoring plans for inputs from Del Rey Lagoon and the Ballona Wetlands to the Ballona Estuary. Each plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of one sampling location at the connecting tide gate(s).

The draft monitoring reports shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once a coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.</td></tr>
<tr><td>3 years after the effective date of the TMDL.</td><td>If the responsible agency for the Del Rey Lagoon intends to pursue a natural source exclusion, it shall submit the results of separate natural source study for the Lagoon to the Executive Officer of the Regional Board. The study shall include a comprehensive assessment of all sources of bacteria loads to the Lagoon and estimates of their individual contributions. In addition, a determination of the number of exceedance days caused by these sources should be made

These studies shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.</td></tr>
<tr><td colspan="2">Responsible Agencies for WLAs and LAs* (*Only if not eligible for natural source exclusion(s)</td></tr>
<tr><td>4 years after the effective date of the TMDL:</td><td>The Regional Board shall reconsider this TMDL to:
(1) Re-assess the allowable winter dry-weather and wet-weather exceedance days based on a re-evaluation of the selected reference watershed and consideration of other reference watersheds that may better represent reaches of Ballona</td></tr>
</table>

Date	Action
	Creek and Estuary, (2) Consider whether the allowable winter dry-weather and wet-weather exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), (3) Re-evaluate the reference year used in the calculation of allowable exceedance days, and (4) Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision. (5) Consider natural source exclusions for bacteria loading from Del Rey Lagoon and the Ballona Wetlands based on results of the source identification study. (6) Re-assess WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
6 years after the effective date of the TMDL:	Achieve compliance with the allowable exceedance days for summer and winter dry-weather as set forth in Table 6-1 and rolling 30-day geometric mean targets.
10 years after effective date of the TMDL or, if an Integrated Water Resources Approach is implemented, up to July 15, 2021.*	Achieve compliance with the allowable exceedance days as set forth in Table 6-1 and rolling 30-day geometric mean targets during wet-weather.

*July 15, 2021 is the final compliance date of the Santa Monica Bay Beaches Bacteria Wet-Weather TMDL.

This page intentionally left blank.

Attachment A to Resolution No. R05-008

Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the Ballona Creek Estuary Toxic Pollutants TMDL

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on July 7, 2005.

Amendments:

Table of Contents
Add:

List of Tables, Figures and Inserts
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries, Section 7-14 (Ballona Creek Estuary Toxic Pollutants TMDL)

This TMDL was adopted by the Regional Water Quality Control Board on July 7, 2005.

This TMDL was approved by:

The State Water Resources Control Board on October 20, 2005.
The Office of Administrative Law on December 9, 2005.
The U.S. Environmental Protection Agency on December 22, 2005.

The following tables include the elements of this TMDL.

Table 7-14.1. Ballona Creek Estuary Toxic Pollutants TMDL: Elements

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Problem Statement</td><td>Ballona Creek and Ballona Creek Estuary (Estuary) is on the Clean Water Act Section 303(d) list of impaired waterbodies for cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs and PAHs in sediments. The following designated beneficial uses are impaired by these toxic pollutants: water contact recreation (REC1); non-contact water recreation (REC2); estuarine habitat (EST); marine habitat (MAR); wildlife habitat (WILD); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); and shellfish harvesting (SHELL).</td></tr>
<tr><td>Numeric Target
(Interpretation of the narrative and numeric water quality objective, used to calculate the allocations)</td><td>Numeric water quality targets are based on the sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration, which are used in evaluating waterbodies within the Los Angeles Region for development of the 303(d) list. The Effects Range-Low (ERLs) guidelines are established as the numeric targets for sediments in Ballona Creek Estuary.

Metal Numeric Targets (mg/kg)
<table>
<tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr>
<tr><td>1.2</td><td>34</td><td>46.7</td><td>1.0</td><td>150</td></tr>
</table>
Organic Numeric Targets (μg/kg)
<table>
<tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr>
<tr><td>0.5</td><td>1.58</td><td>22.7</td><td>4,022</td></tr>
</table>
</td></tr>
<tr><td>Source Analysis</td><td>Urban storm water has been recognized as a substantial source of metals. 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. McPherson et al.[1] estimated that 83% of the cadmium and 86% of the lead were associated with the particle phase in Ballona Creek. Similar to metals, the majority of organic constituents in storm water are associated with particulates, measured concentrations of PAHs, phthalates, and organochlorine compounds in Sepulveda Channel, Centinela Creek, and Ballona Creek found that the majority of these compounds occurred in association with suspended solids. There is toxicity associated with suspended solids in urban runoff discharged from Ballona Creek, as well as with the receiving water sediments. This toxicity is likely attributed to metals and PAHs associated with the suspended sediments.</td></tr>
</table>

[1] McPherson, T.N., S.J. Burian, H.J. Turin, M.K. Stenstrom and I.H. Suffet. 2002. Comparison of Pollutant Loads in Dry and Wet Weather Runoff in a Southern California Urban Watershed. *Water Science and Technology* 45:255-261.

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>Nonpoint sources are not considered a significant source of toxic pollutants in this TMDL. Nonpoint sources are urban runoff from the Ballona Wetland, since this area discharges directly to the Estuary through a tide gate, and direct atmospheric deposition. The Ballona Wetlands cover approximately 460 acres or 0.6% of the watershed, therefore, loading from this source is considered insignificant. Direct atmospheric deposition of metals and PAHs is considered insignificant because the portion of the Ballona Creek watershed covered by water is small, approximately 480 acres or 0.6% of the watershed. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during storm events and delivered to Ballona Creek and its tributaries. The loading of metals associated with indirect atmospheric deposition are accounted for in the storm water runoff.</td></tr>
<tr><td>Loading Capacity</td><td>
TMDLs are developed for cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs and PAHs within the sediments of the Ballona Creek Estuary.
The loading capacity for Ballona Creek Estuary is calculated by multiplying the numeric targets by the average annual deposition of fine sediment, defined as silts (grain size 0.0625 millimeters) and smaller, within the Estuary by the bulk density of the sediment. The average annual fine sediment deposited is 5,004 cubic meters per year (m^3/yr) and the bulk density is 1.42 metric tons per cubic meter (mt/m^3). The TMDL is set equal to the loading capacity.
<table>
<tr><th colspan="5">Metals Loading Capacity (kilograms/year)</th></tr>
<tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr>
<tr><td>8.5</td><td>241.6</td><td>332</td><td>7.1</td><td>1,066</td></tr>
</table>
<table>
<tr><th colspan="4">Organics Loading Capacity (grams/year)</th></tr>
<tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr>
<tr><td>3.55</td><td>11.2</td><td>161</td><td>28,580</td></tr>
</table>
</td></tr>
<tr><td>Load Allocations (for nonpoint sources)</td><td>
Load allocations (LA) are assigned to nonpoint sources for Ballona Creek Estuary. Load allocations are developed for open space and direct atmospheric deposition.
The mass-based load allocation for open space is equal to the percentage of the watershed covered by the Ballona Wetlands (0.6%) multiplied by the total loading capacity.
<table>
<tr><th colspan="5">Metals Load Allocations for Open Space (kg/yr)</th></tr>
<tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr>
<tr><td>0.05</td><td>1.4</td><td>2</td><td>0.04</td><td>6</td></tr>
</table>
<table>
<tr><th colspan="4">Organics Load Allocations for Open Space (g/yr)</th></tr>
<tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr>
<tr><td>0.02</td><td>0.1</td><td>1</td><td>160</td></tr>
</table>
</td></tr>
</table>

Element	Key Findings and Regulatory Provisions

The mass-based load allocation for direct atmospheric deposition is equal to the percentage of the watershed covered by water (0.6%) multiplied by the total loading capacity.

Metals Load Allocations for Direct Atmospheric Deposition (kg/yr)

Cadmium	Copper	Lead	Silver	Zinc
0.05	1.4	2	0.04	6

Organics Load Allocations for Direct Atmospheric Deposition (g/yr)

Chlordane	DDTs	Total PCBs	Total PAHs
0.02	0.1	1	170

***Waste Load Allocations** (for point sources)*

Waste load allocations (WLA) are assigned to point sources for the Ballona Creek watershed. A grouped mass-based waste load allocation is developed for the storm water permittees (Los Angeles County MS4, Caltrans, General Construction and General Industrial) by subtracting the load allocations from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed.

Metals Waste Load Allocations for Storm Water (kg/yr)

Cadmium	Copper	Lead	Silver	Zinc
8.4	238.8	328	7.02	1,054

Organics Waste Load Allocations for Storm Water (g/yr)

Chlordane	DDTs	Total PCBs	Total PAHs
3.51	11	159	28,250

The storm water waste load allocations are apportioned between the MS4 permittees, Caltrans, the general construction and the general industrial storm water permits based on an areal weighting approach.

Metals Storm Water WLAs Apportioned between Permits (kg/yr)

	Cadmium	Copper	Lead	Silver	Zinc
MS4 Permittees	8.0	227.3	312.3	6.69	1003
Caltrans	0.11	3.2	4.4	0.09	14
General Construction	0.23	6.6	9.1	0.20	29
General Industrial	0.06	1.7	2.3	0.05	7

Organics Storm Water WLAs Apportioned between Permits (g/yr)

	Chlordane	DDTs	Total PCBs	Total PAHs
MS4 Permittees	3.34	10.56	152	26,900
Caltrans	0.05	0.15	2	400
General Construction	0.10	0.31	4	800
General Industrial	0.02	0.08	1	200

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td></td><td>
<table>
<tr><th colspan="5">Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)</th></tr>
<tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr>
<tr><td>0.1</td><td>3</td><td>4</td><td>0.1</td><td>13</td></tr>
</table>
<table>
<tr><th colspan="4">Organics per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)</th></tr>
<tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr>
<tr><td>0.04</td><td>0.14</td><td>2</td><td>350</td></tr>
</table>
Concentration-based waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations.
<table>
<tr><th colspan="5">Metals Concentration-based Waste Load Allocations (mg/kg)</th></tr>
<tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr>
<tr><td>1.2</td><td>34</td><td>46.7</td><td>1.0</td><td>150</td></tr>
</table>
<table>
<tr><th colspan="4">Organic Concentration-based Waste Load Allocations (µg/kg)</th></tr>
<tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr>
<tr><td>0.5</td><td>1.58</td><td>22.7</td><td>4,022</td></tr>
</table>
</td></tr>
<tr><td>Margin of Safety</td><td>An implicit margin of safety is applied through the use of the more protective sediment quality guideline values. The ERLs were selected over the higher ERMs as the numeric targets.</td></tr>
<tr><td>Implementation</td><td> The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the State of California Department of Transportation (Caltrans) Storm Water Permit, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement.
The Regional Board shall reconsider this TMDL in six years after the effective date of the TMDL based on additional data obtained from special studies. Table 7-14.2 presents the implementation schedule for the responsible permittees. </td></tr>
</table>

Element	Key Findings and Regulatory Provisions
	Minor NPDES Permits and General Non-Storm Water NPDES Permits: The concentration-based waste load allocations for the minor NPDES permits and general non-storm water NPDES permits will be implemented through NPDES permit limits. Permit writers may translate applicable waste load allocations into effluent limits for the minor and general NPDES permits by applying applicable engineering practices authorized under federal regulations. The minor and general non-storm water NPDES permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations. **General Industrial Storm Water Permit:** The Regional Board will develop a watershed specific general industrial storm water permit to incorporate waste load allocations. Concentration-based permit limits may be set to achieve the mass-based waste load allocations. These concentration-based limits would be equal to the concentration-based waste load allocations assigned to the other NPDES permits. It is expected that permit writers will translate the waste load allocations into BMPs, based on BMP performance data. However, the permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. The general industrial storm water permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations. **General Construction Storm Water Permit:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed specific general construction storm water permit developed by the Regional Board. Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs. All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations.

Attachment A to Resolution No. R05-008

Element	Key Findings and Regulatory Provisions
	MS4 and Caltrans Storm Water Permits: The County of Los Angeles, City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood are jointly responsible for meeting the mass-based waste load allocations for the MS4 permittees. Caltrans is responsible for meeting their mass-based waste load allocations, however, they may choose to work with the MS4 permittees. The primary jurisdiction for the Ballona Creek watershed is the City of Los Angeles. Each municipality and permittee will be required to meet the waste load allocations at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the numeric waste load allocations. We expect that reductions to be achieved by each BMP will be documented and that sufficient monitoring will be put in place to verify that the desired reductions are achieved. The permits should also provide a mechanism to adjust the required BMPs as necessary to ensure their adequate performance. The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach, with compliance to be achieved in prescribed percentages of the watershed, with total compliance to be achieved within 15 years.
Seasonal Variations and Critical Conditions	There is a high degree of inter- and intra-annual variability in sediments deposited at the mouth of Ballona Creek. This is a function of the storms, which are highly variable between years. Studies by the Army Corps of Engineers have shown that sediment delivery to Ballona Creek is related to the size of the storm (USACE, 2003). The TMDL is based on a long-term average deposition patterns over a 10-year period from 1991 to 2001. This time period contains a wide range of storm conditions and flows in the Ballona Creek watershed. Use of the average condition for the TMDL is appropriate because issues of sediment effects on benthic communities and potential for bioaccumulation to higher trophic levels occurs over long time periods.
Monitoring	Effective monitoring will be required to assess the condition of Ballona Creek and Estuary and to assess the on-going effectiveness of efforts by dischargers to reduce toxic pollutants loading to the Ballona Creek Estuary. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer.

Element	Key Findings and Regulatory Provisions
	Ambient Monitoring An ambient monitoring program is necessary to assess water quality throughout Ballona Creek and its tributaries and to assess the progress being made to remove the toxic pollutant impairments in Ballona Creek Estuary sediments. Data on background water quality for organics and sediments will help refine the numeric targets and waste load allocations and assist in the effective placement of BMPs. In addition, fish and mussel tissue data is required in Ballona Creek Estuary to confirm the fish tissue listings. Water quality samples shall be collected from Ballona Creek and Estuary monthly and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs and total PAHs at detection limits that are at or below the minimum levels until the TMDL is reconsidered in the sixth year. The minimum levels are those published by the State Water Resources Control Board in Appendix 4 of the Policy for the Implementation of Toxic Standards for Inland Surface Water, Enclosed Bays, and Estuaries of California, March 2, 2000. Special emphasis should be placed on achieving detection limits that will allow evaluation relative to the CTR standards. If these can not be achieved with conventional techniques, then a special study should be proposed to evaluate concentrations of organics. Storm water monitoring conducted as part of the MS4 storm water monitoring program should continue to provide assessment of water quality during wet-weather conditions and loading estimates from the watershed to the Estuary. If analysis of chlordane, dieldrin, DDT, total PCBs or total PAHs are not currently part of the sampling programs these organics should be added. In addition, special emphasis should be placed on achieving lower detection limits for DDTs, PCBs and PAHs. The MS4 and Caltrans storm water permittees are jointly responsible for conducting bioaccumulation testing of fish and mussel tissue within the Estuary. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to confirm the 303(d) listing or delisting, as applicable. Representative sediment sampling locations shall be randomly selected within the Estuary and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs and total PAHs at detection limits that are lower than the ERLs. Sediment samples shall also be analyzed for total organic carbon, grain size and sediment toxicity testing. Initial sediment monitoring should be done quarterly in the first year of the TMDL to define the baseline and semi-annually, thereafter, to evaluate effectiveness of the BMPs until the TMDL is reconsidered in the sixth year. The sediment toxicity testing shall include testing of multiple species, a minimum of three, for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test; the sea

Attachment A to Resolution No. R05-008

Element	Key Findings and Regulatory Provisions
	urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/water interface. The chronic 28-day and shorter-term 10-day amphipod tests may be conducted in the initial year of quarterly testing and the results compared. If there is no significant difference in the tests, then the less expensive 10-day test can be used throughout the rest of the monitoring, with some periodic 28-day testing. **TMDL Effectiveness Monitoring** The water quality samples collected during wet weather as part of the MS4 storm water monitoring program shall be analyzed for total dissolved solids, settable solids and total suspended solids if not already part of the existing sampling program. Sampling shall be designed to collect sufficient volumes of settable and suspended solids to allow for analysis of cadmium, copper, lead, silver, zinc, chlordane, dieldrin, total DDT, total PCBs, total PAHs, and total organic carbon in the bulk sediment. Semi-annually, representative sediment sampling locations shall be randomly selected within the Estuary and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs, and total PAHs at detection limits that are lower than the ERLs. The sediment samples shall also be analyzed for total organic carbon, grain size and sediment toxicity. The sediment toxicity testing shall include testing of multiple species, a minimum of three, for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test; the sea urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/water interface. Toxicity shall be indicated by an amphipod survival rate of 70% or less in a single test. Accelerated monitoring shall be conducted to confirm toxicity at stations identified as toxic. Accelerated monitoring shall consist of six additional tests, approximately every two weeks, over a 12-week period. If the results of any two of the six accelerated tests are less than 90% survival, then the MS4 and Caltrans permittees shall conduct a Toxicity Identification Evaluation (TIE). The TIE shall include reasonable steps to identify the sources of toxicity and steps to reduce the toxicity. The Phase I TIE shall include the following treatments and corresponding blanks: baseline toxicity; particle removal by centrifugation; solid phase extraction of the centrifuged sample using C8, C18, or another media; complexation of metals using ethylenediaminetetraacetic acid (EDTA) addition to the raw sample; neutralization of oxidants/metals using sodium thiosulfate addition to the raw sample; and inhibition of organo-phosphate (OP) pesticide activation using piperonyl butoxide addition to the raw sample (crustacean toxicity tests only).

Element	Key Findings and Regulatory Provisions
	Bioaccumulation monitoring of fish and mussel tissue within the Estuary shall be conducted. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to assess the effectiveness of the TMDL. The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general industrial permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities within their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in contaminate loads to the MS4 system. **Special Studies** Special studies are recommended to refine source assessments, to provide better estimates of loading capacity, and to optimize implementation efforts. The Regional Board will re-consider the TMDL in the sixth year after the effective date in light of the findings of these studies. Special studies may include: • Evaluation and use of low detection level techniques to evaluate water quality concentrations for those contaminants where standard detection limits cannot be used to assess compliance for CTR standards or are not sufficient for estimating source loadings from tributaries and storm water. • Developing and implementing a monitoring program to collection the data necessary to apply a multiple lines of evidence approach. • Evaluation and use of sediment TIEs to evaluate causes of any recurring sediment toxicity. • Evaluate partitioning coefficients between water column and sediment to assess the contribution of water column discharges to sediment concentrations in the Estuary. • Studies to refine relationship between pollutants and suspended solids aimed at better understanding of the delivery of pollutants to the watershed. • Studies to understand transport of sediments to the estuary, including the relationship between storm flows, sediment loadings to the estuary, and sediment deposition patterns within the estuary. • Studies to evaluate effectiveness of BMPs to address pollutants and/or sediments.

Attachment A to Resolution No. R05-008

Table 7-14.2. Ballona Creek Estuary Toxic Pollutants TMDL: Implementation Schedule

Date	Action
Effective date of the TMDL	Regional Board permit writers shall incorporate the waste load allocations for sediment into the NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal or re-opener.
Within 6 months after the effective date of the State Board adopted sediment quality objectives and implementation policy	The Regional Board will re-assess the numeric targets and waste load allocations for consistency with the State Board adopted sediment quality objectives.
5 years after effective date of the TMDL	Responsible jurisdictions and agencies shall provide to the Regional Board result of any special studies.
6 years after effective date of the TMDL	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
MINOR NPDES PERMITS AND GENERAL NON-STORM WATER NPDES PERMITS	
7 years after effective date of the TMDL	The non-storm water NPDES permits shall achieve the concentration-based waste load allocations for sediment per provisions allowed for in NPDES permits.
GENERAL INDUSTRIAL STORM WATER PERMIT	
7 years after effective date of the TMDL	The general industrial storm water permits shall achieve the mass-based waste load allocations for sediment per provisions allowed for in NPDES permits. Permits shall allow an iterative BMP process including BMP effectiveness monitoring to achieve compliance with permit requirements.
GENERAL CONSTRUCTION STORM WATER PERMIT	
7 years from the effective date of the TMDL	The construction industry will submit the results of the BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
8 years from the effective date of the TMDL	The Regional Board will consider results of the BMP effectiveness studies and consider approval of BMPs no later than six years from the effective date of the TMDL.
9 years from the effective date of the TMDL	All general construction storm water permittees shall implement Regional Board-approved BMPs.

Attachment A to Resolution No. R05-008

Date	Action
MS4 AND CALTRANS STORM WATER PERMITS	
12 months after the effective date of the TMDL	In response to an order issued by the Executive Officer, the MS4 and Caltrans storm water NPDES permittees must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both ambient monitoring and TMDL effectiveness monitoring. Once the coordinated monitoring plan is approved by the Executive Officer, ambient monitoring shall commence within 6 months.
5 years after effective date of TMDL (Draft Report) 5 ½ years after effective date of TMDL (Final Report)	The MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining how they will achieve the waste load allocations for sediment to Ballona Creek Estuary. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan.
7 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 25% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
9 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
11 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
15 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.

WATER QUALITY COMPLIANCE MASTER PLAN FOR URBAN RUNOFF

CLEAN STORMWATER / URBAN RUNOFF MASTER PLAN

Watershed Protection Division
Bureau of Sanitation
Department of Public Works

City of Los Angeles

May 2009

Contents

List of Tables

List of Figures

Appendices

(this page is purposely left blank)

Acknowledgments

Council Districts		
Jill Sourial / *CD1* Claire Bartels, Jennifer Cohen/*CD2* Cliff Ruff / *CD3* Renee Weitzer / *CD4* Paul Backstrom / *CD5* Macaria Flores / *CD6*	Saeed Ali / *CD7* Bernard C. Parks, Jr. / *CD8* Jeff Catalano, Kiran Hashmi / *CD9* Charmette Bonpua / *CD10* Alex Fay / *CD11* Mitch Englander / *CD12*	Sam Siegel / *CD13* Peter Hidalgo / *CD14* Eric Moody / *CD15*
Board of Public Works		
Cynthia Ruiz *(President)* Valerie Lynne Shaw (*Vice President)*	Paula Daniels *(Commissioner)* Ernesto Cardenas *(Commissioner)* Julie Gutman *(Commissioner)*	
Bureau of Sanitation Executives		
Enrique Zaldivar *(Director)* Rita Robinson *(Past Director)* Traci Minamide *(Ch. Exec. Officer)*	Adel Hagekhalil *(Asst. Director)* Varouj Abkian *(Asst. Director)* Alex Helou *(Asst. Director)*	
Project Management Committee		
Michael Mullin / *Mayor's Office* Jill Sourial / *CD1* Alex Fay / *CD11*	Paula Daniels / *BPW* Rafael Prieto / *Office of the CLA* Charles Modica / *Office of the CLA*	Shahram Kharaghani / *BOS* Reza Iranpour / *BOS* Hubertus Cox / *BOS*
Project Team		
Reza Iranpour / *BOS* Hubertus Cox / *BOS* Kenneth Weston / *BOS*	Hampik Dekermenjian / *CDM* Richard Meyerhoff / *CDM* Jennifer Gronberg / *CDM*	Ken Susilo / *Geosyntec*
Contributors		
Joyce Amaro / *BOS* Jon Ball / *BOS* Sheila Brice / *BOS* David Cheng / *FMD* Deborah Deets / *BOS* Vijay Desai / *BOS* Roulene Diego / *BOS* Wendy Dinh / *BOS* Ammar Eltawil / *BOS* Nasir Emami / *BOS* Mo English / *BOS* Oscar Figueroa / *BOS*	Alice Gong / *BOS* Chris Harris / *Harris & Co.* Darren Hartwich / *CDM* Thu-Van Ho / *BOS* Azya Jackson / *BOS* Kosta Kaporis / *BOS* Alfredo Magallanes / *BOS* Shokoufe Marashi / *BOS* Vivian Marquez / *BOS* Ida Meisami-Fard / *BOS* Sofia Mohaghegh / *BOS* Steven Nikaido / *BOS*	Majid Sadeghi / *BOS* Michael Scaduto / *BOS* Morad Sedrak / *BOS* Hamid Tadayon / *BOS* Ryan Thiha / *BOS* Peter Tonthat / *BOS* Donna Toy-Chen / *BOS* Alexander Vasquez / *BOS* Robert Vega / *BOS* Amy Wade / *CDM* Penny Weiand / *BOS*

Stakeholder Advisory Committee

Mark Abramson / *SM BayKeeper*
Mario Acevedo / *DWP*
James Alamillo / *Heal the Bay*
Ginachi Amah / *LARWQCB*
Rodney Anderson / *Burbank*
Carol Armstrong / *BOE*
David Attaway / *Dept Rec & Parks*
Dede Audet / *Grassroots Venice Neighborhood Council*
Soe Aung / *LAUSD*
Talal Balaa / *LAUSD*
Vik Bapna / *LA County, DPW*
Polly Barrowman / *Heal the Bay*
Melinda Bartlett / *DEA*
Jay Brakensiek / *LAUSD*
Edward Belden / *LA & San Gabriel Rivers Watershed Council*
Jeff Beller / *BOS*
Edith Ben-Horin / *TreePeople*
Hector Bordas / *LA County DPW*
Carlos Borja / *LA County Dept of Health*
Claire Bowin / *Dept of City Planning*
Jonathan Brooks / *Friends of LA River*
Erika Bustamante / *City of Inglewood*
Carlos Carreon / *SM Baykeeper*
Luis Castillo / *DWP*
Leslie Chan / *MRCA*
Vincent Chee / *City of Beverly Hills*
Kathryn Curtis / *Harbor Dept*
Tim Dafeta / *BOS*
Glen Dake / *LA Community Garden Council*
Mike D’Annucci / *Malcolm Pirnie*
Gus Dembegiotes / *BOS*
Josette Descalzo / *City of Beverly Hills*
Joyce Dillard
Mas Dojiri / *BOS*
Susan Early / *California Dept Public Health*
Rebecca Drayse / *TreePeople*

Steve Fan / BOS
Tracy Egoscue / *LARWQCB*
Farsheed Farhang / *BOS*
Tom Ford / *SM Baykeeper*
Rex Frankel / *Ballona Ecosystem Education Project*
Ken Fredrick / *MRCA*
Nidia Garcia / *North East Trees*
Joe Geever / *Surfrider Foundation*
Angela George / *LA County DPW*
Mark Gold / *Heal the Bay*
Laura Grant / *PCCI, POLA*
Neil Guglielmo / *BOS*
Jessica Hall / *Ballona Creek Watershed Task Force*
Mark Hanna / *DWP*
Tim Haug / *BOE*
Paul Herzog / *Surfrider Foundation*
Ken Hoffman / *LA County Sanitation Districts*
Neelakshi Hudda / *LARWQCB*
Kirsten James / *Heal the Bay*
Liz Jennings / *River Center*
Beth Jines / *DEA*
Andrew Jirik / *Harbor Dept*
Sheila Kennedy / *Pasadena*
Jim Lamm / *Ballona Creek Renaissance*
Stephanie Landregan / *SMMC, MRCA*
Hugh Lee / *BSS*
Albert Leung / *LAUSD*
Joe Linton / *Livable Places*
Andy Lipkis / *TreePeople*
Shelley Luce / *SMBRC*
Mark Mackowski / *Upper LA River Area, Water Master Support*
Jim Marchese / *BOS*
Meredith McCarthy / *Heal the Bay*
Kathleen McGowan / *City of Hermosa Beach*
Gerald McGowen / *BOS*
Sommvang Meksavanh / *LAWA*
John Moore / *BOS*
Hiddo Netto / *BOS*

Jenny Newman / *LARWQCB*
L.B. Nye / *LARWQCB*
Maurice Oillataguerre / *Glendale*
Lance Oishi / *BSS*
Kendrick Okuda / *BOE*
Mi-Hyun Park / *UCLA*
Jason Pereira / *LA County DPW*
Craig Perkins / *City of SM*
Kevin Powers / *Hidden Hills*
Dana Prevost / *Building & Safety*
Charlynn Rachell / *LAX*
Salvador Ramirez / *City of Irwindale*
Barbara Romero / *MRCA*
Diego Rosso / *UCI*
Katherine Rubin / *DWP*
Laura Saltzman / *MRCA*
Susie Santilena / *Heal the Bay*
Neal Shapiro / *City of SM*
Michael Shay / *City of Redondo Beach*
Susan Shu / *BOE*
Michael Shull / *Dept of Rec. & Park*
Youn Sim / *LA County DPW*
Nancy Steele / *Los Angeles & San Gabriel Rivers Watershed Council*
Eric Stein / *SCCWRP*
Nathan Stevenson / *LA County DPW*
Michael Stenstrom / *UCLA*
Xavier Swamikannu / *LARWQCB*
Stephanie Taylor / *Green LA*
Mitzi Taggart / *Heal the Bay*
Ray Tahir / *City of Irwindale*
Tom Tait / *City of Arcadia*
Paul Teensma / *DEA*
Jeanette Vosburg / *Ballona Network*
Dan Wall / *City of San Fernando*
Ying Wang / *LAUSD*
Deborah Weinstein / *TreePeople*
Melanie Winter / *The River Project*
Robert Wu / *CALTRANS*
Clayton Yoshida / *DWP*

Acronyms

A

AQUA	Aquaculture (beneficial use)
ARG	Agricultural Supply (beneficial use)

B

BOD	Biological Oxygen Demand
BC	Ballona Creek
BCR	Ballona Creek Renaissance
BCWTF	Ballona Creek Watershed Task Force
BES	Bureau of Environmental Services, Portland, Oregon
BIOL	Preservation of Biological Habitats (beneficial use)
BMP	Best Management Practice
BOS	Bureau of Sanitation, City of Los Angeles
BOSS	Bureau of Street Services, City of Los Angeles

C

CAD	Computer-Aided Design
CaSIL	California Spatial Information Library
CASQA	California Stormwater Quality Association
cf/ac-yr	cubic-foot per acre-year
CBI	Clean Beaches Initiative
CCI	Community Conservancy International
CCWMP	Compton Creek Watershed Management Plan
CDD	Community Development Department, City of Los Angeles
CDS	Continuous Deflection Separator
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CLEAN	Cleanup Loans and Environmental Assistance to Neighbors
CMP	Coordinated Monitoring Plan
COD	Chemical Oxygen Demand
COG	Council of Government
COLD	Cold Freshwater Habitat (beneficial use)
COMM	Commercial and Sport Fishing (beneficial use)
CPI	Catchment Priority Index (Los Angeles County BMP Prioritization Model)
CRA	Community Redevelopment Agency, City of Los Angeles

CREST	Cleaner River through Effective Stakeholder TMDLs
CSMP	Coordinated Shoreline Monitoring Plan
CSO	Combined Sewer Overflow
CWA	Clean Water Act

D

DA	Drainage Area
DDC	Department of Design and Construction, City of New York
DDT	Dichloro-Diphenyls Trichloroethylene
DHS	Department of Health Services
DOT	Department of Transportation
DPD	Department of Planning and Development, City of Seattle
DPH	Department of Public Health, Los Angeles County
DW	Dry Weather
DWAC	Dominguez Watershed Advisory Council
DWMMP	Dominguez Watershed Management Master Plan
DWP	Department of Water and Power, City of Los Angeles

E

EAD	Environmental Affairs Department, City of Los Angeles
EC	*Escherichia coli* (*E. coli*)
ECA	Environmentally Critical Areas, City of Seattle
ED	Effective Date
EDG	Economy Development Group, Los Angeles Department of Water and Power
EDU	Equivalent Dwelling Unit
EPA	Environmental Protection Agency
ES	Executive Summary
ESRI	Environmental Systems Research Institute
EST	Estuarine Habitat (beneficial use)

F

FC	Fecal Coliform
FOG	Fats, Oils and Grease
FUSRAP	Formerly Utilized Sites Remedial Action Program
FRSH	Freshwater Replenishment (beneficial use)
FWY	Freeway

G

GIS	Geographic Information System

GIASP	General Industrial Activity Stormwater Program
g/ha/day	gallons per hectare per day
GWR	Ground Water Recharge (beneficial use)

H

HJTA	Howard Jarvis Taxpayers Association
HLSS	High-Level Storm Sewer, City of New York

I

ID	Identification
ICB	Inner Cabrillo Beach
IND	Industrial Service Supply (beneficial use)
IPWP	Integrated Plan for Wastewater Program
IRWMP	Integrated Regional Water Management Plan
IRP	Integrated Resource Program

J

J2	Jurisdiction 2 of Santa Monica Bay Watershed (north of Santa Monica and south of Marina del Rey)
J3	Jurisdiction 3 of Santa Monica Bay Watershed (near City of Santa Monica)
J7	Jurisdiction 7 of Santa Monica Bay Watershed (near Palos Verdes Peninsula)
JPA	Joint Power Authority

K

kg	kilogram

L

LACDPW	Los Angeles City Department of Public Works
LACGC	Los Angeles Community Garden Council
LANLT	Los Angeles Neighborhood Land Trust
LAR	Los Angeles River
LARRMP	Los Angeles River Revitalization Master Plan
LARWQCB	Los Angeles Regional Water Quality Control Board
LAUSD	Los Angeles Unified School District
LAWA	Los Angeles World Airports
LEED	Leadership in Engineering and Environmental Design
LFD	Low Flow Diversion
LID	Low Impact Development
LREC-1	Limited Water Contact Recreation (beneficial use)

M

MAR	Marine Habitat (beneficial use)
mgd	million gallons per day
MIRG	Migration of Aquatic Organisms (beneficial use)
MOU	Memorandum of Understanding
mg/kg	milligram per kilogram
mg/l	milligram per liter
MPN/100ml	Most Probable Number per 100 milliliter
MRCA	Mountain Recreation and Conservancy Authority
MS4	Municipal Separate Storm Sewer System
MSC	Main Ship Channel

N

NAV	Navigation (beneficial use)
NELA/OS	North East Los Angeles Open Space Coalition
NPDES	National Pollutant Discharge Elimination System
NRDC	National Resources Defense Council
NURP	National Urban Runoff Pollution
NTU	Nephelometric Turbidity Unit

O

OAL	Office of Administration Law
O&G	Oil and Grease
OCP	Overflow Control Program, Kansas City
OSD	Office of Sustainable Design, City of New York or Office of Sustainable Development, City of Portland

P

PAHs	Polycyclic Aromatic Hydrocarbons
PCA	Porter-Cologne Act
PCBs	Polychlorinated Biphenyls
PDC	Portland Development Council
POTW	Public Owned Treatment Works
PIE	Public Involvement Education, City of Santa Monica
PIPP	Public Information and Participation Programs
POW	Hydropower Generation (beneficial use)
PROC	Industrial Process Supply (beneficial use)

R

RARE	Rare, Threatened, or Endangered Species (beneficial use)

REC-1	Water Contact Recreation (beneficial use)
REC-2	Non-Contact Water Recreation (beneficial use)
RMC	River Mountain Conservancy
RIO	River Improvement Overlay
ROW	Right-of-Way

S

SAL	Inland Saline Water Habitat (beneficial use)
SCA	State Constitution Amendment
SCP	Sustainable City Plan
SCCWRP	Southern California Costal Water Research Project
SMB	Santa Monica Bay
SCAG	Southern California Agencies of Government
SCAQMD	South Coast Air Quality Management District
SHELL	Shellfish Harvesting (beneficial use)
SIC	Standard Industrial Classification Code
SMBRP	Santa Monica Bay Restoration Project
SMURRF	Santa Monica Urban Runoff Recycling Facility
SPAC	Stormwater Pollution Abatement Charge
SPAF	Stormwater Pollution Abatement Fund
SPI	Subwatershed Prioritization Index
SPWN	Spawning, Reproduction, and/or Early Development (beneficial use)
SRF	State Revolving Fund
SRPC	Strafford Regional Planning Commission
SSMC	Santa Monica Mountain Conservancy
SSO	Sanitary Sewer Overflow
SUSMP	Standard Urban Stormwater Mitigation Plan
SWRCB	State Water Resources Control Board

T

TC	Total Coliforms
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
TNT	Teens for Neighborhood Trees, City of New York
TSS	Total Suspended Solids

U

µg/l	microgram per liter
UCLA	University of California at Los Angeles

UCCE	University of California Cooperative Extension

W

WARM	Warm Freshwater Habitat (beneficial use)
WDR	Waste Discharge Requirements
WERF	Water Environment Research Foundation
WET	Wetland Habitat (beneficial use)
WILD	Wildlife Habitat (beneficial use)
WLA	Wasteload Allocation
WPD	Watershed Protection Division, City of Los Angeles
WRP	Wastewater Reclamation Plant
WQ	Water Quality
WQCMPUR	Water Quality Compliance Master Plan for Urban Runoff
WW	Wet Weather

Definitions

303(d) list	List of "water quality limited segments" (water bodies) that require TMDLs to satisfy section 303(d) of the Clean Water Act.

A

Aldrin	Compound belonging to the group of organochlorine insecticides.
Anthropogenic	Caused by human activity (as opposed to caused by nature).

B

BMP	Activity or measure for reducing the amount of pollutants entering a receiving water body from urban runoff, or a method that has been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.
BOD	Laboratory measurement of the amount of oxygen required by bacteria to consume organic chemicals in water (Biological Oxygen Demand). A high BOD usually results in a water body deficient in oxygen and not being able to support higher life forms.
Biofiltration	Simultaneous process of filtration, infiltration, adsorption and biological uptake of pollutants that takes place when stormwater flows over and through vegetated areas.
Bioremediation	Use of living organisms (typically bacteria) to clean up oil spills or remove other pollutants from soil, water, or wastewater.
Bioretention	Stormwater management practice that utilizes shallow storage, landscaping and soils to control and treat stormwater by collecting it in shallow depressions before filtering it through a fabricated planting soil media.
Biosolids	Term used by the water treatment industry which refers to treated sludge.

C

Catch basins	Storm drain inlet or curb inlet to the storm drain system that typically includes a grate or curb inlet where stormwater enters the catch basin and a sump to capture sediment and debris.
Chaparral	Shrubland or heathland plant community found primarily in California.

ChemA	Term referring to the group of the following chemicals: Aldrin, Dieldrin, Chlordane, Endrin, Heptachlor, Heptachlor Epoxide, HCH, Endosulfan, and Toxaphene.
Cistern	Reservoir, tank, or container used for storing stormwater in order to enable its use for irrigation.
Coliform bacteria	Class of bacteria that are commonly used as indicator of likely presence of pathogenic organisms.
Composting	Controlled biological decomposition of organic material in the presence of air to form humus-like material.
Constructed wetlands	Wetland that is created on a site that previously was not a wetland, specifically to remove pollutants from stormwater.

D

Debt financing	Raising money for working capital or capital expenditures by selling bonds, bills, or notes to individual and/or institutional investors. In return for lending the money, the individuals or institutions become creditors and receive a promise to repay principal with interest on the debt.
Detention	Temporary storage of stormwater runoff with the goals of controlling peak discharge rates and providing gravity settling of pollutants.
Disinfection	Process in which objectionable microorganisms are killed.

E

Effluent	Discharge of water from a natural body of water, or from a man-made structure.
Enteric	Of intestinal origin, especially applied to wastes or bacteria.
Estuary	Semi-enclosed coastal body of water with one or more rivers or streams flowing into it, and with a free connection to the open sea.
Eutrophication	Increase in chemical nutrients—typically compounds containing nitrogen and phosphorus—in an ecosystem resulting in high primary productivity.
Enterococcus	Group of bacteria used as indicators of water quality for the safety of public beaches.

G

GIS	Tool that links spatial features commonly seen on maps with information from various sources ranging from demographics to pollutant sources.

Greenway	Policy or land use designation in land-use planning to retain areas of largely undeveloped, wild, or agricultural land surrounding or neighboring urban areas.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations.

H

Habitat	Particular kind of environment inhabited by certain species.
Heavy metals	Metallic elements with relatively high atomic weights (e.g. mercury, chromium, cadmium, arsenic, and lead); can damage living organisms at low concentrations and tend to accumulate in the food chain.
Hydrocarbons	Organic compound consisting entirely of hydrogen and carbon.
Hydrodynamic separator	Engineered structure which separates sediments and oils from stormwater by gravitational separation and/or hydraulic flow.
Hydrograph	Plot of the discharge of a river as a function of time. In surface water hydrology, a hydrograph is a time record of the discharge of a stream, river or watershed outlet.

I

Impaired water body	Water body that does not meet the criteria that supports its designated use.
Impervious structures	Structures, such as pavement and building roofs, which replace natural landscape and prevent stormwater infiltration.
Infiltration	Penetration of water through the ground surface into sub-surface soil.
Institutional BMP	Any urban runoff management activity that reduces the generation of pollutants at the source and that does not require engineering and/or construction. Sometimes also referred to as nonstructural or source-control BMPs.

L

Lagoons	Body of comparatively shallow salt or brackish water separated from the deeper sea by a shallow or exposed sandbank, coral reef, or similar feature.
Legacy toxics	Toxic or hazardous chemicals or residues such as pesticides (DDT for example) and PCBs that are no longer used or their manufacture has been banned but are still present in the environment. They are often found in sediments.
Load allocation	Portion of a receiving water's TMDL that is attributed to one of its existing or future nonpoint sources of pollution or to natural background sources (EPA).

M

MS4	Municipal Separate Storm Sewer System for collection of urban runoff, which in the City of Los Angeles is separated from the sewers for collecting sewage.

N

NPDES	National Pollutant Discharge Elimination System. A provision of the Clean Water Act that prohibits the discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.
Nonpoint source	Diffuse pollution source or a source without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by stormwater. Common nonpoint sources are agriculture, forestry, urban areas, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.
Nonstructural BMP	See institutional BMP.
Non-vegetative BMP	Structural BMP that prevents or reduces pollutants and runoff without utilizing vegetation such as grass, shrubs, and trees.
Nutrient	Chemical compound, usually containing nitrogen or phosphorus, that stimulates plant growth.

O

Open area	Any area that can be used for implementing BMPs without eliminating the primary use. Open area includes open space, privately owned undeveloped land, parks, parking lots, playgrounds and schoolyards.
Open space	Essentially unimproved land (natural areas) as defined in the California Government Code Section 65560 (b).
Organic compound	Substance containing mainly carbon, hydrogen, nitrogen, and oxygen.
Organochlorine pesticides	Organic pesticides containing chlorine, such as DDT, most of which are now banned.

P

PAHs	Polyaromatic hydrocarbons: class of hydrocarbons typically produced by incomplete combustion of organic materials.
PCBs	Polychlorinated biphenyls: group of toxic, persistent chemicals used in electrical transformers and capacitors for insulating purposes, and in gas pipeline systems as lubricant. The sale and new use of PCBs were banned by law in 1979.

pH	Measure of the acidity (pH less than 7) or alkalinity (pH greater than 7) of a solution.
Pathogens	Microorganisms (e.g., bacteria, viruses, or parasites) that can cause disease in humans, animals and plants.
Percolation	Movement and filtering of fluids through porous materials.
Point source	Stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution, such as a pipe, ditch, ship, ore pit, or factory smokestack.
Pollutant	Contaminant in a concentration or amount that adversely alters the physical, chemical, or biological properties of the natural environment.
Pollutant load	Amount of pollutants entering a water body. Loads are usually expressed in terms of a weight and a time frame, such as pounds per day (lb/d).

R

Receiving waters	Creeks, streams, rivers, lakes, estuaries and other bodies of water into which urban runoff flows.
Reclamation plant	Plant in which raw sewage is treated physically, chemically, and biologically, to become reusable water.
River reach	Section of the river, often between designated tributaries, that has similar characteristics such as geometry, physical, and width.
Runoff	A term used to describe the flow of water, from rain, snowmelt, or other sources, over the land surface, and is a major component of the water cycle.

S

SSO	Sanitary Sewer Overflow: an occasional unintentional discharge of raw sewage from a municipal sanitary sewer.
Sand filter	Device that filters storm water runoff through a sand layer into an underdrain system that conveys the treated runoff to a detention facility or to the ultimate point of discharge.
Sediments	Product of erosion processes, usually small organic and inorganic particles that are transported by flowing water and ultimately settle the bottom.
Semi-arid	Climatic regions that receive low annual rainfall (250-500 mm or 10-20 in).
Septic tank	Underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank.

Solid waste	Waste type that includes predominately household or domestic waste with sometimes the addition of commercial wastes collected by a municipality.
Source control BMP	See institutional BMP.
Stakeholder	Individual or organization that has an interest in the outcome of the watershed plan.
Stormwater	Urban runoff generated by rainfall that does not seep into the earth and flows overland to flowing or open bodies of water.
Stressor	Any physical, chemical or biological entity that can induce an adverse response. Stressors cause impairments of water bodies.
Structural BMP	Any urban runoff management practice that requires construction, installation, and maintenance (as opposed to institutional BMPs).
Sub-watershed	Smaller basin of a larger drainage area that all drains to a central point of the larger watershed.

T

TMDL	Total Maximum Daily Load: sum of the individual wasteload allocations and load allocations. A margin of safety is included with the two types of allocations so that any additional loading, regardless of source, would not produce a violation of water quality standards (EPA).
TSS	Total Suspended Solids: small solid particles that remain in suspension in water as a colloid due to the motion of the water.
Thermal desorption	Process of heating soil anywhere between 200 and 1000°F in order to vaporize contaminants with low boiling points. The vaporized contaminants are collected and treated.
Toxicity	Degree to which something is able to produce illness or damage to an exposed organism.
Treatment control	Structural BMP that focuses on removing pollutants from BMP urban runoff.
Tributary	Stream or river which flows into a main stem (or parent) river, and which does not flow directly into a sea.

U

Urban runoff	Water from city streets and adjacent residential or commercial properties that can transport a range of pollutants. In the dry season, the bulk of the flow is from anthropogenic sources. During wet weather, the flow includes storm generated runoff (stormwater) which can be at much higher volumetric rates.

V

Vegetative BMP	Structural BMP that reduces pollutants and/or the volume of urban runoff by utilizing vegetation such as ornamental grass, shrubs, and trees. An example is a "vegetative swale" designed to intercept and convey surface stormwater runoff, promote infiltration, interception of sediment by the vegetation and provide a landscape feature in urban areas.

W

WLA	Waste load allocation: the portion of receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution (EPA).
Watershed	All the land that drains downslope to a common lowest point.
Water quality standards	Standards that set the goals, pollution limits, and protection requirements for each water body. These standards are composed of designated (beneficial) uses, numeric and narrative criteria, and anti-degradation policies and procedures.
Watershed plan	Document that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to development and implementation of the plan.
Wet season	Period in which rainfall occurs, in Southern California from November 1st to March 31st.

Preface

Council Motion

On March 2, 2007, Council members Ed Reyes (CD 1) and Bill Rosendahl (CD 11) introduced Council Motion 07-0663 (***Appendix 1-1***) to develop a water quality master plan with strategic directions for planning, budgeting and funding to reduce pollution from urban runoff in the City of Los Angeles. The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) was developed by the Bureau of Sanitation, Watershed Protection Division in collaboration with the stakeholders to address the requirements of the Council Motion.

Water Quality Standards

The City's beaches, lakes, rivers and harbors are major elements of what makes living in or visiting the City of Los Angeles a great experience. The City is under a legal mandate, through the Clean Water Act, to ensure that its waters meet water quality standards. It is important that urban runoff management becomes a critical element in all of the City's planning, development and redevelopment through an integrated and citywide approach for improving and protecting the quality of the City's waters. Since the City's waters are parts of larger watersheds, it is equally important to work together with neighboring cities.

Environmental Responsibility

In May 2007, Mayor Villaraigosa released Green LA, an action plan to reduce greenhouse gas emissions, and create a more sustainable environment. Likewise, the City Council has adopted several motions that support the greening of Los Angeles. The City now looks at its rivers, lakes and coastal waters as essential for the quality of life in Los Angeles. As the City moves through the first half of the 21st Century, urban runoff should no longer only be viewed as a nuisance or flooding danger that should be swiftly removed by "channelized" streams to the ocean. Instead, urban runoff is a valuable resource to augment our diminishing water supplies as the City grows. In addition to protecting the quality of the City's waters, the WQCMPUR supports the Mayor's initiatives to transform Los Angeles to the cleanest and greenest big city in America by:

- Restoring the natural ecosystems of bays, rivers and lakes where possible;
- Capturing urban runoff for recharging the aquifers and for other beneficial uses such as irrigation; and
- Implementing urban runoff strategies that promote the sustainability of the City of Los Angeles.

Challenges

The City of Los Angeles covers a large area and is highly urbanized. Most of its land area is impervious due to extensive development. A network of storm drains rapidly conveys urban runoff from rooftops, streets, parking lots and other impervious surfaces. Urban runoff pollutants - for instance from traffic, industrial activities or other sources - end up in the receiving waters, often without any form of treatment. The challenge of meeting water quality standards is to develop an extensive approach that combines source control of urban runoff pollutants, reduction of urban runoff volumes, and treatment technologies for removing pollutants from urban runoff. Additional challenges include:

- **Administration** – A citywide and unified approach is needed as urban runoff management affects all City departments;

- **Legislative and policy** – Effective urban runoff management will need policy changes at local, county and state levels, for instance, to regulate the use of urban runoff pollutants and to provide guidelines for the use of urban runoff in infiltration and irrigation;

- **Funding** – While the Stormwater Pollution Abatement Charge provides funding for the City's current Watershed Protection Program, additional funding is needed for implementation of the WQCMPUR;

- **Science** – With urban runoff management being a relatively new area with many uncertainties, development of science-based methods is essential to identifying pollutant sources and finding the best solutions for improving water quality;

Approach

The WQCMPUR seeks a broad watershed-based perspective to improve water quality and bring the City of Los Angeles into compliance. The strategy is to build on ongoing successful initiatives and programs, identify common grounds (for benefits and funding), and seek new initiatives that will address complex problems. This approach will also promote water conservation and factor in objectives identified by other plans, including increased recreation opportunities and support for the greening of Los Angeles. Successful implementation of the WQCMPUR requires a consensus for change with citizens, neighborhoods, City government, businesses, non-governmental organizations (NGO's), consultants, universities, adjoining cities, and other agencies. Hence, implementation of water quality improvement projects should be through collaboration and partnerships with all stakeholders.

WQCMPUR Document

A great amount of data and information has been reviewed and used for developing the WQCMPUR. ***Chapters 1 through 8*** present an overview of the existing status of urban runoff management in the City. Some of the elements in this part include a description of the four watersheds in the City of Los Angeles, urban runoff pollutant sources and their distribution over the City, regulatory requirements for water quality, existing watershed management, and related plans for compliance with regulatory requirements. ***Chapter 9*** looks at the future of urban runoff management in the City of Los Angeles and distinguishes between three initiatives, which include:

- **Water Quality Management Initiative** - discusses the various technical components that go into developing projects for the Water Quality Management Plans to comply with stormwater regulations;

- **Citywide Collaboration Initiative** – discusses what is needed to revise and develop City policies, ordinances, and guidelines for urban development and redevelopment to focus on green solutions, Low Impact Development (LID), and stormwater use while increasing coordination Citywide;

- **Outreach Initiative** – discusses how the City will enhance outreach activities to reach target audiences, and establish methods to quantify the water quality benefits achieved through outreach activities.

Chapter 10, the financial plan, evaluates current and future revenues, and provides an estimate of the costs needed for implementing the strategies proposed by the WQCMPUR as well as opportunities for funding.

Executive Summary

ES.1 Introduction

The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) was developed in response to City Council Motion CF 07-0663, dated March 2, 2007, ***Appendix 1-1***, "A Water Quality Compliance Master Plan is needed to provide strategic direction essential for planning, budgeting and funding efforts to reduce pollution from urban runoff. This plan should guide the City's efforts to meet its CWA mandates. The need for this plan is urgent, and the City needs to show leadership immediately."

The development of the WQCMPUR was a combined effort of the Management Committee (Mayor's Office, Council Districts 1 and 11, Office of the Chief Legislative Analyst, Board of Public Works, Bureau of Sanitation), the Project Team, and stakeholders. The WQCMPUR provides a description of the Los Angeles watersheds, the concerns about the quality of urban runoff, the ongoing City efforts to address those concerns, a strategy for future urban runoff management, and a financial plan to support this strategy.

The primary goal of the WQCMPUR is to help meet water quality regulations. Implementation of the WQCMPUR over the next 20 to 30 years will result in cleaner neighborhoods, rivers, lakes and bays, augmented local water supply, reduced flood risk, more open space, and beaches that are safe for swimming. The WQCMPUR also supports the Mayor and Council's efforts to make Los Angeles the greenest major city in the nation. These goals are summarized in ***Table ES-1***.

Throughout the WQCMPUR, one will find the following underlying themes:

- Identifying where the beneficial uses of our waters are impaired, and applying technologies and strategies to improve water quality;
- Planning and building more livable, healthier and sustainable communities;
- Investing in research and technologies to support allocation of City tax dollars to work toward the most cost effective solutions;
- Reducing administrative barriers and fostering new partnerships among City departments, allowing for a clearer focus on water quality improvement;
- Increasing public involvement and participation through education and outreach, creating a strong stewardship mentality among citizens;
- Leveraging the strength and motivations of the residents of Los Angeles to build, support, and to share in the achieving of our mission; and

Table ES-1
WQCMPUR Goals and Key Objectives

Goals	Purpose	Key Objectives	Reference
1) Comply with water quality standards	Improve water quality in City watersheds	– Meet NPDES MS4 Permit requirements – Meet TMDL-specific numeric waste load allocations – Meet other water quality standards	– ***Appendix 5.1*** summarizes numeric WLAs – ***Section 9.7*** describes implementation of a compliance assessment once every five years
2) Implement a watershed-wide approach to water quality compliance	Establish a comprehensive solution by building upon ongoing watershed planning work being conducted by other organizations	– Establish Citywide numeric BMP design and performance criteria – Establish quantitative nexus between BMP selection and water quality standards attainment – Establish Water Quality Management Plans for four watersheds	– ***Section 9.2*** and ***Appendix 9.2*** describe Water Quality Management Plan development process, including need for BMP design and performance criteria – ***Appendix 9-3*** describes process for developing quantitative nexus
3) Maximize the use of BMPs that support multiple benefits	Use the need to comply with TMDLs as an opportunity to support other City and watershed goals	– Establish metrics in each Water Quality Management Plan that measure benefits achieved, e.g., number of green streets or acres where urban runoff is captured, treated, and used	– ***Sections 9.2*** and ***9.7*** note that these types of metrics will be developed in association with each Water Quality Management Plan
4) Establish comprehensive Citywide approach to compliance	Establish urban runoff management as a requirement in all City new development and redevelopment activities	– Establish Low Impact Development Ordinance – Establish Stormwater Use Ordinance – Establish Stream Protection Ordinance	– ***Section 9.3*** describes the activities planned for establishing a Citywide collaborative approach to urban runoff management
5) Support urban runoff goals of the Water IRP	Ensure that implementation is consistent with Water IRP	– Implement BMPs that support Water IRP dry and wet weather runoff numeric goals – Implement applicable Go-Policy Directives	– ***Section 8.3.8*** provides overview of Water IRP goals – ***Table 9.2*** links Go-Policy Directives to strategy elements
6) Engage the community	Create a sense of stewardship at all levels of the community	– Implement outreach activities on a variety of levels – Encourage participation in development of Water Quality Management Plans	– ***Section 9.4*** describes planned outreach activities – ***Section 9.6*** describes opportunities for stakeholder participation

- Conducting assessments of the implementation of the plan, and the progress towards meeting water quality regulations in each watershed.

ES.2 Watersheds

Four watersheds encompass the City of Los Angeles: Los Angeles River, Ballona Creek, Dominguez Channel, and Santa Monica Bay. Each watershed has unique characteristics, needs, and opportunities that require specific approaches and solutions. These watersheds comprise many cities that share responsibility for meeting water quality regulations. For example, the Los Angeles River Watershed has 42 responsible cities and agencies. Jurisdictional coordination is key to successful urban runoff management on a watershed-wide basis.

ES.3 Water Quality

City of Los Angeles and other agencies monitor the water quality at our beaches, and in rivers, creeks, and lakes on a regular basis. So far, water quality monitoring has mostly focused on the receiving waterbodies, and the pollutants that are regulated by adopted TMDLs. For the prioritization of pollution generating areas and the development of pollution reduction measures, there may be a need for more water quality data in the tributaries, and storm drains that transport pollutants to the receiving waters.

ES.4 Pollutants of Concern

The most common pollutants causing impairments include: trash, metals, coliform bacteria, oil and grease, nutrients, and toxic organic compounds, such as pesticides and herbicides. These pollutants come from many sources, and are found in the water column, or are deposited in sediments and fish tissues. Understanding pollutant sources is critical to improving water quality. If the source can be reduced or eliminated, water quality benefits can be more quickly realized with lower cost.

ES.5 Regulatory Requirements

The Federal Clean Water Act (CWA), the State Porter-Cologne Act, and the California Ocean Plan provide the basis for the protection of water quality in fresh and marine waters. The Los Angeles Regional Water Quality Control Board (LARWQCB), and the California Environmental Protection Agency (Cal EPA) implement State and Federal water quality regulations. Water quality regulations applicable to urban runoff management are primarily implemented through the National Pollutant Discharge Elimination System Permit for the Municipal Separate Storm Sewer System (NPDES MS4 Permit). Earlier versions of the NPDES MS4 Permit were mostly narrative with requirements for implementation of Best Management Practices. Future NPDES MS4 Permits, however, are likely to also include numeric water quality standards, or action levels, and pollutant load allocations that are specified in Total Maximum Daily Loads (TMDLs). A TMDL establishes the maximum amount of a pollutant that a waterbody can receive from all sources, including the MS4, while still meeting water quality goals.

Many Los Angeles waterbodies have been designated as impaired because of poor water quality. As of December 2008, the LARWQCB has adopted 14 TMDLs to address these impairments, of which 13 have been approved by the State Water Resources Control Board (SWRCB), Office of Administrative Law (AOL), and U.S. EPA and are, therefore, effective. By 2012, the LARWQCB will have developed as many as 60 TMDLs, required under a Federal Consent Decree.

ES.6 Best Management Practices

Urban runoff management relies on the use of Best Management Practices (BMPs) to control the discharge of pollutants to receiving waters. BMPs are designed to reduce pollutant concentrations at the source, to reduce the volume of runoff that carries pollutants to the receiving water or to remove pollutants from runoff in the storm drain system. BMPs may be either non-structural (control of pollutants through programmatic activities such as product substitution, education or ordinance implementation) or structural (facilities that improve water quality through some treatment mechanism). The selection of BMPs will be based on minimum design storm criteria and BMP performance criteria. Structural BMPs are also anticipated to result in significant urban runoff reuse and groundwater recharge.

ES.7 TMDL Implementation Plans

Water quality planning is an ongoing activity in the City. Some planning efforts respond directly to regulatory requirements, e.g., the need to establish specific TMDL implementation plans. TMDL implementation plans delineate a stepwise approach and schedule for meeting TMDL requirements. To date, the City has developed, in conjunction with other responsible agencies, two TMDL implementation plans. Four additional implementation plans are required by 2011 and more are expected as new TMDLs are adopted. Future plans will have a watershed focus that addresses multiple TMDL requirements and builds on other watershed planning efforts.

ES.8 Watershed Management Plans

Several watershed management plans have been developed for the Los Angeles area. These plans in general have a broader mission that goes beyond compliance with water quality regulations. Examples include the Los Angeles River Revitalization Master Plan, the City's Water Integrated Resources Plan (Water IRP), the Ballona Creek Watershed Management Master Plan, Dominguez Watershed Management Master Plan, the Greater Los Angeles County Integrated Regional Water Management Plan and others. Implementation of the WQCMPUR will build upon ongoing watershed management planning work in order to use resources efficiently and maximize water quality benefits.

ES.9 Implementation Strategy

The WQCMPUR Implementation Strategy describes the direction and activities required to achieve the goals and objectives outlined in ***Table ES-1*** and meet and go beyond the NPDES MS4 Permit requirements. Building upon currently ongoing water quality improvement efforts, the Implementation Strategy is divided into three initiatives that are closely correlated:

- **Water Quality Management Initiative** - This initiative describes how Water Quality Management Plans for each of the City's four watersheds and TMDL-specific Implementation Plans will be developed to ensure compliance with water quality regulations. Using the guidelines of the WQCMPUR, these Water Quality Management Plans and TMDL Implementation Plans will:

- Identify BMPs for implementation that will result in compliance with water quality regulations by using design storm and BMP performance criteria;
- Select and prioritize the BMPs for implementation in the watersheds, focusing on the BMPs outlined in the Citywide Collaboration and the Outreach Initiatives;
- Coordinate with ongoing watershed management activities where common goals exist;
- Support the urban runoff management goals of the Water IRP;
- Establish a quantitative nexus between the BMPs selected for implementation and water quality standards attainment;
- Establish metrics to measure success.

■ **Citywide Collaboration Initiative** – This initiative recognizes that urban runoff management is closely linked with urban development and redevelopment, requiring:

- Citywide collaboration and coordination of urban runoff management;
- City policies and guidelines for urban development and redevelopment that focus on using green solutions to manage urban runoff; and
- Strategies to promote Low Impact Development (LID) and stormwater use.

■ **Outreach Initiative** – This initiative promotes public education and community engagement with a focus on preventing urban runoff pollution and will:

- Enhance outreach activities to reach appropriate target audiences;
- Establish methods to quantify water quality benefits achieved through outreach activities; and
- Promote community engagement in all of the City's urban runoff management activities.

Table ES-2 shows the subinitiatives in a matrix of identifiable programs in each initiative. The Implementation Strategy identifies and prioritizes recommended activities for each initiative and subinitiative as follows:

■ "High priority recommended activities" are included in the Implementation Strategy Action Plan, ***Table ES-3***, which includes the lead City department and schedule.

■ "Other recommended activities" have not been included in the Implementation Strategy Action Plan because they may be less urgent and/or they may need

Table ES-2
Framework of the Water Quality Compliance Implementation Strategy

Initiatives	Subinitiatives	Purpose
Water Quality Management	Water Quality Management Plans	Establish four Water Quality Management Plans that include NPDES MS4 Permit and TMDL-specific requirements
	Jurisdictional Partnerships	Establish agreements within each watershed to support Water Quality Management Plan implementation
	Research & Evaluation	Continue pilot studies and research to support Water Quality Management Plan implementation
Citywide Collaboration	General Plan Update	Guide establishment of Citywide policies for urban runoff management towards compliance with NPDES MS4 permit
	Green Solutions	Implement low impact development activities to promote green landscapes, stormwater use, and multi-benefit projects
	Runoff Management	Implement a runoff management program that increases infiltration and reduces pollutant loading and peak flows
	Source Reduction	Reduce waste and toxics material generation at the source and improve enforcement activities
Outreach	Pollutant-Specific Outreach	Develop outreach for specific pollutants, but integrate education messages/materials where possible
	Stormwater NPDES and TMDLs Outreach	Inform general public, community, business and environmental leaders and organizations about meeting NPDES MS4 Permit and TMDL requirements
	School Outreach	Continue to enhance school education programs, teacher training and community linkages
	Business Outreach	Target appropriate businesses to address most significant pollutant concerns
	Employee Training Program	Review training materials and evaluate effectiveness of program
	Mass Media Advertising	Continue advertising programs; revise or enhance as needed
	Stakeholder Involvement	Coordinate stakeholder involvement activities with Prop O project implementation
	Collaboration with Other Programs	Continue collaboration with non-profits, government agencies and other organizations to support TMDL implementation efforts

further development and evaluation. Other recommended activities can be found in ***Chapter 9, Implementation Strategy***.

Implementation of high priority recommended activities depends on the financial resources available to the Watershed Protection Program. Whereas a few high priority recommended activities in ***Table ES-3*** have already begun under the existing budget, many others will require additional financial resources before they can be implemented. Delays in additional funding will affect the schedules and delay milestones.

Table ES-3
Implementation Strategy Action Plan with High Priority Recommended Activities

Initiative	RA	Lead	Task	Year									
				1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Water Quality Management	1	BOE WPD	Implement TMDL compliance projects currently identified in CIP	•	•	•	•	•					
	2	WPD	Complete BMP Prioritization Methodology Phase II	•									
	3	WPD	Establish BMP siting, design storm and BMP performance criteria	•									
	4	WPD	Develop methodology for quantitative nexus between BMP selection and water quality standards attainment	•									
	5	WPD	Develop Water Quality Management Plan (WQMP) for Ballona Creek Watershed	•	•					**R**			
	5	WPD	Develop WQMP for Los Angeles River Watershed		•	•					**R**		
	5	WPD	Develop WQMP for Santa Monica Bay Watershed			•	•					**R**	
	5	WPD	Develop WQMP for Dominguez Channel Watershed				•	•					**R**
	6	BOE WPD	Implement future CIP projects for TMDL compliance			•	•	•	•	•	•	•	•
	10	WPD	Establish jurisdictional partnership agreements in each watershed	•	•	•	•	•					
	12	WPD	Participate in regional and national research opportunities	•	•	•	•	•	•	•	•	•	•
Citywide Collaboration	15	DCP WPD	Review and update General Plan for implementation of urban runoff management goals	•	•	•							
	16	WPD	Develop Low Impact Development strategy	•	•	•							
	17	WPD	Develop Stream Protection Ordinance	•	•								
	23	WPD BSS	Evaluate the use of public right of ways for local management of urban runoff (green streets)	•	•								
	30	WES D WPD	Support implementation of urban runoff goals of Water IRP	•	•	•	•	•	•	•	•	•	•
	31	WPD	Revise SUSMP requirements	•	•								
	32	WPD DRP	Evaluate use of publicly owned land for infiltration and urban runoff management	•	•	•							
	40	WPD	Establish water quality requirements for reuse of urban runoff	•	•								
Outreach	50-67	WPD	Evaluate and implement future outreach program elements as identified in Section 9.4.1	•	•	•	•	•	•	•	•	•	•
	68-69	WPD	Implement pilot studies to quantify benefits of non-structural BMPs	•	•	•	•						
	70	WPD	Create link to WQCMPUR activities on WPD website	•									
All Initiatives	71	WPD	Develop metrics for measuring success	•	•	•	•	•					
	72	WPD	Implementation strategy assessment and review					**R**					**R**

RA □ Recommended Activity in ***Chapter 9***; this Action Plan only includes the high priority recommended activities.
R □ Review and revise document

Using the WQCMPUR for strategic direction, metrics and numeric targets will be established more specifically in the development of Water Quality Management Plans for the City's four watersheds. The progress of implementation of the WQCMPUR and Water Quality Management Plans will be assessed every five years. This assessment may include the following:

- Review of water quality data and status of compliance with water quality regulations;
- Progress of implementing multi-benefit urban runoff projects;
- Status of city-wide collaboration activities; and
- Estimates of the pollution prevented through source reduction activities, particularly through increased community engagement and implementation.

Stakeholder participation is critical for the success of the WQCMPUR. The City will continue involving all stakeholders in future watershed planning and evaluate and seek collaboration and partnerships with all stakeholder organizations for the implementation of water quality improvement activities.

As a strategic document, the WQCMPUR does not require an Environmental Impact Report. California Environmental Quality Act requirements will be evaluated on an individual basis for specific projects.

ES.10 Financial Plan

It is estimated that the total cost for implementation of the WQCMPUR over the next 20 to 30 years will approximately be in the range of $7 billion to $9 billion. The financial plan for the WQCMPUR has identified a gap between these estimated costs and the current revenues for the City's Watershed Protection Program. The WQCMPUR recommends that the most sustainable approach for funding future water quality compliance activities is to seek an increase in tax revenues to pay for annual O&M costs and fund the Capital Improvement Program with debt financing. One option for increasing revenues is the Stormwater Pollution Abatement Fund (SPAF), which was created in 1991. The SPAF is funded by Stormwater Pollution Abatement Charge (SPAC) assessed to property owners in the City. The first and last time the SPAC was increased was in 1993/94, and revenues from the SPAF have remained the same ever since. Currently, the SPAC is $1.92 per month per Equivalent Dwelling Unit (EDU; the "average rate" for home owners). A stepwise increase over five years to $8.25 per month per EDU is recommended, but will require voter approval per Proposition 218.

Additional funding may be sought through a partnership with the County of Los Angeles Flood Control Program by: 1) modifying the scope of this program to include allocations for water quality improvement; and 2) increasing revenues generated (tax increase) by this program to cover the cost of water quality improvement projects that will eventually be implemented within the County of Los Angeles including the cities. The City and County are in the planning stages of developing a request that may be put forward to County property owners (50% approval required) sometime in 2010.

For the City's part, it intends to spread the cost of the CIP over a long period of time to avoid high annual funding requirements by use of debt financing and avoid annual requests to voters for an increase in taxes for stormwater related projects.

Chapter 1 Introduction

The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) has been developed in response to a Council motion asking for a strategic framework for urban runoff management in the City of Los Angeles. The ultimate goal of the WQCMPUR is that the City's rivers, lakes and coastal waters will meet all water quality regulations to protect public health and the environment. The WQCMPUR advocates a citywide approach and identifies how the City should manage urban runoff:

- ***Chapters 2 to 8*** summarize the current status of urban runoff management in the City of Los Angeles; and
- ***Chapters 9 and 10*** provide strategic directions and identify future opportunities for urban runoff management and funding.

1.1 Council Motion

On March 2, 2007, the City Council approved Council Motion CF 07-0663 introduced by Council members Ed Reyes (CD1) and Bill Rosendahl (CD11), ***Figure 1-1***, ***Appendix 1-1***. With public health, the environment and water quality legal mandates in mind, this motion calls for the development of the WQCMPUR for the City of Los Angeles with the purposes of:

- Providing strategic directions for planning, budgeting and funding for reducing pollution from urban runoff; and
- Guiding the City's efforts in meeting the Clean Water Act mandates for water quality.

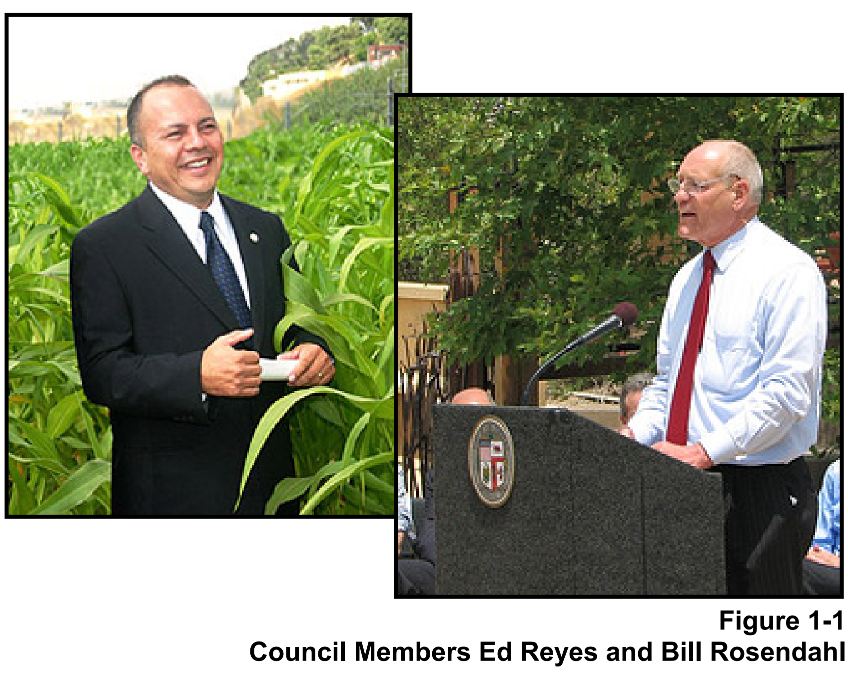


Figure 1-1
Council Members Ed Reyes and Bill Rosendahl

In addition to these overarching goals, the Council Motion requires the WQCMPUR to incorporate the following elements:

- Identify pollutants of concern in the City (by type and location);
- Prioritize polluted areas in the City;
- Develop timetables for regulatory compliance;
- Review the City's existing efforts in reducing pollutants from urban runoff;
- Develop strategies for the City to meet Clean Water Act standards;
- Demonstrate that strategies will comply with water quality standards;
- Identify water quality data gaps to put the program on a sound footing; and
- Estimate costs and identify sources of financial support.

The WQCMPUR addresses the requirements of the Council Motion. The City of Los Angeles has been at the forefront of urban runoff management and water quality protection since the founding of the Watershed Protection Division (formerly the Stormwater Management Division) within the Bureau of Sanitation in 1990. The need for the WQCMPUR does not advocate a complete transformation of past watershed management practices in the City. Instead, the WQCMPUR builds on existing efforts by evaluating strengths and weaknesses and proposes strategic directions for how urban runoff should be managed in the future. Even though urban runoff management is a monumental task in a highly urbanized city as large as Los Angeles, the WQCMPUR should result in the City working together towards improving the quality of our waters.

1.2 Background and Scope

For many decades the focus of urban waste management has been on collecting, treating and disposing of wastewater and solid waste, because of their immediate and potentially large impacts on public health. Urban runoff management is a relatively new development triggered by the federal Clean Water Act and its subsequent amendments in the 1970's and 1980's. Under this Act, urban runoff must meet National Pollutant Discharge Elimination System (NPDES) Permit requirements, which are designed to reduce pollutants carried in urban runoff from point sources.

Pollutants carried by urban runoff can have significant impacts on water quality, aquatic ecosystems and public health. To address these concerns and to remain compliant with NPDES requirements, many cities in the United States have developed urban runoff management programs. However, even with these programs in place, urban runoff pollutants can still seriously impact water quality. Where the impact is significant, Total Maximum Daily Loads (TMDLs) are established to set limits to the amount of pollutants that a specific water body can receive and still meet water quality standards. Fourteen of these TMDLs have already been adopted in the Los Angeles area; adoption of over 60 TMDLs by 2012 is expected. As a result, the need to enhance the City's urban runoff management program has become more urgent because of approaching regulatory deadlines to meet the TMDL requirements that will eventually be incorporated into the NPDES Permit for the Municipal Separate Storm Sewer System (MS4).

In response to Clean Water Act regulatory mandates, the City of Los Angeles started its Watershed Protection Program (formerly named Stormwater Program) in 1990. The Watershed Protection Division, which is responsible for this program, has been tasked with:

- Satisfying federal, state, regional, and local regulatory requirements;
- Coordinating City programs to minimize polluted runoff;
- Optimizing beneficial use of beaches and receiving waters by reducing pollutant loads through watershed management;
- Reducing waste disposal by providing public and employee education programs;
- Improving the waste disposal infrastructure;
- Expanding the use of technical knowledge regarding urban runoff issues; and
- Minimizing the adverse effects of flooding on the City of Los Angeles.

While the City is one of the nation's leaders in urban runoff management, the approach might best be described as reactive to specific problems. Planning efforts have been done in a partly integrated and localized manner, but not on a watershed-wide basis. This approach has resulted in the development and implementation of a variety of stormwater programs and projects, including public outreach and education, inspection, enforcement, scientific studies and construction of structural Best Management Practices. In contrast to this approach, the WQCMPUR is expected to proactively address current and future water quality regulations. It provides an overarching framework with strategic directions for development of Water Quality Management Plans and TMDL-specific Implementation Plans that will bring the City into compliance with water quality standards, ***Figure 1-2***.

The concept of a watershed-wide approach is not new. ***Chapter 8*** discusses various management plans that have already been developed for the City of Los Angeles watersheds. These plans usually present a broad view of how these watersheds should be managed, but with less attention to specific water quality issues. The primary focus of the WQCMPUR is on improving the quality of the waters within City limits. However, the WQCMPUR advocates a watershed-wide approach to coordinate the City's efforts with other cities and agencies in the watersheds.

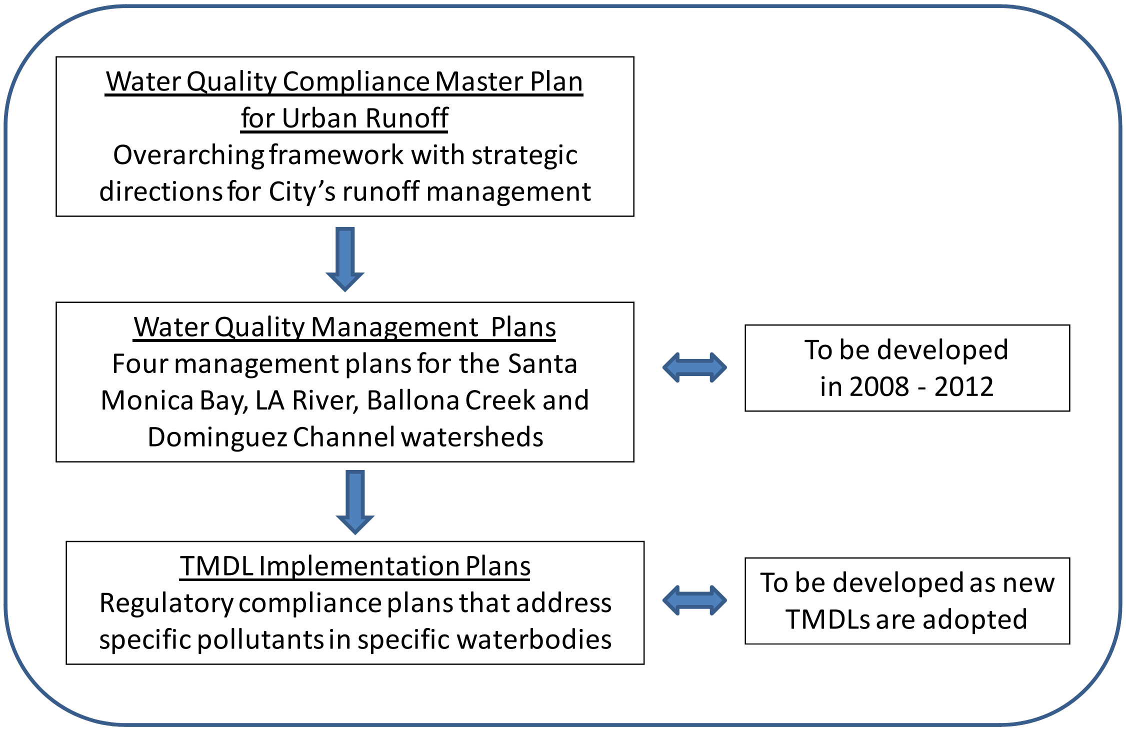


Figure 1-2
Urban Runoff Management in City of Los Angeles

In summary, the WQCMPUR takes a comprehensive view of our City and provides the strategic directions for managing urban runoff over the next 20 to 30 years. However, urban runoff management is an area with many remaining technical unknowns in an ever-changing public policy landscape. The WQCMPUR will be revisited to adjust its course in response to demographic, regulatory, political, and technological changes.

1.3 WQCMPUR Development

The development of the WQCMPUR was a citywide effort carried by many divisions and departments in the City along with input from water quality regulators, non-government and environmental organizations and the public. Such collaboration with stakeholders is critically important for any master plan, and it will be even more important for the implementation of the WQCMPUR. The first draft of the WQCMPUR was developed in nine months through the efforts of the following committees:

- The Management Committee met biweekly and consisted of the Mayor's Office, Council Districts 1 and 11, the Office of the Chief Legislative Analyst and Bureau of Sanitation's Watershed Protection Division. This committee managed the development of the WQCMPUR by providing oversight of and directions to the Project Team;

- The Stakeholder Advisory Committee met in the River Center in three workshops on June 27, August 14 and December 4, 2007. These workshops were attended by 70-100 people from environmental organizations, government agencies and internal City departments. The breakout sessions during these workshops, ***Figure 1-3***, provided many suggestions for the development of the WQCMPUR;

Figure 1-3
Stakeholder Workshops

- The Citywide Committee originally met on a monthly basis to discuss citywide collaboration in urban runoff management. The major participants in this committee were the Departments of Public Works, Water and Power, Harbor and Airports, Recreation and Parks, Planning and Building and Safety. Later meetings of the Citywide Committee were canceled as most City departments attended the stakeholder workshops where citywide collaboration was one of the major topics. In addition, the Watershed Protection Division met with the individual City Departments in several follow-up meetings; and

- The Project Team with staff from the Watershed Protection Division and consultants met on a weekly basis and was responsible for developing the WQCMPUR.

The stakeholder workshops and discussions with various City departments provided a wealth of ideas, suggestions and concerns or questions. While some ideas and suggestions may not have been included in this document, they remain valuable for the future implementation of the WQCMPUR.

The project schedule for developing the WQCMPUR consisted of the following phases:

- In Phase 1, the scope of the WQCMPUR was developed with a detailed breakdown of the multiple tasks to be performed. In addition, the members of the Project Team were selected and strategies for stakeholder involvement were developed;

- In Phase 2, the focus was on summarizing and evaluating the current status of runoff management in the City, including urban runoff pollutants and their sources, water quality data and monitoring, water quality regulations, existing efforts for attaining water quality standards, and compliance with current TMDLs and the NPDES MS4 (Municipal Separate Storm Sewer System) Permit. Most of the information collected in this phase can be found in ***Chapters 2*** through ***8;***

- In Phase 3, using the data collected in Phase 2 as a basis, the focus shifted towards developing the future strategies for urban runoff management and evaluating the financial implications of implementing these strategies. The results can be found in ***Chapters 9*** and ***10***; and

- In Phase 4, the draft documents were extensively reviewed by the Management Committee and stakeholders and finalized by the Project Team.

Chapter 2
Watersheds and Pollutants

2.1 Introduction

The term "watershed" describes all the land that drains to a common low point. Water moves through both underground and surface drainage pathways that converge into streams and rivers. Eventually the water reaches a receiving waterbody such as a river, stream, lake, wetland or the ocean.

Integral with the watershed is the water that flows over, under and through it. For the purposes of the WQCMPUR, water is characterized as stormwater or urban runoff:

- Stormwater is the water from rain events and that finds its way to the City's streets, storm drain system, streams and rivers, beaches, wetlands, estuaries, bays and harbors. In Los Angeles, stormwater occurs almost entirely during the wet season.

- Urban runoff includes stormwater, but also other sources of water not directly associated with rain events. Urban runoff includes natural sources such as groundwater seepage and springs. It includes anthropogenic sources of water, such as landscape overwatering, car-washing, illegal connections to the stormwater system, illegal dumping and treated water from industrial facilities (each requiring a specific permit). Urban runoff occurs in some form throughout the year, though the magnitude of flow tends to be much greater after rain events.

Urban runoff is collected by the City's storm drain system. This is a system of underground pipes, devices, conveyance networks and treatments that is completely separate from Los Angeles' sewer system, which collects residential, commercial and industrial wastewater. Except for illicit connections, there is no sewage entering into the storm drain system. The storm drain system typically is considered to start on City streets with the gutters that convey runoff to the storm drain inlets or "catch basins". Almost all catch basins are marked with "do not dump – drains to ocean" warnings. The catch basins may have external screens and/or internal capture devices to separate trash from urban runoff. The catch basins provide a visible "link" between the City's watersheds and an underground pipe network of small pipes connecting to larger pipes, ultimately empting into constructed channels or streams and creeks. The smaller creeks and streams may empty into wetlands, lakes or flood control basins. The larger water flows generally end up in rivers that discharge into harbors or directly into the ocean.

Watersheds can be broken down into smaller sub-watersheds, basins and catchments, divisions that depend on site-specific conditions, inter-jurisdictional considerations or on the level of detail needed for effective management. A portion of a watershed may have unique environmental factors, be subject to certain historical impairments or fall under the political jurisdiction of multiple agencies.

It will become apparent that there are complex interrelationships within a watershed that require a great deal of cooperation among responsible agencies when discussing watershed management. This chapter introduces some of these important watershed quality management issues.

2.1.1 City of Los Angeles Watersheds

The City of Los Angeles lies within four major watersheds. The boundaries are illustrated in ***Figure 2-1,*** and the total watershed areas and portions within the City are summarized in ***Table 2-1*** for the following watersheds*:*

- **Los Angeles River watershed** – This is the largest regional watershed shown on ***Figure 2-2*** and significant portions of impaired sub-watersheds are within City boundaries. For water quality compliance with respect to metals, the watershed has been divided into six "jurisdictional groups." The City has joint responsibility for water quality management in each of these defined areas, ***Ref. 2-1***. Water from the Los Angeles River discharges into San Pedro Bay from the Los Angeles River Estuary.

- **Santa Monica Bay watershed** – The Santa Monica Bay watershed is comprised of numerous sub-watersheds emptying into Santa Monica Bay. The northern portions of the watershed, outside the Los Angeles City limits, extend to the Los Angeles County / Ventura County Line, ***Figure 2-3***. To the south, the watershed extends to the Palos Verdes Peninsula. There is also the very small Marina del Rey sub-watershed that can be viewed as part of the Santa Monica Bay watershed, but it is sometimes treated as a separate watershed with respect to water quality management.

- **Ballona Creek watershed** – This watershed contains the Ballona Creek, Ballona Creek Estuary and Ballona Creek Wetlands, ***Figure 2-4***. As the Ballona Creek discharges into the Pacific Ocean, the Ballona Creek watershed could also be viewed as a sub-watershed of the Santa Monica Bay watershed.

- **Dominguez Channel watershed** – This watershed includes the drainage areas of the Dominguez Channel, the Wilmington Drain/Machado Lake, Dominguez Channel Estuary and the Torrance-Carson Channel that all eventually discharge through the Dominquez Channel into the Los Angeles Harbor area, ***Figure 2-5***. The Los Angeles/Long Beach Harbor is itself subdivided into several distinct waterbodies.

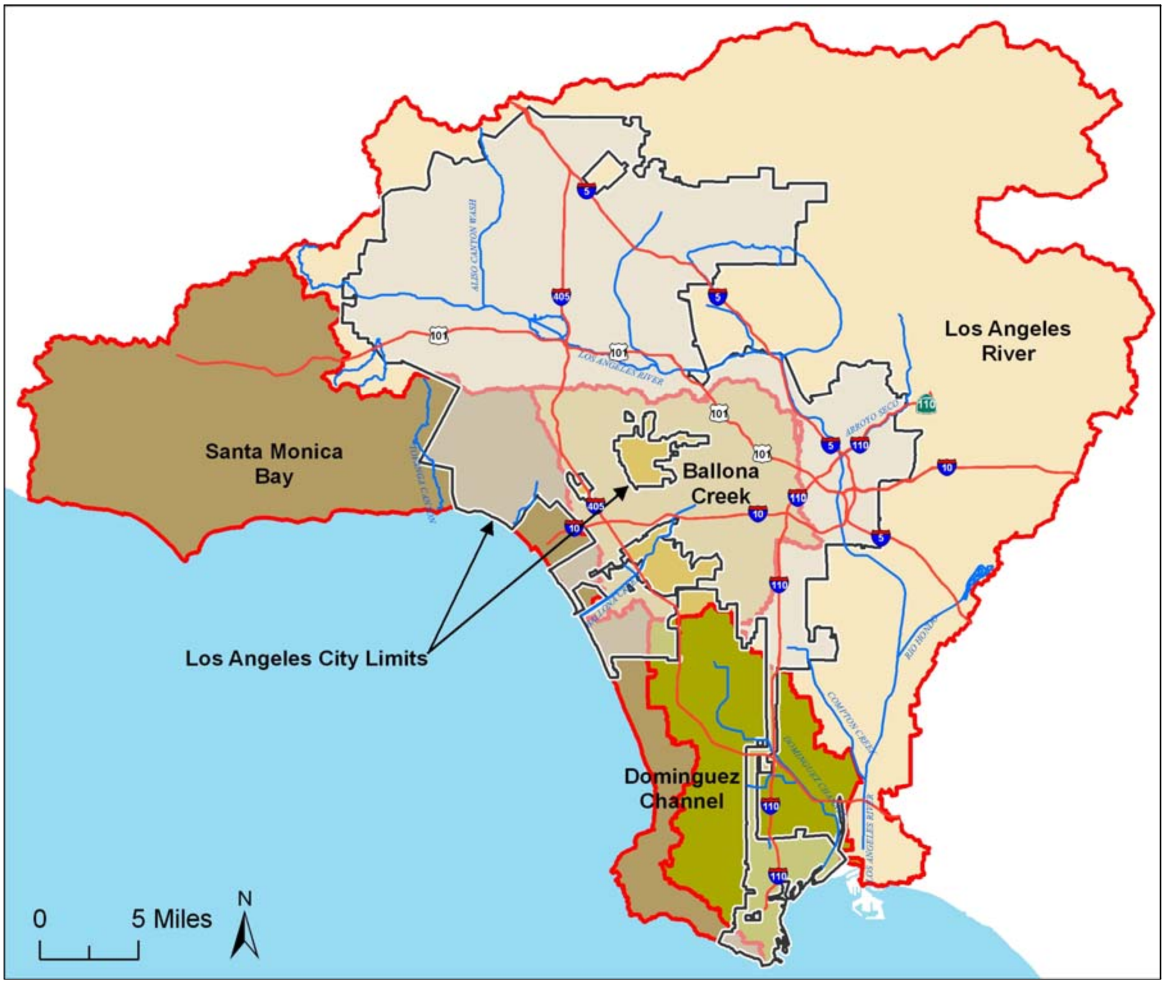


Figure 2-1
Watersheds
This figure illustrates four regional watersheds, superimposed with Los Angeles City limits.

Table 2-1
City of Los Angeles Area Watersheds
Total land areas and areas within the limits of City of Los Angeles[1]

City/Agency	Land Area (acres)	Area[1] (sq. miles)	% LA City
Los Angeles River			
Los Angeles	177,500	277	33
Other cities	157,000	245	
Other agencies	199,000	311	
Total	**533,000**	**833**	
Santa Monica Bay			
Los Angeles	21,000	32.8	12
Other cities and agencies	161,000	252	
Total	**182,000**	**285**	
Ballona Creek			
Los Angeles	66,400	104	81
Other cities	10,000	15.6	
Other agencies	5,600	8.7	
Total	**82,000**	**128**	
Dominguez Channel			
Los Angeles	22,100	34.5	32
Other cities and agencies	47,900	74.8	
Total	**70,000**	**109**	

(1) The Santa Monica Bay total area was from ***Ref. 2-2***. Other areas are from ***Ref. 2-3***.

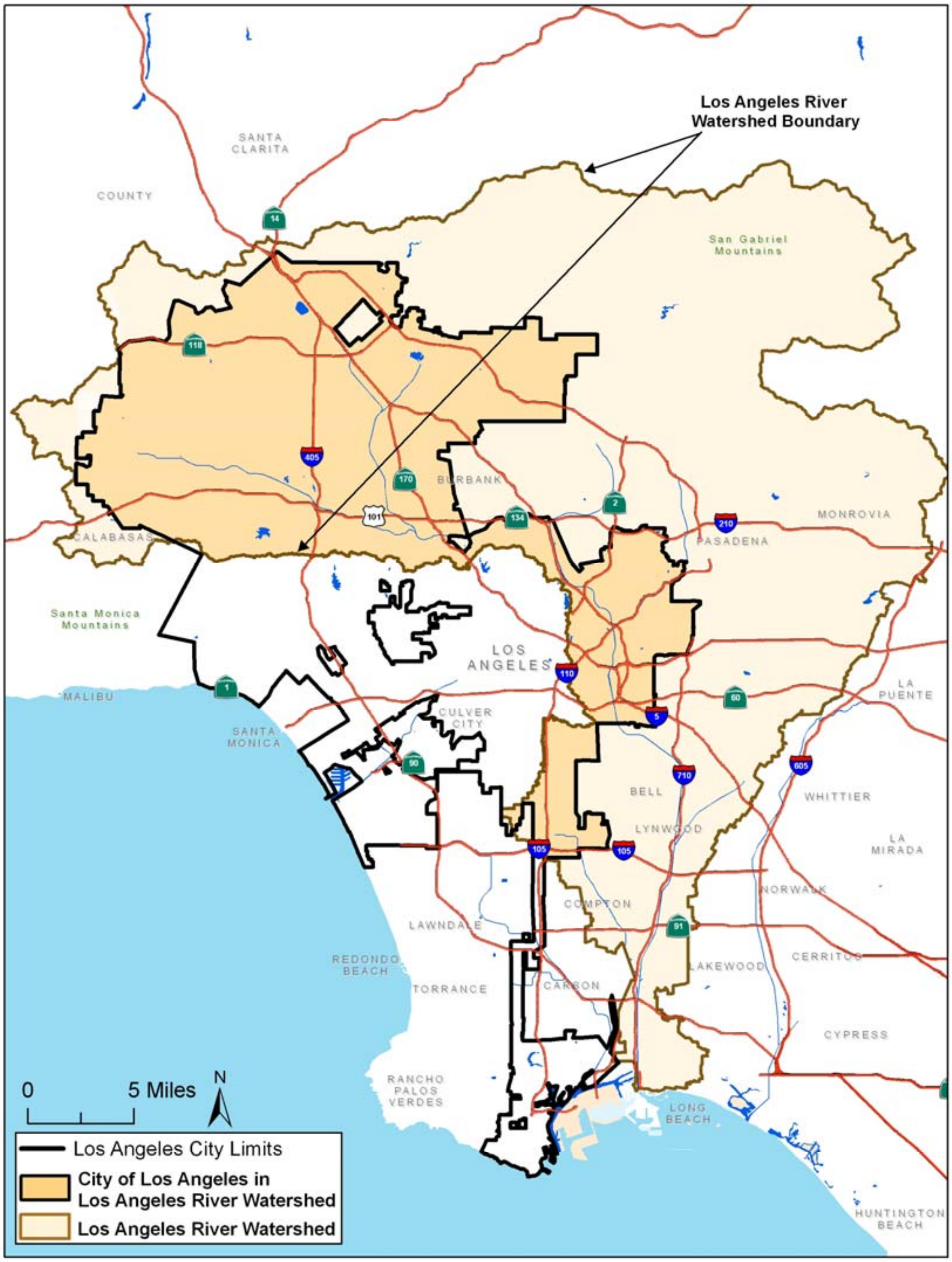


Figure 2-2
Los Angeles River Watershed
Urban runoff from the Los Angeles River watershed ultimately discharges into Los Angeles and Long Beach Harbors. Figure illustrates portions of Los Angeles River watershed within and outside the Los Angeles City limits.

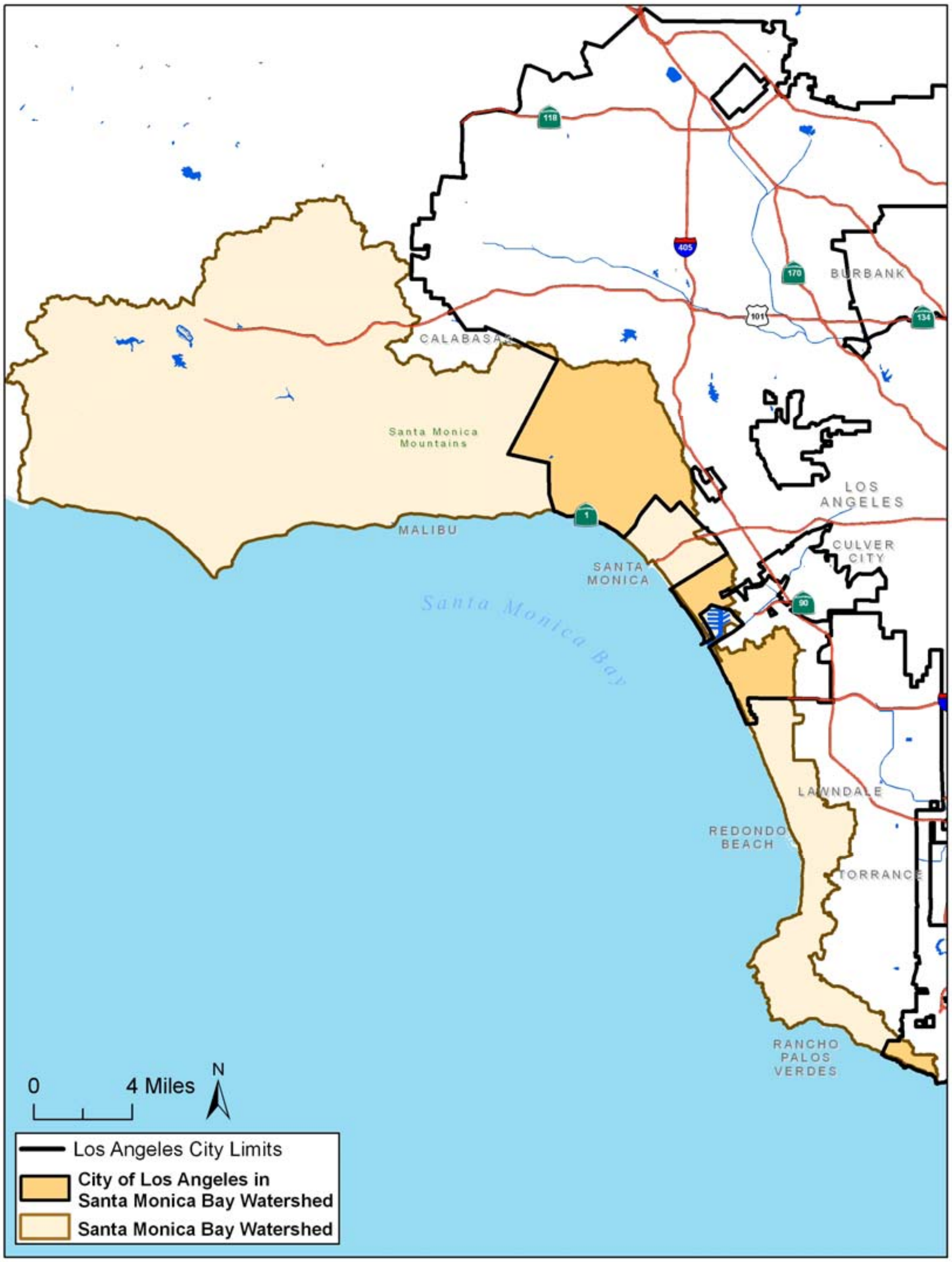


Figure 2-3
Santa Monica Bay Watershed
This figure illustrates the intersection of the City of Los Angeles with the Santa Monica Bay watershed. Runoff from the numerous sub-watersheds ultimately discharges into Santa Monica Bay.

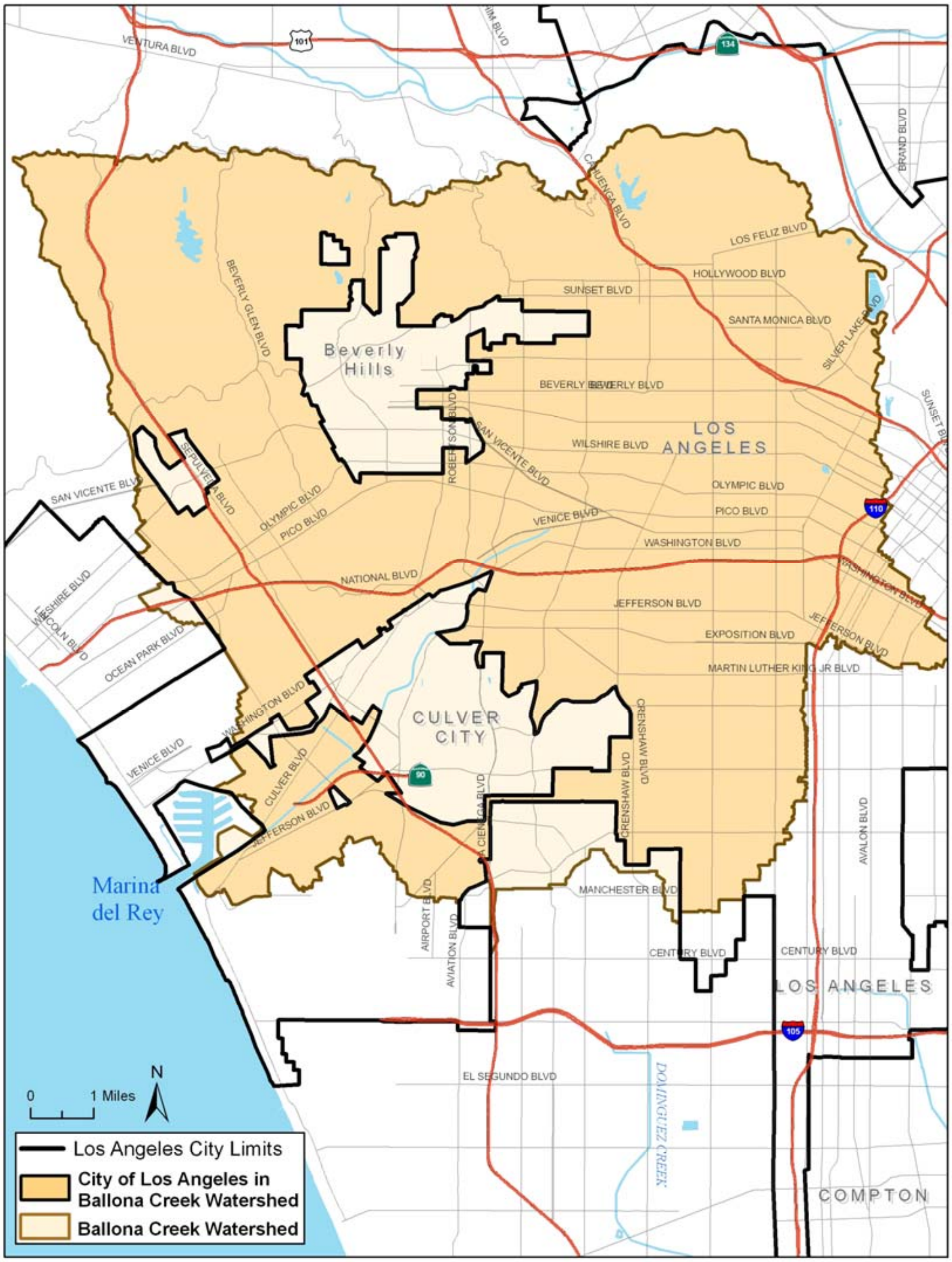


Figure 2-4
Ballona Creek Watershed
Runoff from Ballona Creek watershed ultimately discharges into Santa Monica Bay from Ballona Creek, just south of Marina del Rey.

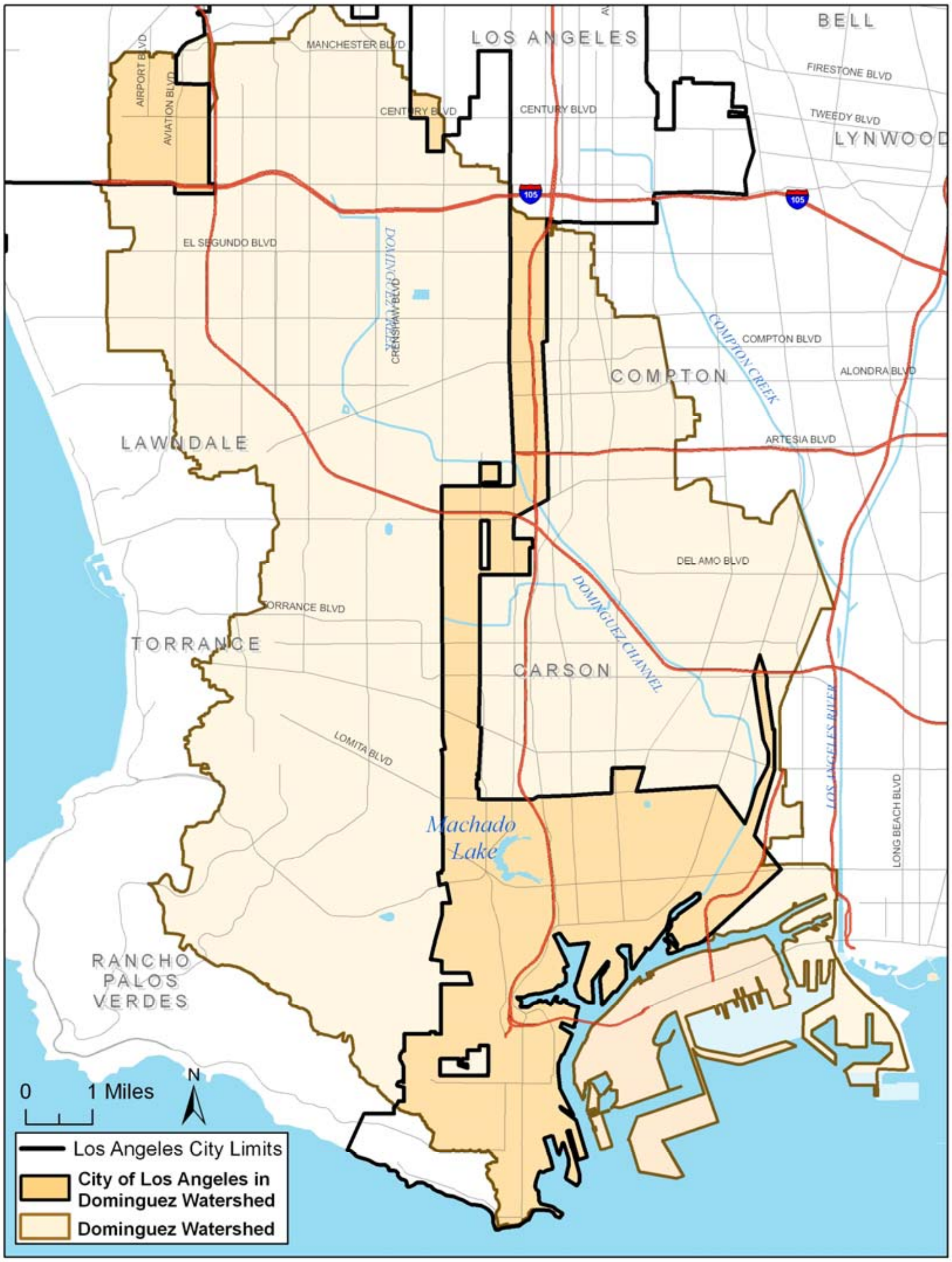


Figure 2-5
Dominguez Channel Watershed
Runoff from the Dominguez Channel watershed discharges into Los Angeles Harbor in the San Pedro area.

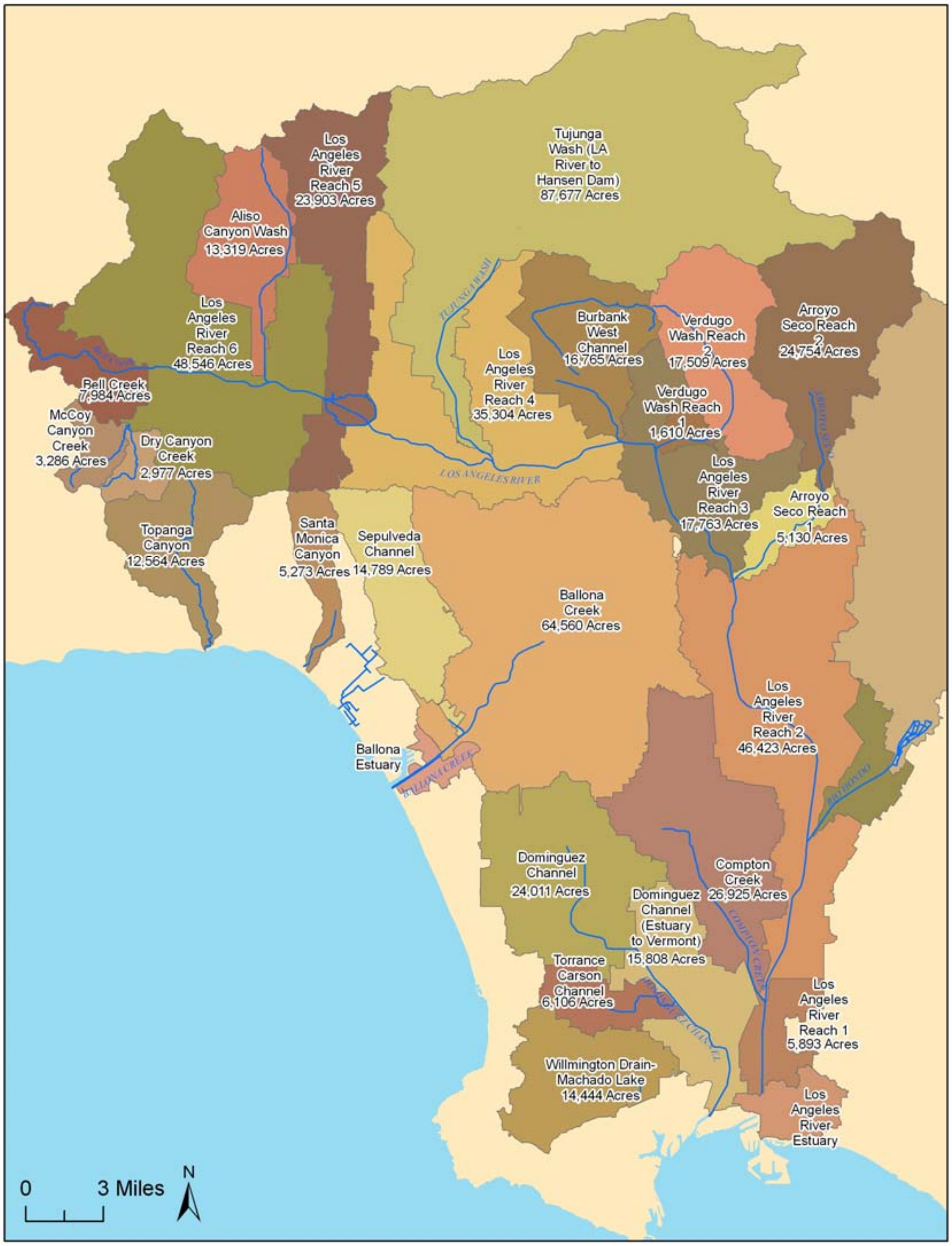


Figure 2-6
Los Angeles Area: 303(d) List-Impaired Subwatersheds and Reaches
Many of sub-watershed boundaries of the Los Angeles River, Dominguez Channel and Ballona Creek watersheds are illustrated above.

Sub-watersheds often have specific water quality impairments. ***Figure 2-6*** illustrates many of the sub-watersheds and reaches within the Los Angeles River, Santa Monica Bay, Ballona Creek, and Dominguez Channel watersheds that have been identified with impairments (as identified in the 303(d) List, ***Section 2.3***). The figure also has estimated drainage areas for these sub-watersheds. ***Appendices 2-1*** through ***2-4*** summarize some of the characteristics of the four Los Angeles area watersheds. ***Appendix 5-2*** lists impairments found in each watershed and the association with specific waterbodies within the watersheds.

The "connectivity" of a stream system is the primary reason for describing effects on various waterbodies on a watershed or sub-watershed level. "Connectivity" refers to the physical connections between a river and its tributaries, between surface water and groundwater, and between wetlands and waterbodies. However, watersheds do not often follow political boundaries and this can complicate the management of watershed-based issues. For example, ***Table 2-1*** illustrates the ownership breakdown of the four major watersheds into the portions owned by the City of Los Angeles, other cities, and agencies. Regulatory compliance is the responsibility of each city and agency that owns land draining into impaired waterbodies. The City of Los Angeles is one of the largest owners in each of the main watersheds and, therefore, is often the lead agency for compliance as designated by the Los Angeles Regional Water Quality Control Board (LARWQCB). State and Federal owned lands (parks and other natural areas) do not fall under the jurisdiction of the LARWQCB even though they are part of the area in the Santa Monica Bay and Los Angeles River watersheds. The focus of the WQCMPUR are the portions of the watersheds, which fall under the jurisdiction of the LARWQCB, and more specifically within the City limits.

Regulatory compliance may be a complex task, especially for watersheds composed of many cities, such as the Los Angeles River watershed, which includes over 40 cities. The percentage of land ownership in a particular watershed is often the basis for cost sharing of management activities discussed later in WQCMPUR. Dividing watersheds into sub-watersheds with unique issues or common elements may help to manage the complex interrelationships between the responsible cities and agencies. Coordination is critical for the success of any runoff management strategy that uses a watershed-wide approach.

2.1.2 Geography

The Los Angeles River watershed is the largest of the four area watersheds and includes all the lands draining into the Los Angeles River, ***Figure 2-1***. The river is 51 miles long, originates in the western San Fernando Valley in Canoga Park and discharges into San Pedro Bay. The first 30 miles of the River are within the City of Los Angeles. The total watershed area is 833 square miles, with about 324 square miles of the upstream portion covered by the forest and open space of the Santa Monica, Santa Susana and San Gabriel Mountains. Los Angeles River tributaries originate at an elevation of 795 feet in the western part of the San Fernando Valley collecting runoff from the northern slopes of the Santa Monica Mountains (North of Mulholland Drive) and the southern slopes of the San Gabriel Mountains. The steep slope of the River, averaging about 16 feet per mile, results in rapid drainage to the San Pedro Bay at Long Beach.

The Santa Monica Bay watershed runs along the coast from the Ventura-Los Angeles County line in the north to the Palos Verdes Peninsula in the south, and has a total watershed area of 285 square miles (not including the Ballona Creek watershed, which also discharges into Santa Monica Bay). A detailed description of the watershed can be found in ***Ref. 2-4***. As mentioned previously, the Marina del Rey watershed could be viewed as a sub-watershed of the surrounding Santa Monica Bay watershed. The total area of the Marina del Rey watershed is 2.9 square miles – a small percentage of the Santa Monica Bay watershed.

The Ballona Creek watershed is located on the coastal plain of the Los Angeles basin, with the Santa Monica Mountains to the north and the Baldwin Hills to the south. This watershed collects runoff from the southern part of the Santa Monica Mountains (south of Mulholland Drive) and the western part of the City of Los Angeles and drains into Santa Monica Bay. Ballona Creek is predominantly channelized and the watershed is highly developed with both residential and commercial properties. The Ballona Creek has a drainage area of approximately 128 square miles.

The Dominguez Channel watershed is also termed a "management area" that includes some land with storm drains that do not empty into Dominguez Channel, but is geographically connected with the land that does drain into the channel ***(Ref. 2-5)***. This area includes the communities of Wilmington and San Pedro. The Dominguez Channel watershed is the most urbanized watershed in Los Angeles County. In the northern and eastern portions of the watershed, the Rosecrans and Dominguez Hills rise to about 200 feet elevation. In the southwest portion of the watershed, the Palos Verdes Hills rise to an elevation of 1,480 feet. The Dominguez Channel drains an area of approximately 109 square miles into the Los Angeles Harbor/Long Beach Harbor areas**.** The forty-acre Machado Lake is located in the Wilmington section of this watershed within the Ken Malloy Harbor Regional Park.

Geographically, the four watersheds are substantially different from each other. Some of the important topographic features of the region are illustrated in ***Figure 2-7***.

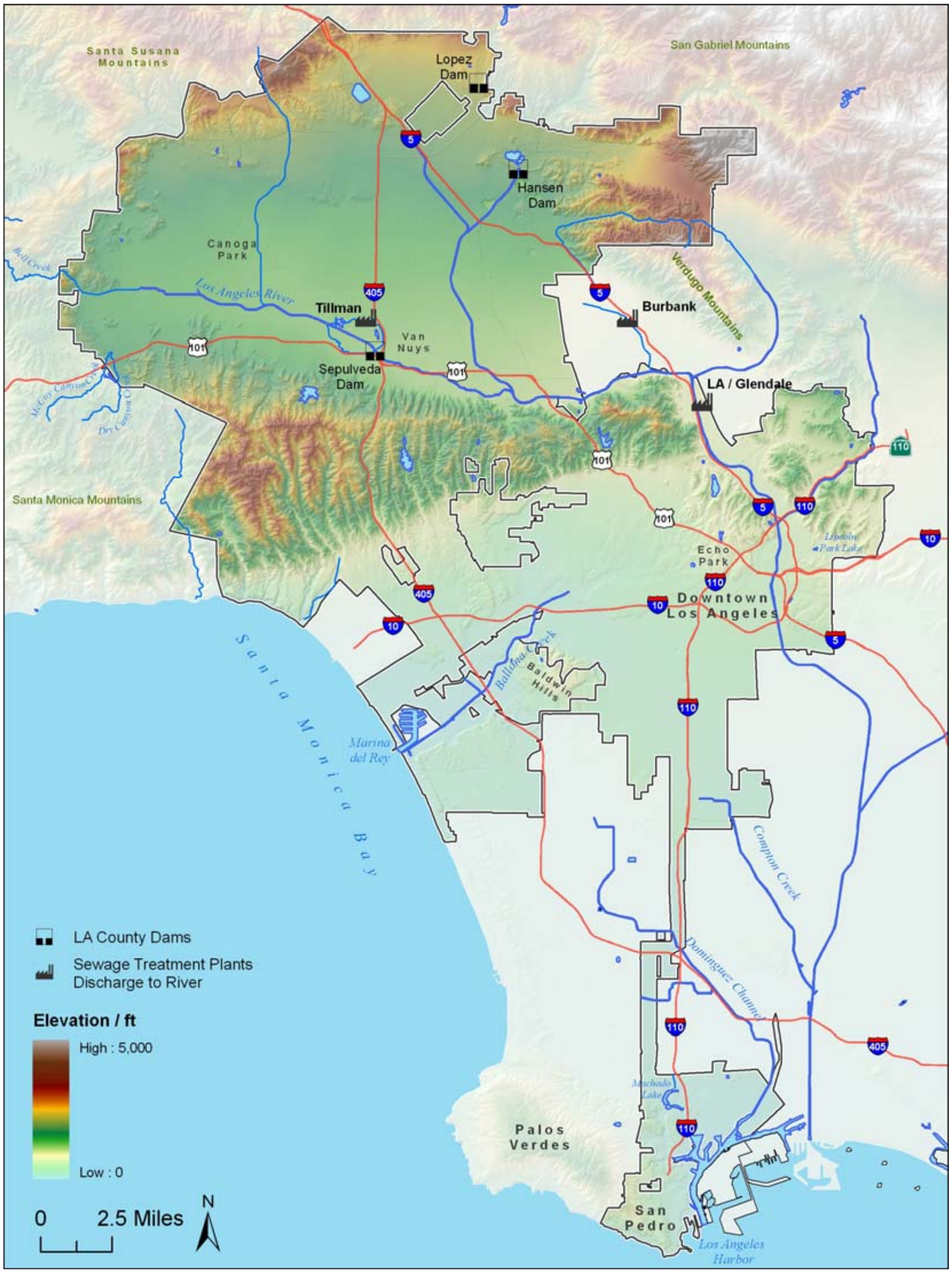


Figure 2-7
Topographic and Significant Hydraulic Features in City of Los Angeles

2.1.3 Rainfall

The Los Angeles climate can be characterized as "semi-arid" with average annual rainfall of 15 inches per year. Historically, 80% of recorded annual rainfall has been between 7" and 26". On average, 94% of seasonal rain falls between the end of October and the beginning of May as illustrated by ***Figure 2-8 (Ref. 2-6)***. However, in part due to the varied topography in the Los Angeles region, rainfall amounts vary significantly by location within the City. The average annual rainfall in the northern mountains is nearly twice as much as in the southern part of the City, near the Port of Los Angeles, as illustrated by ***Figure 2-9***.

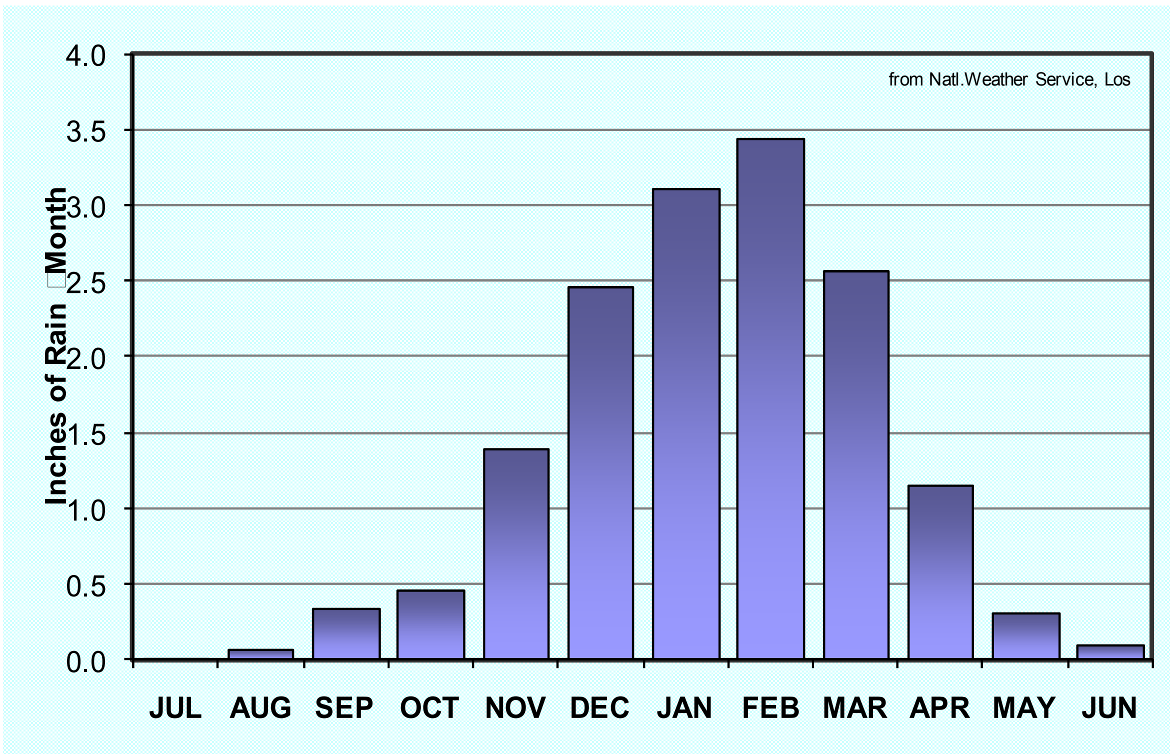


Figure 2-8
Average Monthly Rainfall in City of Los Angeles 1921-2006
The chart above summarizes the average monthly rainfall measured from 1921 to 2006. The average annual rainfall is approximately 15. Most rain falls between November and April, leaving the rest of the year mostly dry.

Figure 2-9
Mean Annual Rainfall Contours in City of Los Angeles

Statistically there will be 33 measurable rain events per year (***Ref. 2-7***). These rain events may be as little as 0.01 inches of rain. However, Los Angeles County rainfall data (***Ref. 2-8***) has indicated that the 1-year storm event (what you might expect in any given year) in Los Angeles is 1.7 inches of rain, the 5 year event (what you might expect once every five years) is 3.5 inches of rain and the 25 year event is 5.3 inches of rain; again, this varies depending on location in the city. Runoff management strategies employing structural "Best Management Practices, " or BMPs (as discussed in ***Chapter 6***), must consider how much of the runoff flow from storm events can be economically handled as opposed to average seasonal rainfall. Runoff treatment systems will operate far below their design capacity during most of the year.

2.1.4 Hydrology and Water Resources

Figure 2-7 illustrates the locations of principal rivers and channels, dams, reservoirs and wastewater treatment plant discharge points. None of these facilities is designed to store, slow or treat all the water from storm events but, instead, have been engineered to convey runoff to the ultimate discharge points.

Rainfall that does not fall on impervious surfaces has a chance to infiltrate and possibly recharge groundwater. The degree to which this might happen is related to soil types and associated infiltration rates. ***Figure 2-10*** illustrates data on soil types in the City of Los Angeles. This information gives a "first cut" at areas that might be promising for groundwater infiltration purposes.

During most of the year runoff management needs to focus on the relatively low-volumetric, dry-weather runoff. Dry-weather runoff sources include landscape irrigation, street washing, car washing, groundwater seepage, illegal connections, hydrant flushing, construction runoff and other commercial activities. The dry-weather runoff can be considered the background flow rate to which stormwater is added on a non-periodic basis. The 3rd and 4th columns of ***Table 2-2*** summarize the estimated/measured dry weather flow rates for each of the four watersheds. The 5th and 6th columns of ***Table 2-2*** show estimates of average annual stormwater.

Urban runoff management options will need to consider seasonal conditions, perhaps with different performance criteria. For example, a 0.45" storm event was selected as the largest targeted storm to be managed in several urban runoff projects in the Santa Monica Bay watershed (Note that the Standard Urban Stormwater Mitigation Plans use a storm of 0.75". Also note that establishing design criteria is a high priority recommended activity of the Implementation Strategy, ***Section 9.2***). If this same criterion were applied over the entire City, the amount of runoff requiring treatment could be 1.7 billion gallons.[1] ***Table 2-2*** summarizes the rainfall from a 0.45" storm for each of the main watersheds discussed in the WQCMPUR. Alternative management strategies might focus on pollutant source reduction or volume reduction to reduce

[1] For comparison, 1.7 billion gallons would fill the Los Angeles Coliseum about 12 times.

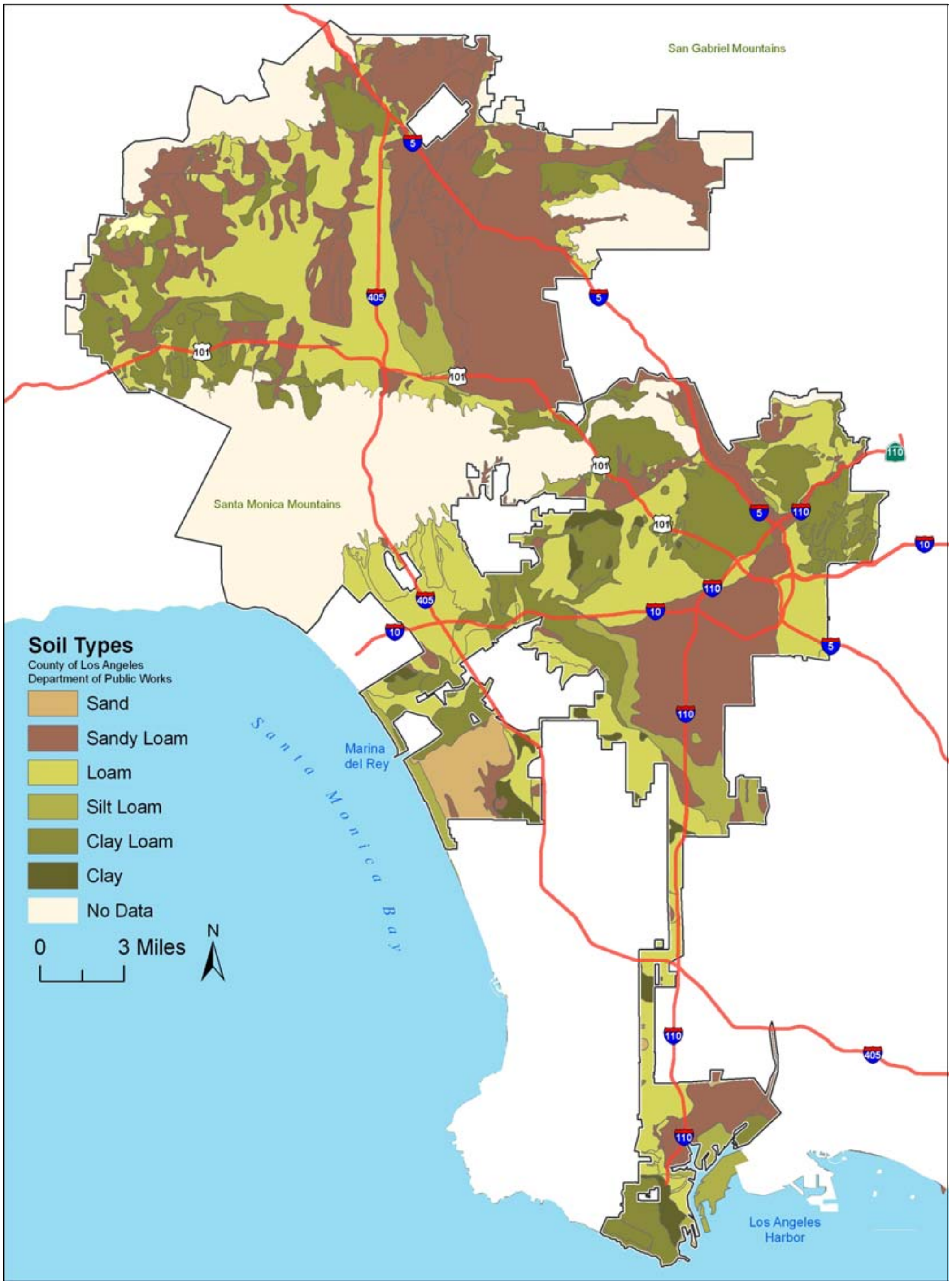


Figure 2-10
Soil Type Analysis

Table 2-2
Runoff from City of Los Angeles Area Watersheds
On an annual basis, the runoff associated with stormwater is significantly greater than the background (dry weather) runoff that is more or less constant all year. The runoff from a storm is concentrated over a short time period. The rightmost columns illustrate the possible runoff volume from a moderate storm over several Los Angeles area watersheds.

Watershed	Runoff Rate (gpd/ac)	Dry Weather Runoff (billion gallons/year)		Average annual runoff (billion gallons/year)(5)		Runoff from 0.45" storm (billion gallons)(5)(6)	
		Total Watershed	City	Total Watershed	City	Total Watershed	City
Los Angeles River	(1)	11	5.2	216	35	2.5	1.1
Santa Monica Bay (J2/3)(2)	(2)	5.5	3.7	74	5.3	0.3	0.16
Ballona Creek	230 (3)	7.3	5.8	34	13	0.5	0.39
Dominguez Channel	230 (4)	5.8	1.5	28	2.8	0.5	0.1
Total	-	**29**	**16**	**353**	**56**	**3.8**	**1.7**

(1) Dry-weather flow in Los Angeles River is measured at W.Wardlow Road (Long Beach), about 4.5 miles upstream from Long Beach Harbor. The two main sources are (a) groundwater seepage (2.9 mgd) and (b) dry weather runoff (26.6 mgd). It does not include treated discharges from three water reclamation plants (approximately 55 mgd).
(2) The runoff estimates given for Santa Monica Bay watershed are for Jurisdictions 2 and 3 (J2/3) only (therefore, not the entire watershed), which is the area most relevant for the City (***Appendix 2-2***) . The estimation of dry-weather runoff from Santa Monica Bay Jurisdictions 2 and 3 is based on the total expected flow (13cfs) in twenty major low-flow diversions described in "Low Flow Diversion Upgrade Calculations for Winter Dry-Weather Flow" from the Santa Monica Canyon Dry-Weather Diversion Compliance Workshop.
(3) Dry-weather flow in Ballona Creek is estimated from measurements at Sawtelle Boulevard, about 2.5 miles upstream from where the creek ends in the bay.
(4) Given the proximity of the Dominguez Channel watershed to the Ballona Creek watershed, the same runoff rate was used as an estimate.
(5) ***Ref. 2-9***. Runoff coefficient of 0.47 assumed. The City runoff total is based on an average rainfall of 14.95 inches per year and assumes that 47% of the rain ends up in storm drains. The average wet-weather runoff from just the City land (56 Billion Gallons/year) would fill the Los Angeles Coliseum more than 400 times.
(6) This table uses the 0.45" storm for illustrative purposes only. The Water Integrated Resources Plan, ***Ref.2-9***, identified this storm as the "largest targeted storm that needs to be managed in order to meet the Santa Monica Bay Bacteria TMDL. Note that the WQCMPUR Implementation Strategy, Section 9-2, recommends to establish design storm criteria for guiding the selection of structural BMPs.

treatment volumes. These considerations are factored into the Implementation Strategy discussed in ***Chapter 9***.

Comparing dry weather flow and the estimates of stormwater volume in ***Table 2-2***, it is obvious that the amount of runoff dramatically increases during a storm event. The Los Angeles River design capacity flowrate is 175,000 cfs, though the largest recorded daily flowrate in Los Angeles River was 43,000 cfs (24-hour average, on January 10, 1995).[2] Ballona Creek, though serving a smaller watershed, has a design flow capacity of 69,000 cfs; the USACE has estimated (2003) a 50-year "return flow" of 32,000 cfs for Ballona Creek. One of the considerations of stormwater runoff management, therefore, is the importance of reducing, delaying or diverting runoff to reduce

[2] This flowrate would fill the Los Angeles Coliseum in less than 8 minutes.

possible treatment capacities, whether treatment is with regional or distributed systems.

The intensity and duration of rainfall is another variable for pollution transport that has only been investigated on a limited basis. Studies have indicated up to 75% of the pollutant loadings could be discharged in the first 25% of the total storm volume (***Ref. 2-10***). If these studies are shown to be true, it may present an opportunity to target the portion of stormwater runoff most polluted instead of trying to manage the entire volume at a much higher cost. Such relatively concentrated stormwater is still much less concentrated than the water treated at wastewater plants. Developing the information that supports these observations may be important to implementing cost-efficient water quality strategies.

2.1.5 Land Use and Imperviousness

Urban development typically results in areas becoming significantly impervious to rainfall infiltration, thereby increasing the percentage of runoff entering the stormwater system, which was designed to mitigate the potential threat of major flooding. ***Table 2-3*** shows a breakdown of land use by watershed, with corresponding "imperviousness factors" that create a scale on how resistant the ground surface is to water infiltration. Major parts of the Los Angeles River (43%) and Santa Monica Bay (55%) watersheds are relatively open (they have a low imperviousness factor (< 25%). However, much of this land is in the mountains and generally "upstream" from suspected pollution sources. Within the City limits, watersheds are highly developed with residential, commercial and light industrial land use categories predominating. Transportation is also a major land use category in the Dominguez Channel Watershed. ***Figure 2-11*** illustrates the complex distribution of land use types found in the City of Los Angeles. As might be expected, the impervious areas in the City are associated with a high density of commercial and industrial facilities. These areas are concentrated in downtown Los Angeles and the harbor area of the Dominguez Channel Watershed. Certain land use categories can indicate potential "open areas" beyond that normally associated with parks or forests. For example, ***Table 2-3*** identifies considerable land use in each of the watersheds as "Education" that probably is associated with schools. Some of this land may be paved playgrounds or parking lots that might be useful open area when trying to meet water quality standards without compromising the primary use.[3]

---

[3] The use of the term "open area" goes beyond the term "open space" that has been defined in the California Government Code §65560 which is focused on the open space element of county or city general plans. As such, open space generally refers to land which is largely unimproved and devoted to preservation of natural resources and recreation among other specific uses. It also include "vacant land" which has seen no changes to the natural conditions. That definition might not include all parks, golf courses, engineered "green" structures to mitigate urban runoff associated pollution, or areas that have minor improvements such as a ground-level parking lot or a paved playground. In some of the planning discussed in the WQCMPUR, the document takes a broader view of open spaces and uses the term "open area" in lieu of open space.

Table 2-3
Land Use Categories in Major Watersheds with Associated Imperviousness Factors[(1)]
The dominant categories of land use in each watershed are in **bold font**.

Land Use	Imperviousness Factor	Los Angeles River		Santa Monica Bay Jurisdictions 2 & 3 [(2)]		Ballona Creek		Dominguez Channel	
		Acres	□ Area	Acres	□ Area	Acres	□ Area	Acres	□ Area
Vacant (open space with no improvements)	0.01	**213,517**	**39.6**	**14,403**	**48.6**	**11,198**	**13.7**	3,072	4.0
Golf Courses	0.03	4,680	0.9	418	1.4	1,092	1.3	747	1.0
Under Construction	0.15	1,494	0.3	32	0.1	367	0.5	350	0.5
Low Density Single Family / Rural Residential	0.21	11,761	2.2	1,327	4.5	2,688	3.3	1,361	1.8
High Density Single Family	0.42	**148,943**	**27.7**	**5,236**	**17.7**	**27,039**	**33.1**	**23,597**	**30.6**
Agriculture / Orchards / Horse Ranch	0.47	3,154	0.6	9	0.0	21	0.0	642	0.8
Education	0.47	10,925	2.0	381	1.3	2,518	3.1	2,618	3.4
Natural Resources Extraction	0.47	2,540	0.5	-	-	870	1.1	424	0.6
Multiple Family Residential / Trailer parks	0.55	22,289	4.1	1,593	5.4	**11,219**	**13.7**	5,007	6.5
Mixed Residential	0.59	15,614	2.9	610	2.1	7,404	9.1	3,354	4.4
Military	0.65	171	0.0	-	-	21	0.0	754	1.0
Heavy Industrial	0.66	1,576	0.3	928	3.1	32	0.0	4,576	5.9
Open Space / Recreation	0.74	9,573	1.8	663	2.2	1,640	2.0	2,138	2.8
Mixed Urban	0.89	498	0.1	15	0.1	184	0.2	78	0.1
Commercial / Industrial	0.91	303	0.1	2	0.0	74	0.1	172	0.2
General Office	0.91	8,323	1.5	291	1.0	1,324	1.6	1,395	1.8
Institutional	0.91	6,081	1.1	111	0.4	1,739	2.1	1,121	1.5
Light Industrial	0.91	25,575	4.7	383	1.3	2,369	2.9	**9,012**	**11.7**
Maintenance Yards Communications Facilities	0.91	968	0.2	10	0.0	178	0.2	149	0.2
Other Commercial	0.91	1,866	0.3	55	0.2	435	0.5	1,036	1.3
Other Facilities	0.91	5,942	1.1	142	0.5	139	0.2	988	1.3
Regular / Mixed Transportation	0.91	14,756	2.7	2,206	7.4	1,673	2.0	**9,032**	**11.7**
Retail / Commercial	0.97	20,630	3.8	774	2.6	6,874	8.4	4,921	6.4
Floodways and Structures	1.00	6,277	1.2	29	0.1	216	0.3	113	0.1
Receiving / Marina Waters	1.00	1,099	0.2	16	0.1	326	0.4	350	0.5
Total	**-**	**538,554**	**100**	**29,634**	**100**	**81,644**	**100**	**77,006**	**100**

(1) Source: ***Ref 2-11.***
(2) Land use data for Santa Monica Bay watershed are for Jurisdictions 2 and 3 (J2/3) only (therefore, not the entire watershed), which is the area most relevant for the City (***Appendix 2-2***).Other jurisdictions of the watershed have a larger percentage of vacant land use category.

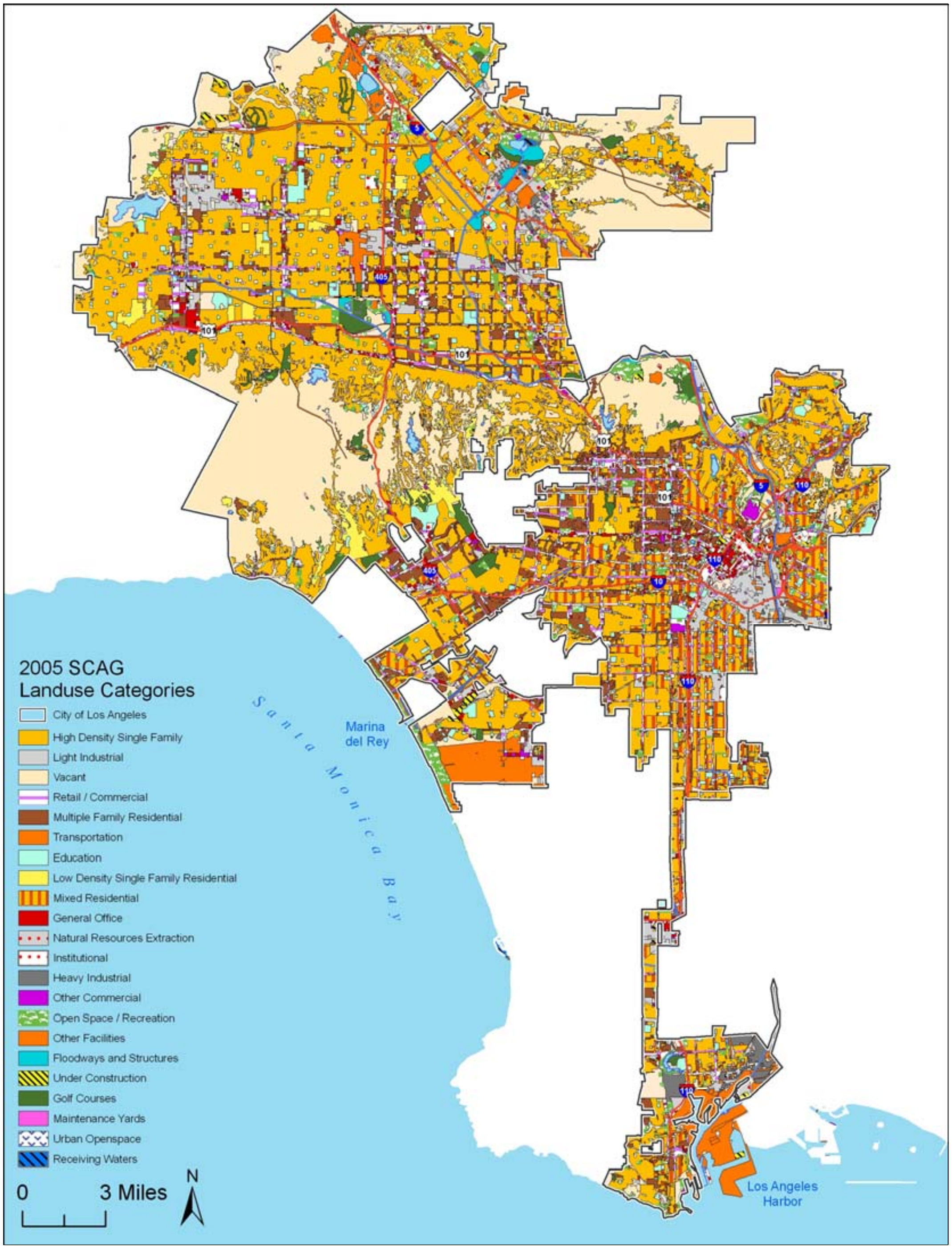


Figure 2-11
Land Use Distribution in City of Los Angeles
Land use definitions are defined by SCAG, ***Ref. 2-11***; the term Vacant Land refers to land still in its natural state.

As shown in later chapters, commercial and industrial areas (with very high imperviousness factors (>0.9) usually generate more pollution than other land use categories. Thus, runoff from these areas tends to be especially polluted and easily transported to the stormwater system.

2.1.6 Demographics

Population, number of residences and commercial/industrial activity (as indicated by employment) are expected to significantly increase by 2025 as summarized in ***Table 2-4***. This may affect runoff pollution in two ways: (a) generation of runoff pollutants may increase; (b) redevelopment and new development may increase the imperviousness of the area, thereby reducing infiltration and increasing the amount of runoff entering the storm drain system. To counteract these tendencies, development and redevelopments in the City must develop Standard Urban Stormwater Mitigation Plans (SUSMP) to reduce the quantity and improve the quality of runoff that leaves the site (***Section 6.2.2***).

Table 2-4
City of Los Angeles Growth Factors
Population increases will result in more intensely used land, but will probably not result in significantly less "open" area." [1]

Category	Totals		
	2000	2025	□ Increase
Population (City)[1]	3,788,752	4,357,359	15□
Households	1,295,410	1,596,055	23□
Employment	1,814,269	2,213,427	22□
Population (County)[1]	9,580,028	11,870,934	24□
Households	3,137,047	3,942,753	26□
Employment	4,453,477	5,520,139	24□
Traffic Indicators:			
Domestic Travel Miles[2]	1977 to 2001: up 110□ nationally		
Average Commute Time[3]	1995 to 2001: up 10□ nationally		
Total Vehicle Miles[4]	1996 to 2006: up 19□ in California		
Projected Freeway miles[5]	2005 to 2028: up 141□ in LA/Long Beach/Santa Ana		

(1) ***Ref. 2-11***.
(2) ***Ref. 2-12***.
(3) ***Ref. 2-13***.
(4) ***Ref. 2-14***.
(5) ***Ref. 2-15***.

Vehicular traffic has a complex relationship to population, where people live and where people work. It is difficult to express this relationship in a single metric. ***Table 2-4*** lists some of the indicators of increased traffic, with a projection toward 2025 based on recent trends. While traffic does not directly increase runoff (unless there is a drastic increase in road or highway construction), motor vehicles have been identified as a source of contaminants found in urban runoff.

Since the City of Los Angeles is already highly developed, future growth is not likely to result in a proportional increase of the runoff volume. As is discussed in ***Chapter 9***, one of the implementation strategies is to regulate future redevelopment to increase open areas and to limit the impact of "urban sprawl".

2.2 Water Quality Protection

The LARWQCB designates specific "beneficial uses" to each waterbody in a watershed (***Ref. 2-16***) under one of three "general use" categories:

- Population, including residential, industrial, agricultural, and water supply;
- Recreation and commercial, including water recreation and fishing;
- Habitat, focused on ecosystems.

Table 2-5 summarizes these beneficial uses, with specific descriptors and nomenclature. The objective of designating beneficial uses for waterbodies is to protect these waters for the intended use by setting relevant water quality standards. Therefore, water quality standards are a direct function of the designated beneficial use of each waterbody. For example, bacterial standards for REC-1 waters (water contact recreation) are stricter than for REC-2 waters (non-contact recreation). A more detailed discussion of beneficial uses can be found in ***Chapter 5***. The designated beneficial uses are reviewed periodically (RWQCB *Triennial Review*) and may be added to, removed or modified.

Table 2-6 shows specific examples of City of Los Angeles waterbodies that have multiple beneficial uses; it also illustrates that identified beneficial uses can change depending on the specific location within the watershed.

A watershed-wide approach is needed for waters that have multiple beneficial uses and that are required to comply with multiple water quality standards.

2.3 Impairments to Water Quality

Impairments are defined to be elevated concentrations of contaminants that are not protective of, and in most cases are harmful to, the designated beneficial use of a waterbody. Impairments may be related to public health, health of marine or freshwater habitat, or aesthetics and appearance. Impairments are usually caused by recognized pollutants such as trash, pathogens, metals and organic chemicals. Waterbodies can also be impaired (or "stressed") by less obvious factors such as temperature, pH and odors. ***Table 2-7*** lists some common categories of impairments.

The four major watersheds in the Los Angeles region have impairments (pollutants or stressors) in various receiving waterbodies as determined by the LARWQCB in the most recently approved (2006) CWA Section 303(d) List, ***Ref. 2-17***; this information is subject to change periodically as better data becomes available (***Appendix 2-5*** contains a sample page from the 2006 303 (d) List).

Table 2-5
Beneficial Use Characterization

The SWRCB has identified certain beneficial use categories for waterbodies to assist in determining the level of impairment of each waterbody. Certain beneficial uses have a higher standard of impairment and will have lower acceptable limits of pollution[1].

Use Category	Beneficial Use	Abbreviation	Description
Population Uses	Municipal and Domestic Supply	MUN	Uses of water for community, military or individual water supply systems including, drinking water supply
	Agricultural Supply	ARG	Farming, horticulture, or ranching; including irrigation, stock watering, or support of vegetation for range grazing
	Industrial Process Supply	PROC	Industrial activities that depend primarily on water quality
	Industrial Service Supply	IND	Uses of water for industrial activities that do not depend on water quality including mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection or oil well re-pressurization
	Ground Water Recharge	GWR	Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of salt water intrusion into freshwater aquifers
	Freshwater Replenishment	FRSH	Uses of water for natural or artificial maintenance of surface water quantity or quality
	Navigation	NAV	Uses of water for shipping, travel, or other transportation by private, military or commercial vessels
	Hydropower Generation	POW	Uses of water for hydropower generation
Recreation and Commercial Uses	Water Contact Recreation	REC-1	Recreational activities involving body contact with water and possibility of ingestion; swimming, wading, water skiing, skin and scuba diving, surfing white water activities, fishing or use of natural hot springs
	Limited Water Contact Recreation	LREC-1	Reduced frequency of use and risk of illness due to recreational contact
	Non-Contact Water Recreation	REC-2	Recreational activities involving proximity to water (non-contact), where ingestion is reasonably possibly; picnicking, sunbathing, hiking, beachcombing, camping, boating, sightseeing, tide pool and marine life study, hunting
	Commercial and Sport Fishing	COMM	Commercial or recreational collection of fish, shellfish, or other organisms intended for bait of human consumption
	Aquaculture	AQUA	Aquaculture or mariculture operations involving aquatic plants and animals for human consumption or bait purposes

Table 2-5 (Continued)
Beneficial Use Characterization*.*

Use Category	Beneficial Use	Abbreviation	Description
Habitat-Related Uses	Warm Freshwater Habitat	WARM	Support and preservation of warm water ecosystems.
	Cold Freshwater Habitat	COLD	Support and preservation of cold-water ecosystems.
	Inland Saline Water Habitat	SAL	Support and preservation of inland saline water ecosystem.
	Estuarine Habitat	EST	Support and preservation of estuarine ecosystems.
	Wetland Habitat	WET	Support and preservation of wetland eco-systems, and other unique wetland functions
	Marine Habitat	MAR	Support and preservation of marine eco-systems
	Wildlife Habitat	WILD	Support and preservation of terrestrial ecosystems
	Preservation of Biological Habitats	BIOL	Support of designated areas or habitats such as Areas of Special Biological Significance (ASBA), established refuges, parks, sanctuaries and ecological reserves
	Rare, Threatened, or Endangered Species	RARE	Support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
	Migration of Aquatic Organisms	MIGR	Support of habitats necessary for migration, acclimatization between fresh and salt water
	Spawning, Reproduction, and/or Early Development	SPWN	Support of high quality aquatic habitats suitable for reproduction and early development of fish.
	Shellfish Harvesting	SHELL	Support of habitats suitable for the collection of filter-feeding shellfish for human consumption, commercial, or sport purposes.

(1) ***Ref. 2-16*** and ***2-18***.

Table 2-6
Beneficial Uses Identified for Selected Area Waterbodies

This table summarizes beneficial uses for waterbodies in the City of Los Angeles that are defined in the Basin Plan and revisions to the basin plan that are part of a "Triennial Review" process (recently reviewed in 2001 and 2004, and currently under review). Source should be consulted for specific beneficial use details and other waterbodies not listed.

Waterbody (Tributary/Reach)	Beneficial Uses[1, 2]				
Los Angeles River Watershed					
Los Angeles River (Reach 1)	MUN(P) WARM SPWN(P)	GWR SHELL IND(P)	LREC-1 RARE	REC-2 MIRG(P)	WILD MAR
Los Angeles River (Reach 2)	MUN(P) WARM	GWR IND(P)	REC-1 WET	REC-2	WILD
Verdugo Wash	MUN(P) WILD(P)	GWR WARM(P)	LREC-1(P)	REC-2(I)	
Pacoima Wash	MUN(P) WARM	GWR	LREC-1(P)	REC-2	WILD
Bull Creek	MUN(P) WARM	GWR(I)	REC-1	REC-2	WILD
Browns Canyon Wash & Creek	MUN(P) WARM(I)	GWR(I)	LREC-1(I)	REC-2	WILD
Compton Creek	MUN(P) WARM	GWR WET	LREC-1	REC-2	WILD
Arroyo Seco Reach 1	MUN(P) WARM(P)	REC-1(I) WET	REC-2(I)	WILD(P)	
Tujunga Wash	MUN(P) WILD(P)	GWR WARM(P)	LREC-1(P) COLD(P)	REC-2(I)	
Aliso Canyon Wash	MUN(P) WILD	GWR(I) WARM	REC-1(I)	REC-2(I)	
McCoy Canyon Creek	MUN(P) WILD	GWR(I) WARM(I)	REC-1(I)	REC-2(I)	
Dry Canyon Creek	MUN(P) WILD	GWR(I) WARM	REC-1(I)	REC-2(I)	
Bell Creek	MUN(P) WILD	GWR(I) WARM(I)	LREC-1(I)	REC-2(I)	
Santa Monica Bay Watershed					
Santa Monica Canyon	MUN(P)	LREC-1	REC-2(I)	WILD(P)	WARM(P)
Topanga Canyon Creek	MUN(P) WARM	REC-1(I) COLD	REC-2(I) MIRG(P)	WILD SPWN(I)	
Marina del Rey	NAV MAR	REC-1 RARE	REC-2 SHELL	COMM	WILD
Ballona Creek Watershed					
Ballona Creek	MUN(P)	LREC-1(P)	REC-2	WILD	WARM(P)
Ballona Creek Estuary	NAV MAR SPWN	REC-1 WILD SHELL	REC-2 RARE IND(P)	COMM MIRG	EST
Ballona Creek to Estuary	MUN(P)	LREC-1	REC-2	WILD(P)	WARM(P)
Dominguez Channel Watershed					
Dominguez Channel Estuary	NAV MAR	LREC-1 WILD	REC-2 RARE	COMM MIRG	EST SPWN
Dominguez Channel to Estuary	MUN(P) WARM(P)	LREC-1(P) RARE	REC-2	WILD(P)	

(1) (P): Potential Use; (I): Intermittent Use.

(2) ***Ref. 2-16***.

Table 2-7
Impairment Categories

Category	Examples of pollutants□indicators	Main concerns
Bacteria/viruses	Fecal coliforms, coliforms, enteroviruses	Infectious diseases of humans
Trash	litter (□5mm)	Aesthetics, leachate, odor
Metals	Copper, zinc, lead, mercury, others	Toxicity, in particular to aquatic life
Organics	PAHs, pesticides, others	Toxicity, in particular to aquatic life
Nutrients/algae	Ammonia, phosphates	Excessive algal growth due to elevated nutrients, potential for causing odor

Specific Los Angeles region "pollutants and stressors" from the List are identified in ***Table 2-8***. While none of the regional waterbodies have all the impairments identified, many waterbodies have multiple impairments. Impairments may reside in the water column, the sediment, or the tissue of aquatic species. Runoff management and compliance with existing and future requirements is a complex task and it is felt that a watershed-wide approach will be the most efficient way to deal with the impairments, as opposed to an approach of addressing individual pollutants one by one.

Table 2-8
Identified Pollutants or Stressors in Los Angeles Region Waterbodies

Bacteria	Enteric Viruses	Nutrients (ammonia, others)
PAH compounds	1,1-DCE	PCE
Aldrin	PCBs	TCE
Chlordane	Dieldrin	DDT
Oil	Foam	pH
Trash	Odors	
□Heavy metals□(including lead, copper, zinc, chromium, selenium, cadmium)		
ChemA: (sum of: aldrin, dieldrin, chlordane, endrin, heptachlor epoxide, heptachlor, HCH, endosulfan, and toxaphene)		

PCE: tetrachloroethylene; DCE: dichloroethane; TCE: trichloroethylene; PCB: polychlorinated byphenols; DDT: dichlorodiphenyltrichloroethane; PAH: polyaromatic hydrocarbons; HCH: hexacyclochlorohexane.

2.4. Summary

- Understanding the interrelationship of pollutants with geography, the unique climate of Southern California, land use and the current and desired use of water resources is critical to understand the scope of the challenge to improve and protect the region's water resources.

- A watershed management approach will require the various responsible cities and agencies to work together in creative new ways to achieve common goals.

References

2-1. Total Maximum Daily Loads for Metals – Los Angeles River and Tributaries (June 2, 2005), California Regional Water Quality Control Board, Los Angeles Region.

2-2. Integrated Regional Water Management Plan for the Santa Monica Bay Watershed, (draft, March 2005), (http://ladpw.org/wmd/watershed).

2-3. Los Angeles County Department of Public Works, http://ladpw.org/wmd/watershed.

2-4. Santa Monica Bay Beaches Wet Weather Bacteria TMDL (Draft, June 2002), http://www.swrcb.ca.gov/rwqcb4/html/meetings/tmdl/santa_monica/02_0621_smb_staff_report.pdf

2-5. Dominguez Watershed Management Master Plan (April 2004), http://ladpw.org/wmd/watershed/dc/DCMP/masterplan.cfm.

2-6. National Weather Service Forecast Office, Los Angeles/Oxnard, (http://www.wrh.noaa.gov/lox/climate/cvc.php).

2-7. National Weather Service website, http://www.nwsla.noaa.gov/.

2-8. Los Angeles County Rainfall Data, http://www.ladpw.org/wrd/publication/RainDepth(50yr_24hr-rain.shp.

2-9. Water Integrated Resources Plan (2004).

2-10. Stein, E.D., L.L. Tiefenthaler and K.C. Schiff (2007), "Southern California Coastal Water Research Project," Costa Mesa, CA.

2-11. Southern California Association of Governments (SCAG). Land-use data from 2005 (restricted data obtained under user agreement). Growth factor data from http://www.scag.ca.gov/ forecast/index.htm.

2-12. Steven E. Polzin (March 2004). "The Relationship between Land Use, Urban Form and Vehicle Miles of Travel: the State of Knowledge and Implications for Transportation Planning," prepared for the Florida Department of Transportation.

2-13. Patricia S. Hu, (December 2004), "Summary of Travel Trends, 2001 National Household Travel Survey," prepared for the U.S. Department of Transportation.

2-14. U.S. Department of Transportation, Federal Highway Administration, "Highway Statistics." (http://www.fhwa.dot.gov/policy/ohpi/hss/hsspubs.htm).

2-15. Projection of data from 2000-2005 to 2028 found in "The 2007 Urban Mobility Report," by Texas Transportation Institute (T. Lomax & D. Schrank) (September 2007).

2-16. Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (1994), California Regional Water Quality Control Board, Region 4. (http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/)

2-17. Regional Water Quality Control Board (2006). CWA Section 303(d) List, (http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r4_06_303d_reqtmdls.pdf).

2-18. Trim, Heather (2001). Beneficial uses of the Los Angeles and San Gabriel Rivers. Los Angeles & San Gabriel Rivers Watershed Council.

Chapter 3
Water Quality

City of Los Angeles departments and other agencies in the City frequently sample our waters to determine the water quality. Most of these monitoring programs are driven by regulations: they are directed by the NPDES MS4 permit and TMDLs. Comparison of water quality data with the water quality standards is important to determine the current status of our waters, to demonstrate regulatory compliance and to prioritize the areas that will need to be the focus of future pollution reduction efforts. So far, water quality monitoring has mostly focused on the pollutants that are on the 303(d) List of impaired waters, but less data are available for the pollutants that may be regulated in the future. There also is a lack of knowledge of the distribution of pollutants at the sub-regional level and the local or parcel level.

3.1 Introduction

All of the City's receiving waters have water quality standards that are defined by the LARWQCB in the Basin Plan. These standards are used for establishing water quality numeric targets in the TMDLs. While the regulatory background of water quality standards and TMDL targets is further discussed in ***Chapter 5***, the purpose of this chapter is to compare the existing water quality of the City's rivers, lakes and coastal waters with the water quality numeric targets. City departments and other agencies monitor the quality of the City's waters on a regular basis by taking samples and analyzing these samples in the laboratory for bacteria, metals and other pollutants. By comparing actual pollutant concentrations with the numeric targets, the current status of our waters can be determined. This comparison is also needed for developing urban runoff management strategies and selecting Best Management Practices (***Chapter 6***) to improve the water quality of the waters that are impaired.

3.2 Water Quality Numeric Targets

This section summarizes the water quality numeric targets for the City's waters for which TMDLs have been adopted, ***Table 3-1***. ***Appendix 3-1*** provides a complete listing of these targets, categorized by pollutant and by water body. Water quality numeric targets for impaired waters that still do not have a TMDL are likely to change as the LARWQCB continues with developing these TMDLs. Any discussion of these future targets, therefore, would be premature.

Trash: The LARWQCB has established trash targets for Los Angeles River, Ballona Creek and Machado Lake. While trash does not necessarily impose a threat to public health, the presence of trash is unaesthetic and has a negative impact on aquatic life and wildlife. The trash numeric target requires that all particles larger than 5 mm be removed from urban runoff before it enters the receiving water, ***Table 1*** in ***Appendix 3-1***. This target shall be met at all times except for storms larger than the 1-year 1-hour storm event. In order to comply with trash TMDL compliance milestones (phased reductions ending by 2015/2016, ***Table 7-1***), the City of Los Angeles is

Table 3-1
Overview of Water Quality Standards in Adopted TMDLs

Water Quality Standard	Receiving Water Body	Chapter Reference
Trash	Los Angeles River Ballona Creek Machado Lake	3-1 3-2 3-3
Bacteria	Santa Monica Bay Ballona Creek and Sepulveda Channel Marina del Rey Harbor (Back Basins) Los Angeles Harbor (Inner Cabrillo Beach and Main Ship Channel)	3-4, 3-5 3-6 3-7 3-8
Metals	Los Angeles River Ballona Creek	3-9 3-10
Toxic pollutants(1)	Ballona Creek (Estuary) Marina Del Rey Harbor (Back Basins)	3-11 3-12
Nutrients	Los Angeles River	3-13

(1) Toxic pollutants include some metals.

equipping catch basins in the City with inserts and screens to prevent trash from entering the storm drain system, ***Chapter 7***.

Bacteria: The water quality numeric targets for bacteria correspond to an acceptable level of risk of human illness associated with the presence of pathogenic organisms in waters used for recreation. The analysis of pathogens usually is time-consuming and expensive. Therefore, the bacterial quality of waters is assessed by analyzing the water for total and fecal coliforms, enterococcus and *E. coli*, because these indicator bacteria can be determined relatively fast and at competitively low cost. Although these bacteria are not necessarily pathogenic for humans, and some strains of *E.coli* are indeed known human pathogens, they are often used as indicators of probable contamination of natural waters by sewage. As shown by ***Table 2*** in ***Appendix 3-1***, the City of Los Angeles currently has to comply with bacterial numeric targets in Santa Monica Bay, Ballona Creek, Ballona Creek Estuary, Sepulveda Channel, Marina del Rey Harbor (Back Basins) and Los Angeles Harbor (Inner Cabrillo Beach and Main Ship Channel). The applicable targets depend on the beneficial use designated for the water. For example, numeric targets for waters with water-contact recreation (REC-1 beneficial use) are stricter than for recreational waters without direct contact with water (REC-2 beneficial use). Also the type of water, fresh water or seawater, is a determining factor.

Metals: Waters within the Los Angeles River and Ballona Creek watersheds are waters in the City of Los Angeles that so far have to meet water quality numeric targets for metals. The metals for which targets have been developed are cadmium, copper, lead, selenium and zinc. As can be seen in ***Table 3*** in ***Appendix 3-1***, the metal numerical targets are not the same for each water body that is regulated. In particular for the Los Angeles River, the numerical targets vary along the course of the river. This is because segments of the river have different beneficial uses. In general, the beneficial uses that are most likely impacted by metals are related to habitats and aquatic life (for example, the WILD, WARM, RARE, WET and MAR beneficial uses in ***Table 2-7***) and water supply (the MUN and GWR beneficial uses in ***Table 2-7***). Other factors that may influence the value of the metal numeric targets include the flow rate in the river (dry-weather versus wet-weather flow) and the hardness of the water (this has an impact on the toxicity of metals to aquatic life).

Toxics: A major challenge when dealing with these regulations is that the identity of the pollutants that cause the toxicity is often unknown. Therefore, special studies are often done (and required by LARWQCB) to identify those pollutants so that subsequent mitigation efforts can be more focused towards reducing the toxicity. Toxicity is a concern for sediments and the water column. At present, only Ballona Creek (specifically its estuary) and Marina del Rey Harbor (Back Basins) have TMDLs that address toxicity, ***Table 4*** in ***Appendix 3-1***. The Ballona Creek estuary has toxic numeric standards for its sediment with numerical targets for metals (cadmium, copper, lead, silver) and organic compounds (chlordane, DDT, PCBs, PAHs). Likewise, several metals and organics have been regulated for the sediment in the Back Basins of Marina del Rey Harbor. Regulation of toxics in Dominguez Channel and Los Angeles Harbor is expected soon.

Nutrients: Water quality numeric targets for nutrients usually concern nitrogen and phosphorus. For the City of Los Angeles, nutrient numeric targets have only been established for certain nitrogen-containing compounds in the Los Angeles River. During dry weather, most of the flow in the Los Angeles River is comprised of wastewater effluent from three Publicly Owned Treatment Works (POTWs) in the Los Angeles River watershed: the Donald C. Tillman Water Reclamation Plan, the Los Angeles-Glendale Water Reclamation Plant and the Burbank Water Reclamation Plant. These plants are major point sources of nitrogen in the Los Angeles River, and their effluents must meet the numeric targets listed in ***Table 5*** in ***Appendix 3-1***, starting in 2007. A TMDL regulating algae, eutrophic conditions and ammonia in Machado Lake is expected soon, although it is not sure yet whether nutrients are the cause of these impairments.

3.3 Water Quality Monitoring Programs

3.3.1 Monitoring Requirements

The requirements of monitoring programs – sampling locations, type of pollutants, analytical procedures, etc. - depend on the purpose of monitoring. Many monitoring programs in the City of Los Angeles are obligatory to demonstrate compliance with water quality numeric targets and other regulations. The requirements of those programs are defined by regulatory agencies. For example, many TMDLs require the development of Coordinated Monitoring Plans (CMPs) by the City of Los Angeles and other responsible agencies, which are subsequently reviewed and approved by the LARWQCB. Additional monitoring requirements have been developed by the SWRCB in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (***Ref. 3-14***). This list of impaired waters is reviewed and updated by the SWRCB once every two years based on the available water quality data.

3.3.2 Existing Monitoring Programs

There are many sources where information can be found about the quality of the waters in the City of Los Angeles, a summary of which is in ***Appendix 3-2.*** Among water quality monitoring programs, there are important differences with respect to their status (ongoing, completed or being developed), their focus (watershed-wide or local) and their duration (short-term or long-term). Long-term monitoring programs that consistently and frequently monitor the water quality in multiple locations of the watershed are the most valuable for comparing water quality numeric targets with actual water quality data. ***Table 3-2*** summarizes the monitoring programs that have been reviewed for the development of the WQCMPUR. The maps with monitoring locations, ***Appendix 3-3***, show that all major waters in the City of Los Angeles are being and will be monitored, often by more than one monitoring program.

Referring to ***Table 3-2***, there are several categories of monitoring programs:

- Most NPDES permits require monitoring. As the primary permit holder, Los Angeles County coordinates monitoring under the NPDES MS4 permit. This program includes Mass Emission Monitoring for estimating pollutant mass emissions from the storm drain system and Tributary Monitoring for identifying subwatersheds that contribute to exceedances of water quality standards. In addition, POTWs and industrial facilities with NPDES permits have programs for monitoring their effluents;

- The Status & Trends Monitoring Program was started by the City of Los Angeles in 1999. This program monitors metals and bacteria at several locations in Los Angeles River, Ballona Creek and Dominguez Channel and their tributaries to get a better understanding of the sources and distribution of pollutants and to identify high-pollution areas in the watersheds. The results of the Status & Trends Monitoring Program support the development of TMDLs and many Status & Trends monitoring locations have been included in the CMPs for TMDLs;

- As noted earlier, many TMDLs require the development of a CMP for approval by the LARWQCB. The City of Los Angeles is currently monitoring for compliance with the bacteria TMDLs in Santa Monica Bay, Marina del Rey Harbor and Los Angeles Harbor. Several CMPs for metals and toxic pollutants have been developed and are awaiting approval by the LARWQCB, or are currently being developed; and

Table 3-2
Major Monitoring Programs

Monitoring Program'Purpose	Monitoring agencies	Monitoring locations	Sampling Frequency[4]	Pollutants	Monitoring Since[5]	Chapter Reference
Mass Emission Monitoring (NPDES MS4 permit)	LA County, City of Los Angeles	Figure 1, 2 (App. 3-3)	Minimum 5 times a year	Over 120 pollutants	1994	3-15
Wastewater treatment plants[1] (NPDES permits)	City of Los Angeles & Burbank	At the plants	Daily/ Weekly/ Monthly/ Quarterly	BOD/COD, metals, toxics, nutrients, and organics	1975	
Other[2] (NPDES permits)	Permittee	Various	Various	Various	Various	
Status & Trends[3]	City of Los Angeles	Figure 3, 4, 5 (App. 3-3)	Various	Metals and Bacteria	1999	
Los Angeles River Metals TMDL	City/ County of Los Angeles DPW	Figure 6 (App. 3-3)	Monthly	Copper, Lead, Selenium, Zinc, and Cadmium	CMP submitted in 2007	3-16
Los Angeles River Nutrients TMDL	City of Los Angeles/ Burbank	At the wastewater treatment plants	Daily	Ammonia, Nitrate, and Nitrite	CMP submitted in 2005	3-17
Santa Monica Bay Beaches Bacteria TMDLs	City of Los Angeles, LA County (J2 & J3)	Figure 7 (App. 3-3)	Daily/ Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2004	3-18
Ballona Creek Metals TMDL	City of Los Angeles	Figure 8 (App. 3-3)	Monthly	Copper, Lead, Selenium, Zinc, and Cadmium	CMP submitted in 2007	3-19
Ballona Creek Bacteria TMDL	City of Los Angeles	Figure 9 (App. 3-3)	Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	CMP submitted in 2008	3-20
Ballona Creek Estuary Toxics Pollutants TMDL	City of Los Angeles	Figure 10 (App. 3-3)	Monthly	Copper, Lead, Cadmium, Silver, Zinc, Chlordane, DDTs, PCBs, and Total PAHs	CMP submitted in 2007	3-19
Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL	City of Los Angeles, LA County	Figure 11 (App. 3-3)	Daily/ Weekly/ Monthly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2007	3-21
Marina del Rey Harbor Mothers' Beach and Back Basin Toxic Pollutants TMDL	County of Los Angeles DPW	Figure 12 (App. 3-3)	Daily/ Weekly/ Monthly	Total coliform, Fecal coliform, Enterococcus, and E. coli	CMP submitted in 2007	3-22

Table 3-2 (Continued)
Major Monitoring Programs

Monitoring Program	Monitoring agencies	Monitoring locations	Sampling Frequency(4)	Pollutants	Monitoring Since(5)	Chapter Reference
Los Angeles Harbor Bacteria TMDL	City/ County of Los Angeles DPW	Figure 13 (App. 3-3)	Daily/ Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2005	

(1) For example, City of LA Hyperion Treatment Plant, Burbank Treatment Plant, others.
(2) For example, DWP Scattergood, LA World Airports, Southern California Edison, others.
(3) The Status & Trends Monitoring Program monitors in the LA River, Ballona Creek and Dominguez Channel watersheds.
(4) Daily sampling is five, six or seven times per week.
(5) Monitoring usually starts six months after approval of the CMP by LARWQCB.

- Many other organizations also perform water quality monitoring in the City of Los Angeles, including environmental organizations such as Santa Monica BayKeeper and Heal the Bay and research organizations such as Southern California Coastal Water Research Project (SCCWRP).

3.4 Water Quality Data

Most of the available water quality data concern metals and bacteria. Less is known about the presence and distribution of other pollutants in the City of Los Angeles watersheds.

In order to develop and select strategies for reducing pollutants in urban runoff, it must be known how much the pollutant concentrations exceed the water quality numeric targets. Clearly, while a 10% reduction of a pollutant may be achieved relatively easily, a reduction of, for example, 90% or greater requires implementation of highly effective control measures, or perhaps the implementation of a series of control measures. This comparison of pollutant concentrations with the applicable targets is a complex exercise that must take many factors into account, including the following:

- Reliability of water quality data;
- Variation of pollutant concentrations over time;
- Spatial variation of pollutant concentrations within the watershed or the water body;
- Variation of pollutant concentrations during dry and wet weather;
- Spatial variation of water quality numeric targets within the watershed or the water body; and

- Difference of water quality numeric targets for dry and wet weather conditions.

Metals are one group of pollutants for which a lot of data exists. Dissolved metals cause toxicity in aquatic life and this toxicity is affected by the pH and temperature. Using copper as an example of one of the five metals in the Los Angeles River Metals TMDL, ***Figure 3-1*** (dry weather) and ***Figure 3-2*** (wet weather) illustrate the complexity by showing for each one of the six reaches in the river the TMDL numeric target, the average concentration and the 95 percentile concentration of copper. It can be noted that these three parameters vary considerably along the river, which would imply that assessment of individual river segments is required instead of the "one size fits all" approach. In addition, the numeric targets and trends of the copper concentrations are different during dry and wet weather conditions.

Bacteria are a second group of pollutants for which a relatively large number of water quality data is available. Bacteria monitoring under the Santa Monica Bay Beaches Bacteria TMDLs started in 2004. As an example, ***Figure 3-3*** shows the compliance with bacterial standards at various locations along the coastline during the summer dry-weather period (April through October) of 2007. The implementation of Low-Flow Diversions (LFDs) at the major storm drain outfalls (***Chapter 7***) has greatly reduced the number of exceedances at the beach during the summer.

Numeric targets for bacteria are sometimes more frequently exceeded during the winter period (November through March), ***Figure 3-4*** versus ***Figure 3-5***. This increase can mainly be attributed to two main factors:

- Currently, urban runoff in the winter period is discharged into the ocean rather than diverted to the sewer system through the LFDs. This is because the capacity of the LFDs is not sufficient for handling the larger volume of urban runoff in the winter. The capacities of the LFDs are currently being increased for meeting the Dry-Weather Santa Monica Bay Beaches Bacteria TMDL requirements for winter runoff (compliance required by 2009, ***Table 7-1***); and

- Bacterial loadings strongly increase during storm events, which typically occur in the winter. ***Section 7.3.1.2*** discusses the various projects that are currently being implemented to comply with the Santa Monica Bay Beaches Bacteria Wet Weather TMDL.

The scattering of fecal coliform data in ***Figure 3-5*** illustrates the challenges when evaluating the bacteria quality of the water at the beaches, in particular in the winter and during storm events. Similar scattering of data has been observed for total coliforms and enterococcus. Implementation plans for bacteria TMDLs will need to address this variability to ensure compliance with numeric targets of all regulated indicator bacteria.

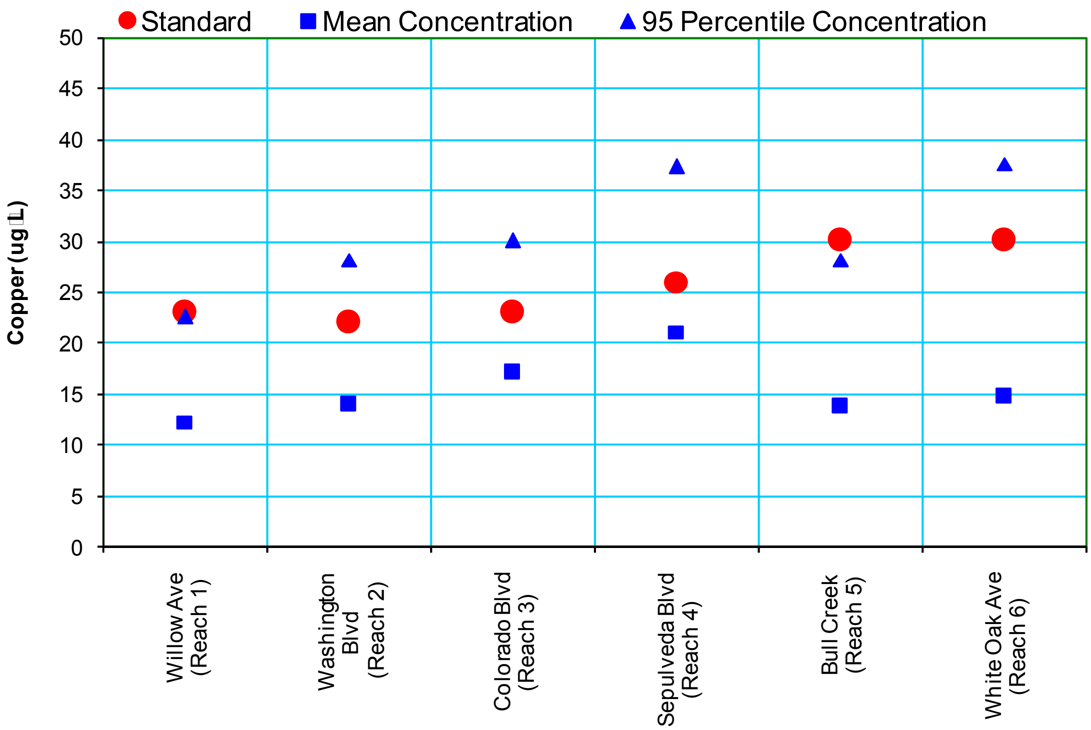


Figure 3-1
Dry Weather Copper Concentrations and Numeric Targets in Los Angeles River
Data from City of Los Angeles Status & Trends Monitoring Program (2001-2006).

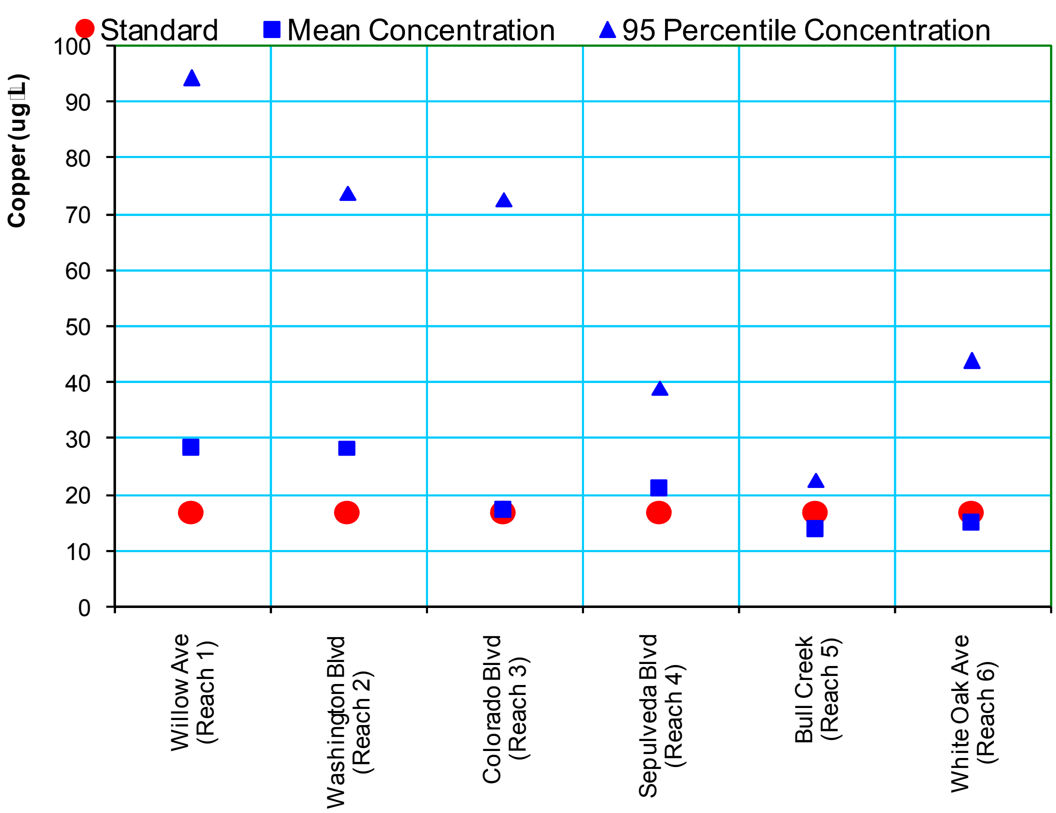


Figure 3-2
Wet Weather Copper Concentrations and Numeric Targets in Los Angeles River
Data from City of Los Angeles Status & Trends Monitoring Program (2001-2006).

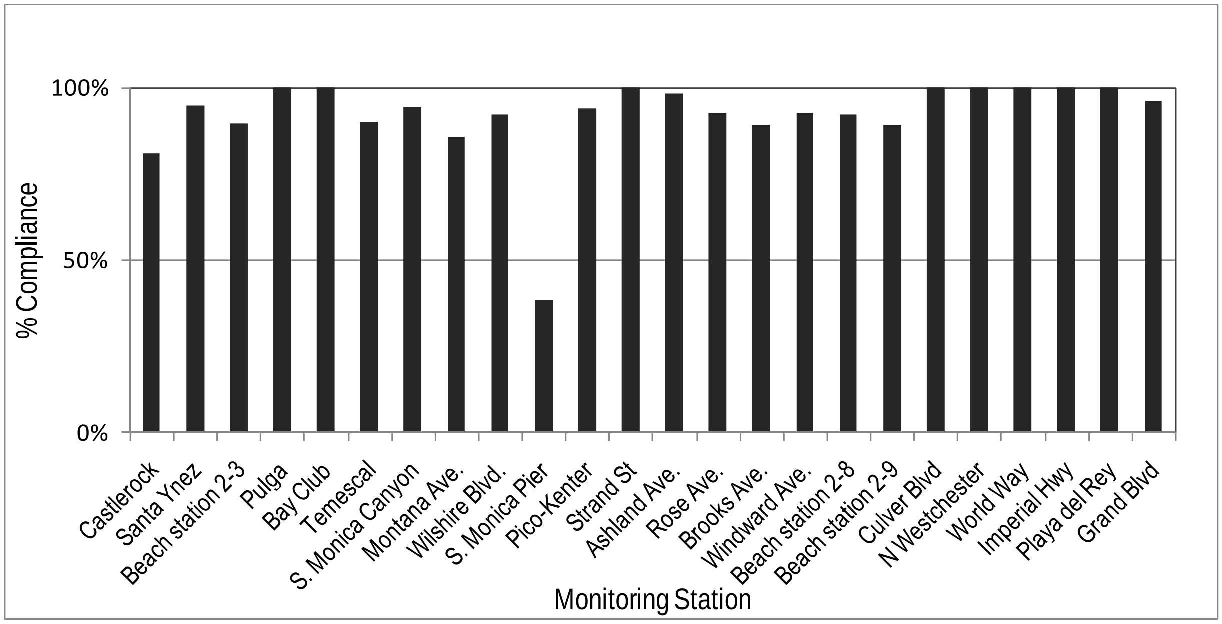


Figure 3-3
Compliance Levels with the Santa Monica Bay Beaches Bacteria TMDL at the Northern Monitoring Stations that Receive Urban Runoff from the City of Los Angeles (Apr Oct, 2007)
Percentage compliance is the ratio of samples meeting all numeric targets for bacteria and the total number of samples taken.

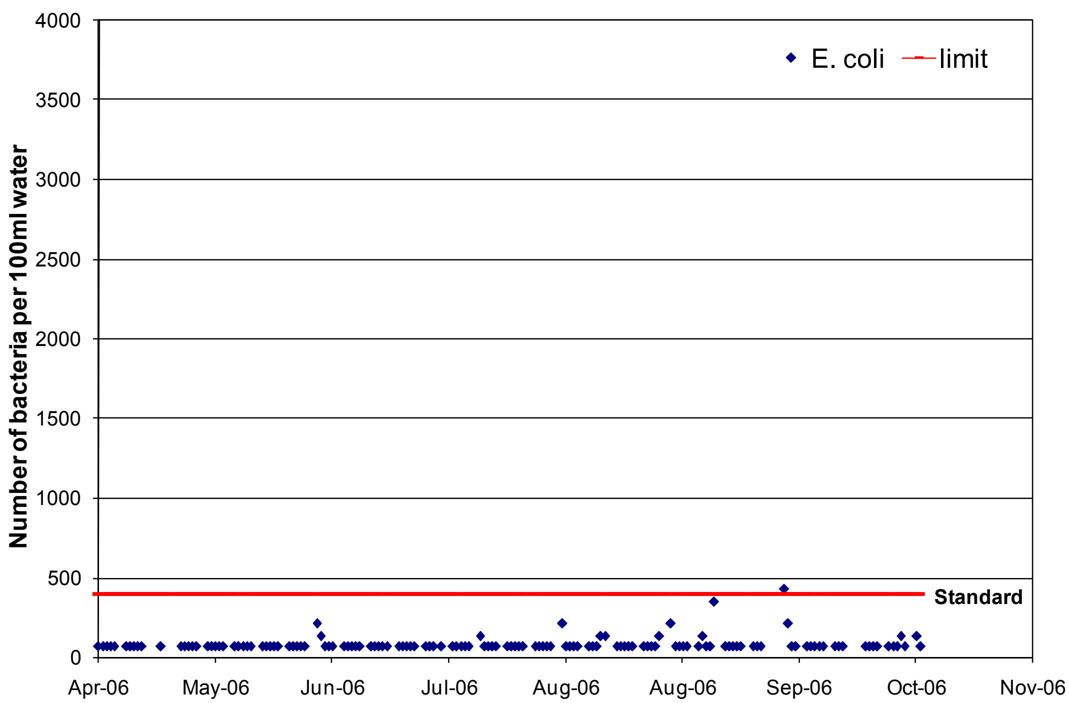


Figure 3-4
Fecal Coliforms at a Beach at Santa Monica Canyon during Summer (Apr Oct, 2007)
Monitoring by City of Los Angeles on behalf of the responsible agencies as described in ***Ref. 3-18***.

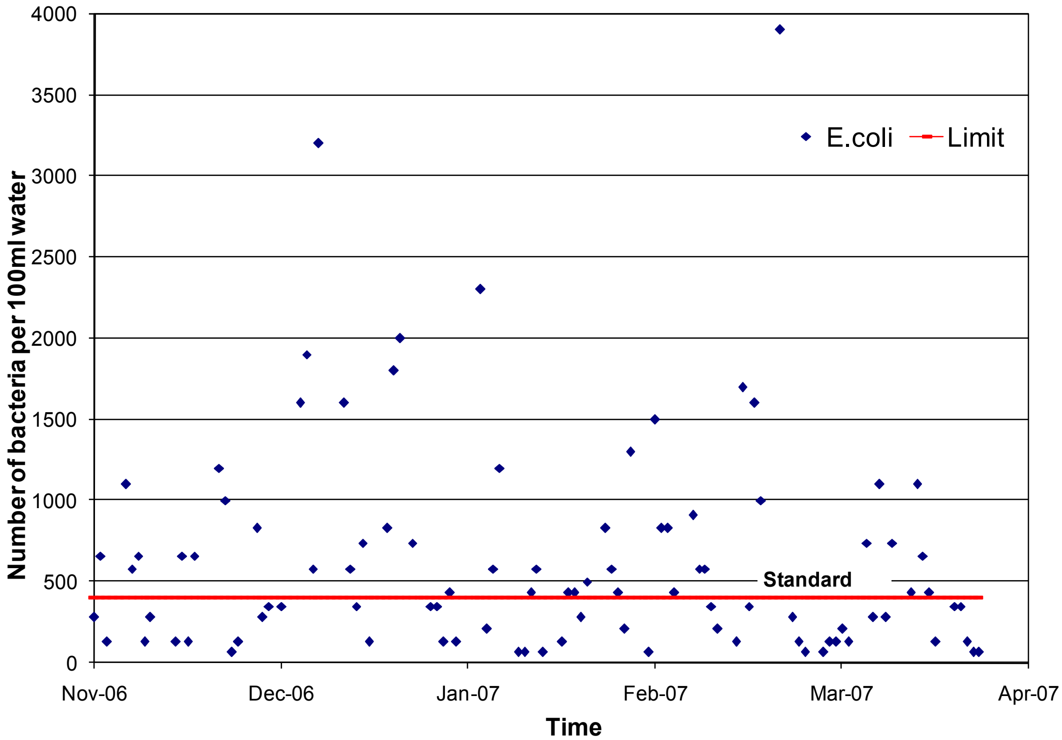


Figure 3-5
Fecal Coliforms at a Beach at Santa Monica Canyon during Winter (Nov 2006 Mar 2007)
Monitoring by City of Los Angeles on behalf of the responsible agencies as described in ***Ref. 3-18.***

3.5 Water Quality Data Gaps

The availability of sufficient and reliable water quality data is a prerequisite for the development of strategies for reducing urban runoff pollution. The previous sections of this chapter have identified various data gaps:

- Most of the available water quality data concerns pollutants that are included on the 303(d) List of impaired waters. There is limited water quality data of the pollutants that will be regulated in the future;

- The water quality data gaps become more apparent when descending from the watershed to the parcel level. Water quality data of receiving water bodies (watershed level) are relatively abundant as it provides the basis for 303(d) List of impaired waters, even though many gaps may still exist. WPD is working together with the LARWQCB to close these gaps by additional monitoring, so that future TMDLs will be developed on a scientific basis. Water quality data of tributaries and major storm drains (regional or sub-regional level) that discharge into receiving water bodies is sparse. These data are needed to identify major pollution sources and their distribution within a watershed. Water quality data of local storm drains (local or parcel level) is almost non-existent, but is needed to identify locations for targeting source reduction and capture and treatment of runoff; and

- In an attempt to address water quality data gaps, the LARWQCB is requiring all new NPDES permits for POTWs to include an integrated regional monitoring program. In response to this new permit requirement, the Los Angeles River watershed POTWs with the assistance of a working group coordinated by the Los Angeles and San Gabriel Rivers Watershed Council recently developed the Los Angeles River Watershed-Wide Monitoring Program. This program provides a framework for monitoring at the watershed scale by:

  - Expanding the monitoring of ambient conditions related to key beneficial uses to the entire watershed;

  - Attempting to improve the coordination and cost-effectiveness of disparate monitoring efforts; and

  - Providing a framework for periodic and comprehensive assessments of watershed condition.

Monitoring under this program began in 2008 and will address the following five core management questions:

- What is the condition of streams in the watershed?
- Are conditions at areas of unique interest getting better or worse?
- Are receiving waters near discharges meeting water quality objectives?
- Is it safe to swim?
- Are locally caught fish safe to eat?

3.6 Summary

The main conclusions of this chapter are:

- Many water quality monitoring plans have been and are being developed in the Los Angeles region. The focus of most of these programs is to evaluate the water quality of receiving waters and to verify compliance with the numeric targets for pollutants in receiving waters.

- Comparison of the concentrations of and numeric targets for pollutants often is site- and pollutant-specific.

- Water quality data gaps become larger for the pollutants that will be regulated in the further future (as opposed to pollutants that are already regulated or will be regulated in the near future).

- For the prioritization of high pollution generating areas and the development of pollution reduction measures, there is a need for more water quality data in the tributaries and storm drains that transport pollutants to the receiving waters.

References

3-1. Los Angeles Regional Water Quality Control Board (2007). Total Maximum Daily Load for Trash in the Los Angeles River Watershed; Resolution No. 07-012.

3-2. Los Angeles Regional Water Quality Control Board (2004). Total Maximum Daily Load for Trash in the Ballona Creek and Wetland; Resolution No. 04-023.

3-3. Los Angeles Regional Water Quality Control Board (2007). Total Maximum Daily Load for Trash in Machado Lake; Resolution No. R4-2007-006.

3-4. Los Angeles Regional Water Quality Control Board (2002). Total Maximum Daily Load for Bacteria at Santa Monica Bay Beach; Resolution No. 02-004.

3-5. Los Angeles Regional Water Quality Control Board (2006). Wet Weather Total Maximum Daily Load at Santa Monica Bay Beach Bacteria; Resolution No. 2006-006.

3-6. Los Angeles Regional Water Quality Control Board (2006). Total Maximum Daily Load for Bacteria in Ballona Creek, Ballona Estuary and Sepulveda Channel; Resolution No. 2006-011.

3-7. Los Angeles Regional Water Quality Control Board (2006). Total Maximum Daily Load at Marina del Rey Mother's Beach and Back Basins Bacteria; Resolution No. 2006-009.

3-8. Los Angeles Regional Water Quality Control Board (2004). Total Maximum Daily Load for Bacteria at Los Angeles Harbor (Inner Cabrillo Beach and Main Ship Channel); Resolution No. 2004-011.

3-9. Los Angeles Regional Water Quality Control Board (2007). Total Maximum Daily Load for Metals in Los Angeles River; Resolution No. R2007-014.

3-10. Los Angeles Regional Water Quality Control Board (2007). Total Maximum Daily Load for Metals in Ballona Creek; Resolution No. R2007-015.

3-11. Los Angeles Regional Water Quality Control Board (2005). Total Maximum Daily Load for Toxic Pollutants in Ballona Creek Estuary; Resolution No. R05-008.

3-12. Los Angeles Regional Water Quality Control Board (2005). Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor; Resolution No. 2005-012.

3-13. Los Angeles Regional Water Quality Control Board (2003). Total Maximum Daily Load for Nitrogen Compounds and Related Effects in the Los Angeles River; Resolution No. 03-016.

3-14. State Water Resources Control Board (2004). Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List; Adopted September 2004.

3-15. County of Los Angeles Department of Public Works (2007). Los Angeles County 2006-07 Stormwater Monitoring period (www.ladpw.org/WMD/npdes/2006-07tc.cfm).

3-16. City of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Los Angeles River Metals TMDL; Submitted to RWQCB in 2007.

3-17. City of Los Angeles and other responsible agencies (2005). Coordinated Monitoring Plan for Los Angeles River Nutrients TMDL; Submitted to RWQBC in 2005.

3-18. City of Los Angeles and other responsible agencies (2004). Coordinated Monitoring Plan for Santa Monica Bay Beaches Bacteria TMDL.

3-19. City of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Ballona Creek Metals and Ballona Creek Estuary Toxic Pollutants TMDL; Submitted to RWQCB in 2007.

3-20. City of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Ballona Creek, Ballona Creek Estuary and Sepulveda Channel Bacteria TMDL; Document in progress, due to RWQCB April, 2008.

3-21. County of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Marina del Rey Harbor and Mothers' Beach and Back Basins Bacteria TMDL.

3-22. County of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Marina del Rey Harbor and Mothers' Beach and Back Basins toxics TMDL; Submitted to RWQCB in 2007.

Chapter 4
Pollutants

4.1 Introduction

Urban runoff, whether dry weather or stormwater generated, collects sediments, pathogens, fertilizers, nutrients, hydrocarbons, metals and other pollutants as it travels through an urban area. Pavement and compacted areas, roofs, reduced tree canopy and limited open areas are all factors that increase urban runoff (both volume and peak flowrates) and pollutant loads that degrade water quality and habitats. Dry-weather flows such as washwater, over-irrigation and illicit discharges have also been documented as being significant sources of pollutants during dry-weather conditions (***Ref. 4-1***).

Urban runoff pollutants usually are anthropogenic but are sometimes from natural sources (***Ref. 4-2***). Source identification is a necessary element to develop an effective water quality implementation strategy. In addition to local studies (for example, ***Ref. 4-3***), numerous studies throughout the U.S. have examined the typical sources of urban runoff and associated pollutants. ***Appendix 4-1*** provides a summary list of the pollutants of concern in the Los Angeles region, their general sources in the environment, and their primary sources in urban runoff; it also summarizes the possible environmental impacts and adverse public health effects. As was discussed in ***Chapter 3***, most of the studies of watershed pollution have focused on the receiving waterbodies – not on the upstream watershed or sub-watershed. This has created some degree of uncertainty regarding the specific sources of many pollutants. The subsequent sections provide a more detailed discussion of the known sources of pollutants.

4.2 Classes of Pollutants

Trash: Trash or litter (such as plastic bags, aluminum cans, plastic bottles, polystyrene products, and paper) is found throughout the watersheds, and is transported via storm drains and is subsequently discharged into the receiving waterbodies. Trash may also reach the receiving waterbodies through direct deposition. Based on regional litter characterization studies, plastics are not only the most environmentally damaging component but also one of the most abundant as shown in ***Table 4-1*** (***Ref. 4-4***).

Table 4-1
Characterization of Trash in Urban Runoff
Trash characterization conducted by Caltrans and UCLA over multiple sites and storm events.

Category	River Clean-up[1]	Catch Basin Cleaning[2]		Freeway Catch Basins	
	Volume (□)	Weight (□)	Volume (□)	Weight (□)	Volume (□)
Plastic-Bags	34	25	19	7	12
Plastic-Film		30	24		
Plastic-Moldable	15	9	19	21	16
Polystyrene	3	7	17	5	15
Paper	4	20	17	9	14
Cloth	18	3	1	6	5
Metal	19	4	3	13	5
Wood	2	1	1	16	10
Glass	1	0	0	1	0
Cardboard	3	0	0	10	11
Cigarette Butts	0	0	0	10	11
Other	0	1	0	2	1

(1) Sorting activity undertaken as part of the Los Angeles River Clean-up Event that occurred on April 30, 2004.
(2) Sorting activity of material collected on June 10, 2004.

The City has studied how trash is generated within the City of Los Angeles based on the amount of trash retrieved by the crews that clean the catch basins (***Ref. 4-5***). The study's results were based on data from 1999 to 2004 and are expressed as annual generation rates (cf/ac-yr). Data indicates that the central part of the City contributes disproportionately more trash per unit area. The central part of the City is characterized with higher population density, has more commercial and industrial areas, and has more pedestrian traffic than other areas of the City. This central part has already been targeted for priority installation of screens and inserts at catch basins to reduce trash from discharging into the Los Angeles River and Ballona Creek. Catch basins in the "medium" trash generation areas will be retrofitted with screen covers on the openings during the next few years. The medium and high trash generation areas in the City are depicted in ***Figure 4-1***.

Metals: Certain metals, including lead, copper and zinc (sometimes referred to as "heavy" metals), can be toxic to aquatic life at relatively low concentration and tend to accumulate in the food chain (***Ref. 4-6***). It is generally concluded that the primary sources of metals in stormwater can be traced to weathering or wearing of a variety of metal-containing surfaces. Numerous studies have identified metal generation as being derived from automobile activities. One study, conducted in the San Francisco Bay area **(*Ref. 4-7*)**, concluded automobile-related activities were primary pollution sources in urban runoff for certain metals including copper (80% of total) and zinc (80%). A number of studies have found elevated amounts of metals along transportation corridors as well as from weathering of roof surfaces (***Ref. 4-8, 4-9*** and ***4-10***). The Center of Environmental Science at the Leiden University in the

Netherlands found that a major source of zinc in stormwater is corrosion from buildings (***Ref. 4-11***). Therefore, understanding the distribution of metallic surfaces such as roofs, and of automobile activities in the watershed, will assist in identifying the spatial distribution of metal pollution generation.

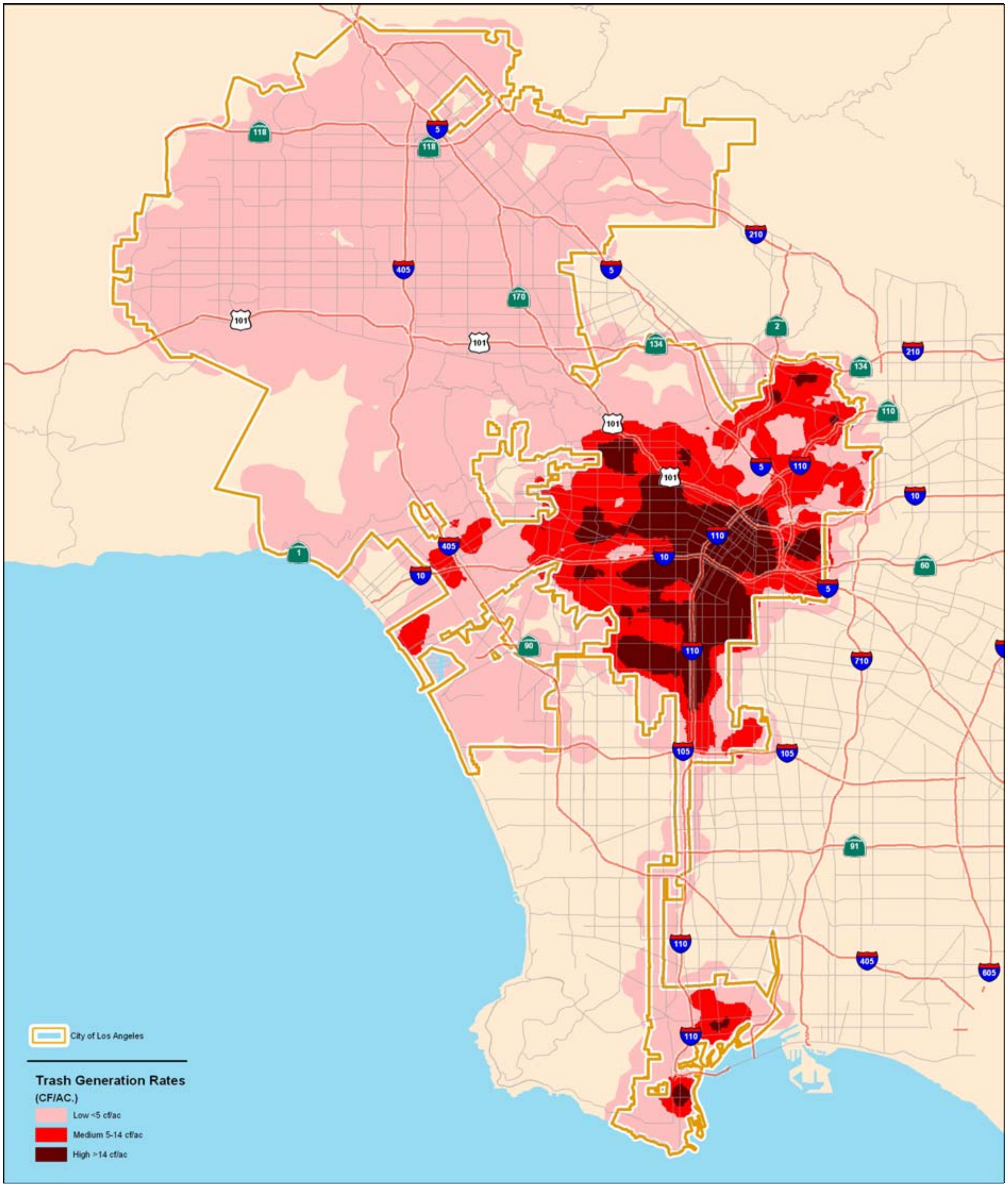


Figure 4-1
High Trash Generation Areas

T he three key metals having multiple listings in the various reaches of the local waterbodies are copper, zinc and lead and to a lesser extent, cadmium and selenium. With respect to copper, the dominant source in urban areas appears to be the friction material used in automobile brake pads, followed by wear of building materials and the use of copper-containing substances used in landscaping. The single largest source of zinc has been found to be automobile tires; secondary sources are asphalt and zinc-coated surfaces such as galvanized steel. Finally, with respect to lead, its historical source has been its use in gasoline and the subsequent deposition from exhaust emissions. Currently, the concentration of lead in gasoline is significantly lower than historic levels. However, lead still persists in sediments and finds its way to receiving waterbodies during rain events.

Watershed Protection Division (WPD), as part of past studies, has mapped both the traffic and the atmospheric deposition of those three metals. The maps from that study can be found in ***Appendix 4-2***. Maps 1 and 2 relate to traffic density and Maps 3, 4 and 5 illustrate the atmospheric deposition of copper, lead and zinc (***Ref. 4-12***). Atmospheric deposition is more concentrated in downtown Los Angeles, which seems to correlate to some extent with local traffic patterns. However, the maps also indicate that there is a wide distribution of these three metals with significant presence in non-urbanized areas.

Due to the geographically widespread and non-point nature of generation of the metals, local structural projects might not result in the reduction that is required for compliance. However non-structural source control efforts that target the generation of the pollutants, especially targeting their use in automobiles, may provide significant reduction opportunities.

Bacteria: An epidemiological study by the Santa Monica Bay Restoration Commission in 1995 linked illness from swimming in the Santa Monica Bay to the exposure to bacteria from urban runoff discharges (***Ref. 4-13***), but there is a significant information gap regarding the sources, fate, and transport of these bacteria. Existing bacteria standards are based on the analyses for total coliform, fecal coliform and/or enterococci (indicator bacteria), but there is increased discussion about changing the focus to common pathogens such as enteric bacteria. Past studies have made direct association between increased urban land use and increasing bacterial loadings from urban runoff. WPD data, summarized in ***Chapter 3***, indicates that precipitation and water quality are closely associated. Increased precipitation levels result in higher bacteria concentrations in the receiving water.

Recently completed and ongoing studies in our region that have attempted to close this knowledge gap. Bacteria pollution is partially attributed to multiple species especially birds and to a lesser extend mammals. With respect to land use, regional studies and monitoring indicate that single-family residential areas generate higher concentrations of bacteria in urban runoff than other land uses, which may possibly be correlated to a higher density of household pets. The high bacteria presence in residential areas is in contrast to other groups of pollutants where highest concentrations are often observed in or near industrial and commercial areas. This poses the problem that when attempting to control areas that discharge multiple types of pollutants, such as trash, metals and bacteria, then almost all critical land uses must be targeted and thus most of the watershed. The information gap related to the sources of bacteria is discussed at the end of this chapter. ***Appendix 4-3*** is a list of completed and ongoing source identification studies that summarizes the current available knowledge for identification of the data gaps.

Polyaromatic Hydrocarbons and Oil & Grease: A review of the Los Angeles County Department of Public Works (LACDPW) monitoring data for Los Angeles River and Ballona Creek during recent rain seasons indicates that petroleum oil constitutes 95% of the total amount of Oil and Grease (O&G) in urban runoff (***Ref. 4-14***). A study conducted in Richmond, California (***Ref. 4-15***), found that in urban runoff O&G resembles used automobile crankcase oil. Studies of polyaromatic hydrocarbons (PAHs), which are also petroleum derived substances, indicate that their profile in urban runoff also mirrors PAHs found in used motor oil. These studies suggest that about 96% of the source of these pollutants come from motor oil (***Ref. 4-16, 4-17***). Other studies have indicated combustion of diesel fuel represents a significant source of PAH.

The limited presence of O&G and PAHs in the various regional watersheds indicates that they are not very broadly distributed and that there are a few areas of high pollutant concentrations (See ***Appendix 5-2*** that identifies the waterbodies impaired by O&G or by PAH compounds). The source to these pollutants is thought to occur through vehicle leaks or through improper disposal of used motor oil. Historical trends indicate a gradual reduction in their concentrations. Much of this reduction may be attributed to used-motor oil programs and other anti-dumping measures that have increased awareness and have resulted in reduced illicit discharges of motor oil. With the decline of illicit dumping, vehicle leaks may have become the primary source of O&G and PAHs. Therefore, the vehicle density may be used as an indicator of the spatial distribution of O&G and PAHs.

Legacy Toxic Organics: The Ballona Creek and Dominguez Channel estuaries and portions of the Marina Del Rey and Los Angeles Harbors have been found to have high concentrations of toxic organics, including PCBs, aldrin, dieldrin, DDT and chlordane in sediment. Sampling in local waterbodies (***Ref. 4-14)*** indicates little presence of these pollutants in urban runoff. Since all of these of these substances have been banned for use in the U.S., the source of many of these compounds appears to be historical. Therefore, the reduction of these pollutants may require on-site treatment or dredging and landfilling.

Nutrients: While nutrients are found in urban runoff, this has historically been associated with major point sources along the Los Angeles River - wastewater treatment (commonly referred to as Publicly Owned Treatment Works, or POTW) plant effluent discharges. The City of Los Angeles (and the City of Burbank) is addressing this problem through modification of its wastewater treatment plants.

The D.C. Tillman and Los Angeles-Glendale Water Reclamation Plants have reduced the levels of nitrogen compounds in their effluents by as much as 80% in 2007. These reductions are expected to result in compliance with the nutrient TMDL for the Los Angeles River. Urban runoff also may contain nutrients from other sources, such as over-application of fertilizers upon landscaping and golf courses.

4.3 Land Use-Based Modeling

It is reasonable to expect that by targeting the areas with the highest pollutant generation rates will reduce compliance costs. However, as previously discussed, this is often times difficult because of the lack of source-related data within the watershed or sub-watershed. Analyzing land use and associated pollutants has been a common approach in modeling and predicting stormwater pollutant loads and their spatial distribution as an alternative to this lack of hard data.

Many past pollution-loading models rely on the EPA's National Urban Runoff Pollution studies (NURP) (***Ref. 4-18***). There are several "Graphical Information System" (GIS) applications for use in regional watersheds, employing land use as the load indicator. In Los Angeles County, land use as an indicator has been used in pollutant-loading models (***Ref. 4-19, 4-20***). In 2001 the Los Angeles County Pollutant Loading Model ***(Ref. 4-21)*** was released in a joint effort between the City and the County of Los Angeles.

Subsequent efforts such as the BMP Planning Application Model ***(Ref. 4-22)*** and the Structural BMP Prioritization Methodology model ***(Ref. 4-23, 4-24),*** that are currently being developed in cooperation between the City, County, State and Heal the Bay, are based on the County model. In the Los Angeles regional models, the pollutant concentrations for each land use are based on eight land use sites that were monitored by LACDPW from 1994 to 2000 (***Ref. 4-25***). ***Table 4-2*** indicates how land use correlates to the generation of pollutants.

The basic premise of these pollution models (that predict "pollution loads") is that the amount of pollutants present in the drainage area runoff is a function of the type of land use (See ***Appendix 9-4*** for an example of a land use model application.)

The Structural BMP Prioritization Methodology Model was used on an application in the Ballona Creek Watershed. The results of the study are illustrated in ***Figures 4-2a*** and ***4-2b***. This example included the predicted concentrations of metals and bacteria within Ballona Creek Watershed and indicates there is a correlation of zinc in runoff with industrial and commercial areas. The model expressed results in terms of "priority" catchments – locations where structural BMPs might be most effectively employed. In this case, however, the identified priority catchments are distributed over a wide area, which reflects that industrial and commercial areas are also distributed over a wide area of the watershed.

Table 4-2
Land Use Based Concentrations
The data is from 1994-2000 MS4 monitoring conducted by Los Angeles County, ***Ref. 4-25***. The column categories are a consolidation of over 100 land use categories.

Name	Unit	HDSF Residential[2]	Light Industrial	Retail Commercial	Vacant[3]	Transportation	Education	Multi Family Residential	Mixed Residential
Oil & Grease	mg/l	1.3	1.7	3.3	no data	3.1	no data	no data	no data
BOD[1]	mg/l	16	20	27	12	21	13	11	18
Ammonia	mg/l	0.41	0.59	1.26	0.13	0.29	0.33	0.47	0.67
Nitrate	mg/l	3.9	4.1	2.6	5.2	2.9	2.6	5.3	6.8
Nitrite	mg/l	0.1	0.09	0.16	0.05	0.09	0.09	0.1	0.12
Total Coliform	MPN/100ml	1,366,667	454,000	1,140,000	9,187	692,500	no data	no data	no data
Fecal Coliform	MPN/100ml	933,333	338,220	528,750	1,397	328,750	no data	no data	no data
Enterococci	MPN/100ml	610,000	98,200	86,250	679	32,000	no data	no data	no data
Total Copper	µg/l	15	32	39	15	56	24	12	19
Dis. Copper	µg/l	8.5	20	14	no data	33	13	6.9	12
Total Lead	µg/l	10	17	18	no data	10	4.9	6	11
Total Cadmium	µg/l	no data	no data	0.73	no data	1.1	no data	no data	no data
Total Zinc	µg/l	79	639	241	46	291	138	146	203
Dis. Zinc	µg/l	44	407	152	no data	192	66	83	133

(1) BOD refers to biological oxygen demand, which is a measure of the easily metabolized organic material in water.
(2) The Vacant land use category includes parks, mountains, forests and open areas.
(3) HDSF refers to high-density single-family land use.

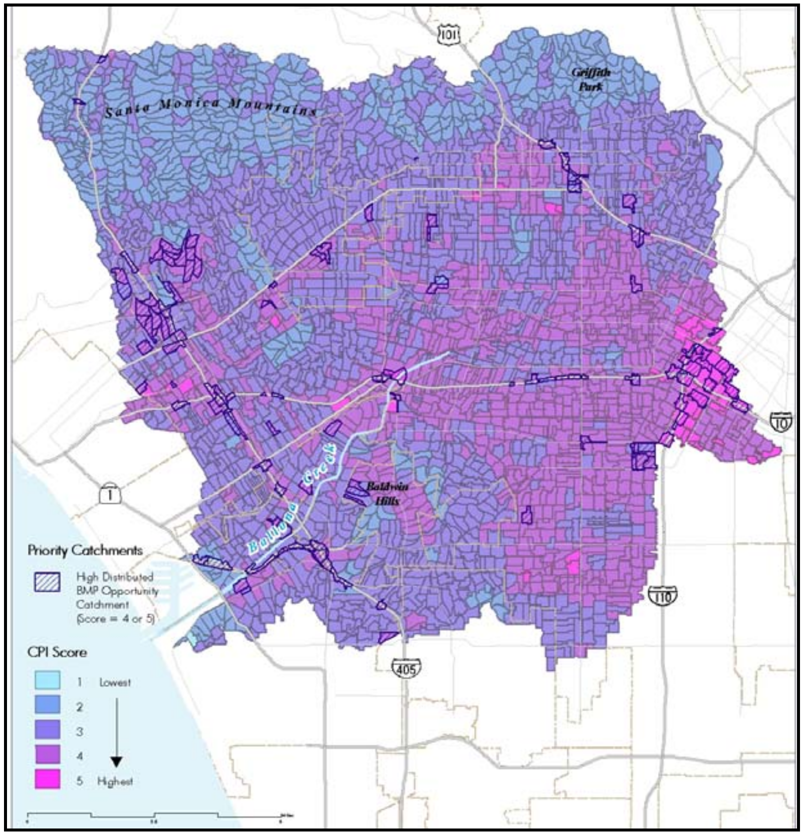


Figure 4-2a Ballona Creek Prioritization Area – Distributed Catchments. Figure identifies catchments with a high Catchment Priority Index (CPI) that might be seen as priority targets for implementing BMPs that could reduce trash, nutrients, metals and bacteria loads to the Ballona Creek Watershed. In this case, most of the identified sites are industrial or commercial sites (***Ref. 4-24****)*.

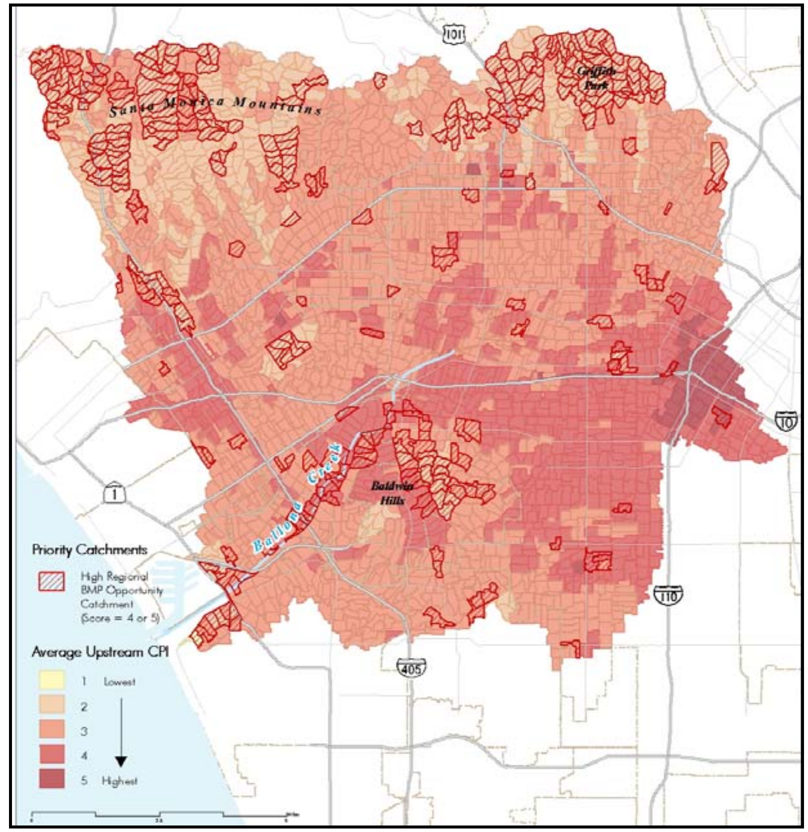


Figure 4-2b Ballona Creek Prioritization Area – Node Catchments. Figure identifies "downstream regional node" catchments with a high Catchment Priority Index (CPI). These are typically located near storm drains that could be chosen as locations for regional treatment BMPs (***Ref. 4-23****)*.

In a second example that focused on O&G and PAHs, the presence of vehicles associated with various land uses has been mapped. ***Appendix 4-2**, **Map 1***, indicates that oil leaks are more likely in industrial and commercial areas because of the greater vehicular presence.

Discharges from industrial facilities (under the state General Industrial Activity Stormwater Program (GIASP)) were also quantified and mapped. ***Appendix 4-2*** shows the presence of GIASP facilities within the City of Los Angeles (***Map 6***), and the spatial distributions of the metal (copper, lead and zinc) (***Maps 7, 8,* and *9***) released from those facilities. The modeling indicates that discharges from these facilities can be a major source of pollutants for the Dominguez Channel and Los Angeles River watersheds.

With the possible exception of trash, however, pollutants are broadly distributed and are not confined to small geographical areas. The highest releases of metals are observed along transportation corridors, and industrial and commercial areas. In contrast, the highest bacteria counts are observed in single-family residential areas. The difficulty posed by this situation is compounded when attempting to use BMPs to target multiple pollutants such as metals and bacteria – the target areas become most of the City of Los Angeles.

The principal advantages of land use modeling are the following:

- Prioritization of "key" land uses can be targeted;
- Existing databases can be easily incorporated; and
- Cost relative to sampling programs is low.

The limitations of land use modeling are as follows:

- Pollution-causing activities are not always confined within single land uses and thus land use is not always the best indicator of pollution generation;
- Automobile traffic, which is a major pollutant source, is not reflected in the land use model since roads are divided among multiple land uses and are not delineated as a separate land use;
- These models are based on monitoring a limited number of land use sites; and
- There is sometimes poor differentiation between land use categories.

Because of these limitations, modeling results should preferably be validated by actual field investigations.

4.4 Data and Knowledge Gaps

Work is needed to address the missing information regarding the generation of pollutants, their spatial distribution, and their geographic prioritization in the following areas:

- Identify and quantify the sources of bacteria, metals and other pollutants that have pending TMDLs;
- Expand land use-based monitoring;
- Monitor tributary storm drains to identify hot spots;
- Review LARWQCB Water Quality data from GIASP facilities;
- Incorporate new modeling approaches to better predict the spatial distribution of pollutants; and
- Quantify aerial deposition of pollutants.

4.5 Summary

The main conclusions regarding the sources and distribution of pollutants:

- With the possible exception of trash, most other pollutants are widely distributed geographically;
- Automobiles constitute the single most important source of metals, PAHs and O&G;
- Compliance with water quality standards may require that the vast majority of the City's area be targeted for stormwater treatment;
- An alternative to structural BMPs is source control to target a few key contributing activities that are widely distributed; and
- There is a need for additional source identification studies and watershed-based monitoring.

References

4-1. EPA (1993). Handbook on Urban Runoff Pollution Prevention and Control Planning. EPA/625/R-93/004.

4-2. EPA (2006). 2006 CWA Section 303(d) List of Water Quality Limited Segments.

4-3. City of Los Angeles (July 2004). Stormwater Pollution Generation and Control. Los Angeles, CA (internal report).

4-4. City of Los Angeles (June 2004). Characterization of Urban Litter. Los Angeles, CA.

4-5. City of Los Angeles (January 2002). High Trash-Generation Areas and Control Measures. Los Angeles, CA. (http://www.lastormwater.org/siteorg/program/news/tackling_trash/summary.htm).

4-6. EPA (1991). Technical Support Documents for Water Quality-Based Toxics Control, EPA 505/2-90-001, Office of Water, U.S. EPA, Washington, DC.

4-7. Santa Clara Valley Urban Runoff Pollution Prevention Program. (1997). Metal Control measures Plan (Volume I) and Evaluation of Nine Metals of Concern (Volume II).

4-8. Bannerman, R. (1994). Sources of Urban Stormwater Pollutants Defined in Wisconsin. Tech. Note 15. Watershed Protection Techniques. 1(1): 30-31. (http://www.goestores.com/catalog.aspx?storename=centerforwatershedprotection&DeptID=200188&ItemID=9679760&detail=1).

4-9. Good, J.C. (1993). Roof Runoff as a Diffuse Source of Metals and Aquatic Toxicity in Stormwater. Water Science Technology. 28 (3-5): 317-322. (http://www.epa.gov/owow/nps/wpt/vol1no2.pdf#page=54).

4-10. Thomas, P.R. and G.R. Greene. (1993).“Rainwater Quality from Different Roof Catchments. Water Science.(http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=0074560EN&q=%22RainWater+Quality+from+Different+Roof+Catchments%22&uid=1217987&setcookie=yes).

4-11. Center of Environmental Science, Leiden University, The Netherlands (2000). Heavy Metals: A Problem Solved? Methods and Models to Evaluate Policy Strategies for Heavy Metals. Kluwer Academic Publishers.

4-12. Stolzenbach, K.D., Turco, R., Lim, J.H., Lu, R., Sabin, L.D., Schiff, K.C. (2004). Atmospheric deposition of metals on watersheds in the Los Angeles region. Report to the Santa Monica Bay Restoration Commission, Los Angeles, CA. (http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=06677417EN&q=&uid=1217987&setcookie=yes).

4-13. Santa Monica Bay Restoration Project (1996). An Epidemiological Study of Possible Adverse Health Effects of Swimming in Santa Monica Bay. Monterey Park, CA. (http://santamonicabay.org/smbay/LinkClick.aspx?link=Epistudy).

4-14. Los Angeles County – Department of Public Works (2006). Stormwater Monitoring Reports. (http://www.ladpw.org/wmd/NPDES/).

4-15. Fam, S., Stenstrom M.K., Silverman, G. (1984). Hydrocarbons in Urban Runoff. Journal of Environmental Engineering, Vol. 113, No.5. (http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=A20043301216CE&q=&uid=1217987&setcookie=yes).

4-16. Hunter, J.V., Sabatino, T., Gomperts, R., MacKenzie, R.J. (1979). Contribution of Urban Runoff to Hydrocarbon Pollution. Journal Water Pollution Control Federation, 51, 2129. (http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=ENV&recid=8000357&q=&uid=1217987&setcookie=yes).

4-17. Latimer, J.S., Hoffman, E.J., Hoffman, G., Fasching, J.L., Quinn, J.G. (1990). Sources of petroleum hydrocarbons in urban runoff. Water, Air and Soil Pollution 52:1-21. (http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=ENV&recid=2368307&q=&uid=1217987&setcookie=yes).

4-18. EPA (1983). National Urban Runoff Program, Vol. I. NTIS PB84-185552.

4-19. Tam, W.K., and Murillo, B.N. (1998). Stormwater Management of Urban Watershed. Water Resources in Urban Environment Proceedings. 25th Water Resources, Planning and Management Conference. Chicago, Ill., 751

4-20. Wong, K., Strecker, E.W., Stenstrom, M.K. (1997). A Geographic Information System to Estimate Stormwater Pollutant Mass Loadings," Journal of the Environmental Engineering Division, ASCE, Vol. 123, pp. 737-745.

4-21. PSOMAS – Automated Pollutant Load Assessment Model, User Manual (2001)

4-22. PSOMAS – BMP Planning Application, User Manual (2005).

4-23. Los Angeles County – Department of Public Works (2006). Los Angeles County-wide Structural BMP Prioritization Methodology. (http://ladpw.org/wmd/bmpmethod/assets/pdfdocs/guideancemanual.pdf).

4-24. County of Los Angeles – Department of Public Works, Heal the Bay and City of Los Angeles – Bureau of Sanitation (2006). Los Angeles County-Wide Structural BMP Prioritization Methodology Ballona Creek Watershed Demonstration UPDATED SUMMARY REPORT. (http://ladpw.org/wmd/bmpmethod/manual.shtm).

4-25. Los Angeles County, Department of Public Works (2000). Stormwater Integrated Monitoring Report (1994-2000). (www.ladpw.org/wmd/NPDES/).

Chapter 5
Governing Regulations

5.1 Introduction

Federal and State water quality regulations provide the context for characterizing water quality data. These regulations not only provide the basis for identifying where water quality problems exist, but they also establish requirements for implementing water quality controls in problem areas. Accordingly, this chapter provides an overview of the key Federal and State regulations for evaluating and protecting local and regional water quality.

5.2 Water Quality Protection

The Federal Water Pollution Control Act and its amendments of 1972, 1977, 1981, and 1987 comprise what is commonly known as the Clean Water Act (CWA). The CWA provides the basis for the protection of all inland surface waters, estuaries, and coastal waters. The federal Environmental Protection Agency (EPA) is responsible for ensuring the implementation of the CWA and its governing regulations (primarily Title 40 of the Code of Federal Regulations) (***Figure 5-1***), but may delegate its authority to the State.

California implements the CWA by promulgating water quality protection laws and regulations and issuing discharge permits through state regulatory agencies. The State, at its own discretion, has in many instances established requirements that are more stringent than federal requirements.

California's primary statute governing water quality is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act) (Water Quality, Division 7 of the California Water Code) (***Figure 5-1)***. The Porter-Cologne Act grants the California State Water Resources Control Board ("State Board") and nine California Regional Water Quality Control Boards ("Regional Boards") broad powers to protect water quality and is the primary vehicle for implementation of California's responsibilities under the CWA.

The Porter-Cologne Act grants the State and Regional Boards authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The governing Regional Board for the Los Angeles area watersheds is the Los Angeles Regional Water Quality Control Board (LARWQCB).

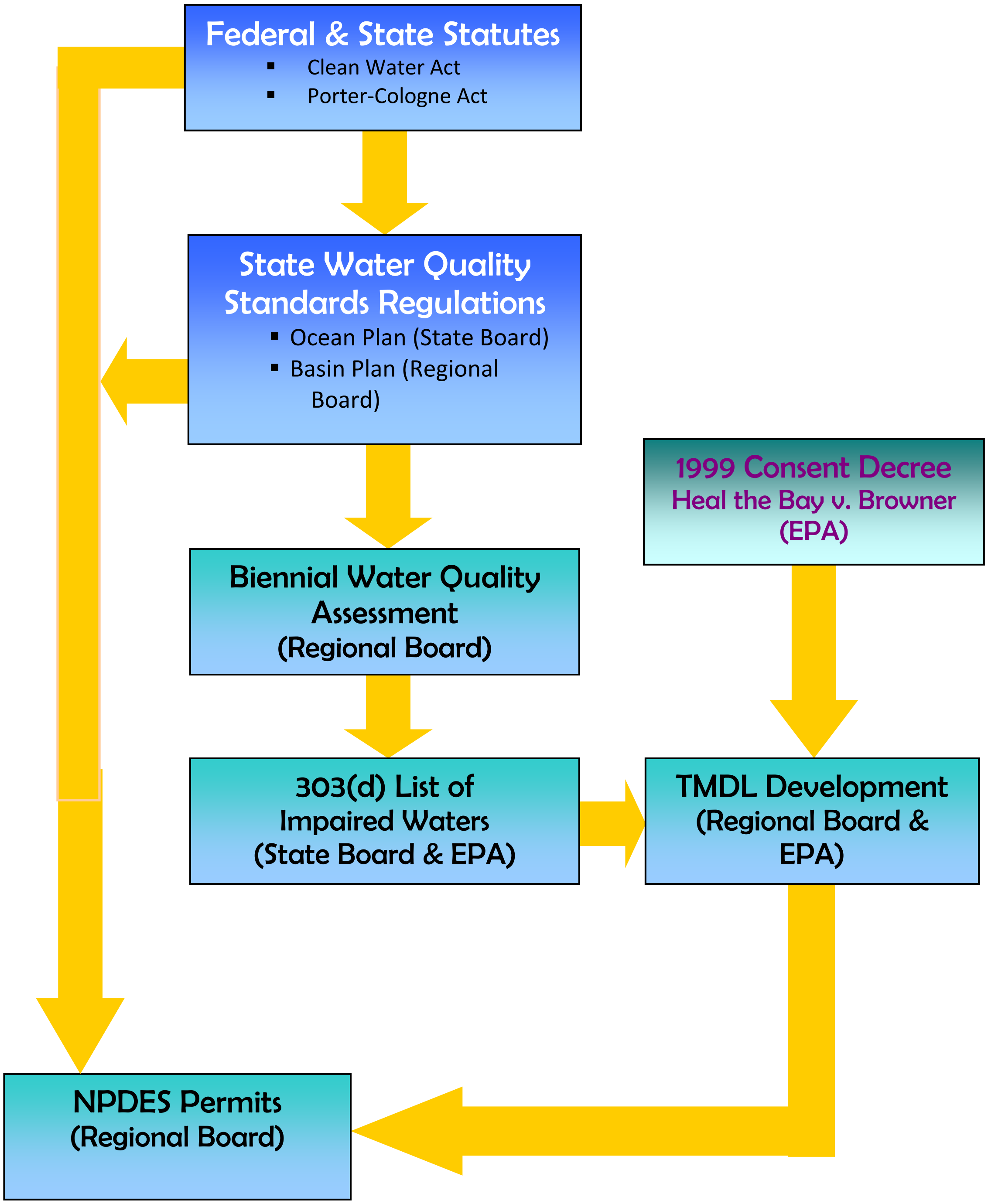


Figure 5-1
Key Federal and State Statutes, Regulations and Programs Associated with TMDL Development and Implementation

5.3 NPDES Permits

National Pollutant Discharge Elimination System (NPDES) (CWA, Section 402) permits are required for point source discharges to surface waters (including storm drains) under the jurisdiction of the CWA (***Figure 5-1***). NPDES permits are required for both wastewater and stormwater discharges. NPDES permits contain discharge requirements that include: (a) technology-based limits (based on the ability of dischargers in the same industrial category to treat the discharge); and (b) water quality-based limits, which are applied if technology-based limits are believed insufficient to provide protection of the receiving water's water quality standards.

The EPA has delegated its authority for issuing NPDES permits to the State of California. In turn, each Regional Board is responsible for developing and issuing the permits for their respective regions. All NPDES permits issued by the Regional Board are also considered Waste Discharge Requirements (WDRs), which are issued under the authority of the Porter-Cologne Act (***Figure 5-1***). Not only do the WDRs address federal NPDES program requirements, but they also address additional provisions of Article 4 of the Porter-Cologne Act. These additional provisions regulate the discharge of wastes that are not made to surface waters, but that may impact the region's water quality by affecting underlying groundwater basins. Such WDRs are issued for Publicly-Owned Treatment Works, wastewater reclamation operations, municipal and industrial (including construction site) stormwater discharges, discharges of wastes from industries, subsurface waste discharges such as septic systems, sanitary landfills, dairies, and a variety of other activities that can affect water quality. The resulting number of active NPDES permits in the Los Angeles Area watersheds is substantial (***Table 5-1***).

5.3.1 Wastewater

Dischargers apply for a permit by submitting a Report of Waste Discharge. The Regional Board prepares a draft permit for public review and comment. A final permit is issued for a period of 5 years, after which the discharger must reapply for authorization to continue to discharge. When a permit is renewed any changes in Basin Plan requirements to protect water quality that have occurred since the last permit was authorized are incorporated into the new permit, e.g., requirements associated with an adopted TMDL.

Wastewater point sources in the Los Angeles area include both sanitary treatment and industrial facilities. NPDES permits authorizing these discharges include both technology- and water quality-based effluent limits. A listing of all permits can be obtained from the LARWQCB (***Ref. 5-1***).

Table 5-1
Number of Active LARWQCB-Issued NPDES Wastewater and NPDES MS4 Permits

Watershed	Permit Type(1)	Active Permits(1)
Ballona Creek	Wastewater	100
	MS4	5
Dominguez Channel	Wastewater	54
	MS4	10
Los Angeles River	Wastewater	141
	MS4	33
Santa Monica Bay	Wastewater	80
	MS4	9

(1) ***Ref. 5-2***, as of February 2008.

5.3.2 Stormwater

Stormwater point sources are the storm drains that discharge collected stormwater from impervious areas such as paved streets, parking lots, and building rooftops to local area waterbodies. Stormwater NPDES permits issued to municipalities are often referred to as Municipal Separate Storm Sewer System Permits (or "NPDES MS4 Permits"). Such permits typically rely on the use of Best Management Practices (BMPs) to control pollutants carried by stormwater runoff and include requirements for inspection, monitoring and public outreach.

In large cities with interconnected municipal storm drain systems, NPDES MS4 Permits are often issued to multiple permittees that work cooperatively to implement the permit. This is the case for the Los Angeles area where the MS4 is permitted under a single permit issued to Los Angeles County (***Ref. 5-3***) and 84 incorporated cities (all except the City of Long Beach).

An important element incorporated into the NPDES MS4 Permit is the requirements associated with development or redevelopment of a site. The NPDES MS4 Permit requires that all new development/redevelopment projects incorporate stormwater mitigation measures. These measures are addressed by developers through the preparation of a Standard Urban Stormwater Mitigation Plan (SUSMP) or a Site-Specific Mitigation Plan (***Ref. 5-4***). The primary purpose of these plans is to reduce the quantity and improve the quality of stormwater runoff that leaves a site.

5.4 Water Quality Standards

5.4.1 Development

The Porter-Cologne Act gives the State and Regional Boards different responsibilities to establish water quality regulations. Chapter 3, Article 4, Section 13170 of the Porter-Cologne Act requires the State Board to establish the California Ocean Plan (***Ref. 5-5***). This plan establishes regulations for the protection of human health and marine species in ocean waters, including Santa Monica Bay. The State Board periodically reviews and revises the Ocean Plan through a public stakeholder process.

Chapter 4, Article 3, Section 13240 of the Porter-Cologne Act requires that Regional Boards adopt a Water Quality Control Plan ("Basin Plan") to protect inland freshwaters and estuaries (***Ref. 5-6***). The Basin Plan for each Regional Board establishes the level of protection required for specific waterbodies under its jurisdiction. The surface waters under the Los Angeles Regional Board jurisdiction include, but are not limited to, the Los Angeles River, Dominguez Channel, Santa Monica Bay, and Ballona Creek. The Water Quality Control Plan, Los Angeles Region (Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties) is published by the LARWQCB (***Ref. 5-6***). This Basin Plan is periodically updated and undergoes a triennial review process, most recently in 1995, 2001 and 2004. Amendments of Basin Plans go through a public stakeholder process.

Section 303 of the CWA establishes the foundation for the protection of water quality through the development and implementation of water quality standards. These standards consist of both the beneficial uses of each waterbody under CWA jurisdiction and the water quality criteria or objectives required to protect those uses (***Figure 5-1***). Under the Porter-Cologne Act water quality standards for inland waters are established in the Basin Plan by each Regional Board. The LARWQCB Basin Plan recognizes many types of beneficial uses, but not all of these uses are applicable to every waterbody. ***Chapter 2***, ***Table 2-8***, lists beneficial uses identified by the LARWQCB Basin Plan applicable to waterbodies in the four Los Angeles area watersheds.

Each Regional Board is required to set water quality objectives that are protective of beneficial uses. Section 13241 of the California Water Code lists the specific factors that are to be considered when establishing water quality objectives.

5.4.2 Evaluating Compliance

The State and Regional Boards evaluate compliance with water quality standards through the following CWA-mandated processes:

- CWA Section 305(b) requires that each state assesses the water quality status of each waterbody under CWA jurisdiction every 2 years and report these findings to EPA. For this assessment, the state reviews available water quality data, compares these data to water quality objectives, and evaluates whether the beneficial uses of each waterbody are supported, ***Figure 5-1***.

- CWA Section 303(d) requires states to "regularly" identify waterbodies not meeting water quality standards even after all required effluent limitations have been implemented (e.g., through a discharge permit). These waters are often referred to as "303(d) listed" or "impaired" waters. All waterbodies on the 303(d) List are required to have a Total Maximum Daily Load (TMDL) developed.

In practice, the Regional Board and State Board conduct the Section 305(b) assessment and this information is used to develop the Section 303(d) List of impaired waters (***Figure 5-1***).

5.4.3 California 303(d) List and TMDL Development

The State Board has established guidelines for the development of the 303(d) List (***Ref. 5-7***). Each list, which is subject to EPA approval, includes the waterbody name, the pollutant of concern, the probable source or stressor (if known), and a proposed schedule for the development of the TMDL. A TMDL establishes the maximum amount of a pollutant that a waterbody can receive from both point and nonpoint sources and still meet water quality standards.

The most recent EPA-approved 303(d) List for California is the 2006 list, which provides updated information on impaired waters, likely pollutant sources, and priority for TMDL development. Many of the required TMDLs on this list date back to the results of the 1996 and 1998 water quality assessments which resulted in the identification of approximately 700 water quality impairments in the Los Angeles region. A March 22, 1999 Consent Decree between EPA and several environmental organizations established a 13-year TMDL development schedule to address these numerous impairments (Heal the Bay Inc., et al. v. Browner, et al. C 98-4825 SBA). This Consent Degree prioritizes the development of TMDLs as indicated in ***Appendix 5-2***.

The development of TMDLs affecting waters in the Los Angeles area watersheds is the responsibility of the LARWQCB; however, because of the Consent Decree, EPA Region 9 supports the development of TMDLs in the region by providing technical and funding resources. The process for approving the TMDL begins with the Regional Board. Adoption of a TMDL requires an amendment to the Basin Plan and is subject to a substantial public review process. After the LARWQCB adopts the TMDL as a Basin Plan amendment, it is submitted to the State Board for approval. Once the State Board approves the TMDL, it is submitted to EPA Region 9 for final review and federal approval. The TMDL is not in effect until the EPA has issued its formal approval.

Existing and Planned TMDLs: To date, a number of TMDLs have received EPA approval in the four watersheds that are the focus of the WQCMPUR (***Table 5-2***) (***Ref. 5-2***). Some of these TMDLs address multiple pollutants and waterbodies. Each TMDL includes wasteload allocations, implementation requirements and a compliance schedule. Established wasteload allocations and key compliance dates are

Table 5-2
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

<table>
<tr><th>Watershed</th><th>TMDL</th><th>Waterbody</th><th>303(d) Impairment</th><th>Original LARWQCB Adoption Order[2]</th><th>TMDL Revisions - LARWQCB Orders[3]</th><th>Effective Date[4]</th></tr>
<tr><td rowspan="25">Ballona Creek</td><td rowspan="10">Ballona Creek Metals TMDL</td><td>Ballona Creek</td><td>Copper (dissolved)</td><td rowspan="10">2005-007</td><td rowspan="10">2007-015</td><td rowspan="10">Original: 1/11/2006
Revised: 10/29/2008</td></tr>
<tr><td rowspan="5">Ballona Creek</td><td>Lead</td></tr>
<tr><td>Selenium</td></tr>
<tr><td>Shellfish Harvesting Advisory</td></tr>
<tr><td>Toxicity</td></tr>
<tr><td>Zinc</td></tr>
<tr><td rowspan="4">Sepulveda Canyon</td><td>Copper</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Selenium</td></tr>
<tr><td>Zinc</td></tr>
<tr><td rowspan="2">Ballona Creek Trash TMDL</td><td>Ballona Creek</td><td>Trash</td><td rowspan="2">2001-014</td><td rowspan="2">2004-023</td><td rowspan="2">Original: 8/28/2002
Revised: 8/11/2005</td></tr>
<tr><td>Ballona Creek Wetlands</td><td>Trash</td></tr>
<tr><td rowspan="4">Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL</td><td rowspan="2">Ballona Creek</td><td>Indicator Bacteria</td><td rowspan="4">2006-011</td><td rowspan="4">N/A</td><td rowspan="4">4/27/2007</td></tr>
<tr><td>Viruses (enteric)</td></tr>
<tr><td>Ballona Creek Estuary</td><td>Indicator Bacteria</td></tr>
<tr><td>Sepulveda Canyon</td><td>Indicator Bacteria</td></tr>
<tr><td rowspan="9">Ballona Estuary Toxic Pollutants TMDL</td><td rowspan="9">Ballona Creek Estuary</td><td>Chlordane (tissue & sediment)</td><td rowspan="9">2005-008</td><td rowspan="9">N/A</td><td rowspan="9">1/11/2006</td></tr>
<tr><td>DDT (sediment)</td></tr>
<tr><td>Lead (sediment)</td></tr>
<tr><td>PAHs</td></tr>
<tr><td>PCBs (tissue & sediment)</td></tr>
<tr><td>Sediment Toxicity</td></tr>
<tr><td>Zinc (sediment)</td></tr>
</table>

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Los Angeles River	Los Angeles River Nutrient TMDL	Burbank Western Channel	Ammonia	2003-009	2003-016	Original: 3/23/2004 Revised: 9/27/2004
		Compton Creek	pH			
		Los Angeles River Reach 1 (Estuary to Carson St.)	Ammonia			
			Nutrients (algae)			
			pH			
		Los Angeles River Reach 2 (Carson to Figueroa St.)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 5 (Within Sepulveda Basin)	Ammonia			
			Nutrients (algae)			
		Rio Hondo Reach 1 - (Confluence Los Angeles River to Santa Ana Freeway)	pH			
		Rio Hondo Reach 2 (At Spreading Grounds)	Ammonia			
		Tujunga Wash (LA River to Hansen Dam)	Ammonia			

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Los Angeles River	Los Angeles River Metals TMDL	Reach 1(Estuary to Carson St.)	Cadmium	2005-006	2007-014	Original: 1/11/2006 Revised: 10/29/2008
			Copper, Dissolved			
			Lead			
			Zinc, Dissolved			
			pH			
		Reach 2 (Carson to Figueroa St.)	Copper			
			Lead			
		Reach 3 (Figueroa St. to Riverside Dr.)	Copper			
			Lead			
		Reach 4 (Sepulveda Dr. to Sepulveda Dam)	Copper			
			Lead			
		Reach 5 (Within Sepulveda Basin)	Copper			
			Lead			
		Reach 6	Selenium			
	Los Angeles River Trash TMDL	All Reaches	Trash	2001-013	2007-012	Original: 8/28/2002 Revised: 9/23/2008

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Santa Monica Bay	Marina del Rey Back Basins Bacteria TMDL	Marina del Rey Harbor □Back Basins	Indicator Bacteria	2003-012	N/A	3/18/2004
	Marina del Rey Harbor Toxics TMDL	Marina del Rey Harbor-Back Basins	Chlordane (tissue & sediment)	2005-012	N/A	3/22/2006
			Copper (sediment)			
			Fish Consumption Advisory			
			Lead (sediment)			
			PCBs (tissue & sediment)			
			Sediment Toxicity			
			Zinc (sediment)			
	Santa Monica Bay Beaches Dry Weather Bacteria TMDL	Santa Monica Bay Beaches	Indicator Bacteria	2002-004	N/A	7/15/2003
	Santa Monica Bay Beaches Wet Weather Bacteria TMDL	Santa Monica Bay Beaches	Indicator Bacteria	2002-022	N/A	7/15/2003
Dominguez Channel	Machado Lake Nutrients TMDL[5]	Machado Lake	Eutrophic	2008-006	NA	NA
			Algae			
			Ammonia			
			Odor			
	Machado Lake Trash TMDL	Machado Lake	Trash	2007-006	N/A	3/6/2008
	Los Angeles Harbor TMDL	Los Angeles Harbor □ Inner Cabrillo Beach Area	Indicator Bacteria	2004-011	N/A	3/10/2005

(1) ***Ref. 5-2***.
(2) Date LARWQCB adopted original TMDL, ***Ref. 5-8***.
(3) Date of most recent LARWQCB activity to revise TMDL, ***Ref. 5-8***.
(4) Several TMDLs have been revised through new resolutions with new effective dates; however, dates for compliance milestones have remained the same, ***Ref. 5-8***.
(5) Machado Lake Nutrients TMDLs was adopted by the LARWQCB in May 2008; approval by SWRCB , AOL, and EPA is pending (December 2008).

summarized in ***Appendix 5-1***. Additional details regarding TMDL implementation requirements and the status of these requirements are presented in ***Chapter 6***.

Per the 2006 303(d) list (***Ref. 5-9***), additional TMDLs are planned for development in the Los Angeles area. The current list of these TMDLs is provided in ***Appendix 5-2***. Several of these TMDLs, e.g., the Machado Lake trash TMDL will become effective soon (***Ref. 5-8)***.

5.4.4 TMDLs and NPDES Permits

A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Depending on the nature of the pollutant, TMDL implementation requires a cap on pollutant contributions from point sources (wasteload allocation), nonpoint sources (load allocation), or both. If an adopted TMDL includes wasteload allocations for point sources, then the NPDES permits issued for affected point sources are modified by the LARWQCB to incorporate the wasteload allocation. Therefore, it may be expected that future NPDES MS4 Permits will include requirements for compliance with TMDL wasteload allocations.

5.5 Summary

- The federal Clean Water Act and State Porter-Cologne Act provide the basis for water quality requirements applicable to waters in the Los Angeles area; the LARWQCB is the agency primarily responsible for implementation of these requirements.

- Many waters in the Los Angeles area have been designated as impaired because of poor stormwater quality. TMDL development is required for waters designated as impaired.

- Controls on urban runoff quality are implemented primarily through NPDES MS4 Permits, which in the future will likely include requirements for compliance with TMDL wasteload allocations.

References

5-1. Los Angeles Regional Water Quality Control Board. November 10, 2007. (http://www.swrcb.ca.gov/rwqcb4/html/permits/general_permits.html)

5-2. State Water Resources Control Board. 2007. 2006 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed by USEPA Approved TMDLs. (http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/state_06_wtmdl.pdf)

5-3. Los Angeles Regional Water Quality Control Board, Order No. 01-182; NPDES Permit No. CAS004001. 2001. Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges within the County Of Los Angeles, and the Incorporated Cities therein, except the City Of Long Beach; December 13, 2001).
(http://www.swrcb.ca.gov/rwqcb4/html/permits/general_permits.html)

5-4. City of Los Angeles Stormwater Program. November 10, 2007. Standard Urban Stormwater Mitigation Plans (SUSMP)
(http://www.lastormwater.org/Siteorg/businesses/susmp/susmpintro.htm).

5-5. State Water Resources Control Board. 2006, and subsequent amendments. California Ocean Plan (http://www.swrcb.ca.gov/plnspols/oplans.html)

5-6. Los Angeles Regional Water Quality Control Board. Los Angeles Regional Water Quality Control Board Basin Plan. 1995, and subsequent amendments. (http://www.swrcb.ca.gov/rwqcb4/html/meetings/tmdl/Basin_plan/basin_plan.html)

5-7. State Water Resources Control Board. 2006, and subsequent amendments. Impaired Waters Guidance and Policy,
(http://www.waterboards.ca.gov/tmdl/tmdl.html)

5-8. Los Angeles Regional Water Quality Control Board Plan Amendments/TMDLs
(http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/tmdl/tmdl_list.shtml; last accessed 12/8/2008).

5-9. State Water Resources Control Board. 2006. 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs.
(http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html)

Chapter 6
Best Management Practices

6.1 Introduction

The NPDES MS4 Permit and TMDLs require the City of Los Angeles to implement a variety of activities or measures for reducing the amount of pollutants entering the receiving water bodies from urban runoff. These activities or measures are collectively known as Best Management Practices (BMPs). They range from programs to prevent the release of pollutants in the environment to the implementation of structural technologies for removing pollutants from urban runoff. Since the start of the Stormwater Program in 1990, the City of Los Angeles has implemented many BMPs to reduce pollution from urban runoff. In addition, major point sources in our watersheds that discharge to receiving waters are required by the NPDES program to implement pollution reduction measures.

Urban runoff management is a relatively new area. Research at universities and technological developments in the industry are rapidly gaining momentum and new technologies are brought to market almost every day. However, there still are many unknowns and uncertainties related to the use of BMPs. This chapter provides an overview of currently available BMPs and evaluates their selection, implementation and performances. Wherever applicable, references are also made to BMPs that have been implemented in the City of Los Angeles. Additional information on BMPs as part of TMDL Implementation Plans is discussed in ***Chapter 7***.

6.2 Overview of Best Management Practices

Urban runoff pollutants can be targeted at the source where they are released or before they are released into the environment, during transport through the storm drain system and at the location of discharge from the storm drain system to the receiving water body. Over the past two decades, the number of available BMPs has greatly increased. Several organizations have developed databases that summarize available BMPs (***Ref. 6-1, 6-2, 6-3, 6-4***). ***Appendix 6-1*** provides a listing of over 100 BMPs and summarizes other pertinent information, which was mostly obtained from the California Stormwater BMP Handbooks (***Ref. 6-1***). The links in ***Appendix 6-1*** provide detailed descriptions of the individual BMPs. As can be observed in ***Appendix 6-1***, there are large data gaps concerning the applicability and costs of BMPs.

BMPs are often categorized into non-structural and structural practices. Non-structural practices are usually associated with source control or institutional programs that do not require the application or construction of engineered solutions, ***Table 6-1*** and ***Section 6.2.1.*** Street sweeping, public education/outreach, regulatory management practices, inspection and other pollution prevention strategies are

Table 6-1
Applicability of Non-Structural Best Management Practices

Pollutant	Best Management Practice
Metals	Regulating the metal-based products formulation (Brake Pads, tires, etc) Public/business/industry education & outreach Erosion/sediment transport control strategies Target critical sources/activities such as streets, building roofs and gutters, salvage yards, railroad yards, vehicle service yards, and catch basins
Pathogens	Public/business education & outreach Erosion/sediment transport control strategies Target critical sources/activities such as: - Sewage spills and septic tanks - Pets/animals facilities - Commercial composting - Landscaping activities
Nutrients	Public/business/industry education & outreach Erosion/sediment transport control strategies Prioritizing the following Sources/Activities Best Management Practices: Commercial animal handling areas Commercial composting Landscaping and lawn/vegetation
Contaminated Sediments	Removal and off-site disposal of contaminated sediments
Trash	Anti-littering statutes such as Sections 56.08, 57.21.06, 62.54, 66.04, 66.25, and 64.70.02 of the Los Angeles Municipal Code (LAMC) Enhanced street sweeping with more sweeping frequencies scheduled at high trash generation zones. Enhanced catch basin cleaning with more cleaning frequencies scheduled for those located in trash generation hotspots. Also, more cleaning frequencies prior to wet weather Abandoned trash reporting hotlines Placement of adequate trash receptacles Formation of Business Improvement Districts (BIDs) along commercial strips that incorporate sidewalk sweeping, litter pick-up, and maintenance of trash receptacles. Educational antilittering outreach efforts through postings, signs, and billboard, television and radio advertisement. Community clean-up programs that involve partnerships between the City, community activists and volunteers for joint effort to beautify the most affected communities.

typical examples of non-structural BMPs. Structural BMPs can be defined as engineered and constructed systems to remove or manage pollutant loadings to the receiving waters. As such, BMPs for urban runoff volume reduction (***Section 6.2.2***) and treatment control (***Section 6.2.3***) are structural. Green solutions or technologies are structural BMPs that can be vegetative or non-vegetative. Biofilters, constructed wetlands and vegetative swales are a few of the examples of vegetative structural practices that can reduce urban runoff pollution and contribute to the greening of urban environments. In contrast, sand filters, infiltration basins and hydrodynamic separators are examples of non-vegetative structural practices, although some of these BMPs can be part of projects to green the environment (for instance, infiltration basins can typically be located in parks, or detention basins or tanks can be used for storing urban runoff as a source of irrigation water). ***Table 6-2*** summarizes a few of the structural BMPs and the pollutants that they target.

Table 6-2
Applicability of Structural Best Management Practices(1)

Best Management Practice	Metals	Pathogens	Nutrients	Trash
Low Flow Diversion/Outfall Interception	X	X	X	
Infiltration	X	X	X	
Bioretention	X	X	X	
Wetland	X	X	X	
Detention	X	X	X	
Disinfection		X		
Hydrodynamic Separator				X
Catch Basin Cover/Insert				X
Catch Basin Filter	X			
Stormdrain Netting System				X

(1) ***Ref. 6-5***.

6.2.1 Source Control

Source control BMPs include all non-engineering BMPs that aim at preventing the generation of urban runoff pollutants at the source. Driven in large part by the NPDES MS4 Permit, the City of Los Angeles has implemented a wide range of source control programs. The Watershed Protection Division is responsible for many of these source control programs through the Stormwater Program:

- **Public Outreach**: The Public Education Section implements the Public Information Participation Program by targeting the general public, home owners, school children, business owners and city employees to increase public awareness about urban runoff pollution and to change behaviors that impact the quality of receiving waters. Outreach activities include mass media advertising campaigns, distribution of educational materials, visits to schools, festivals and other public events.

- **Inspection and Enforcement**: The Inspection and Enforcement Section implements the Industrial/Commercial Facilities Control Program and the Illicit Connections and Illicit Discharges Elimination Program.

- **Development Construction Program**: This program is to mitigate pollutants, mostly sediment, from construction sites larger than 1 acre.

- **Public Agencies Activities Program**: This program is to mitigate pollutants from City facilities such as fire stations and vehicle maintenance yards.

- **Other Source Control Activities**: include enforcement of anti-littering statutes, street sweeping, catch basin cleaning, abandoned trash pick-up, the placement of trash receptacles and community clean-up programs. Many of these activities are coordinated efforts by several City Bureaus and Departments.

Source control is an important element in sustainable urban runoff management and, accordingly, it is part of one of the three initiatives in the Implementation Strategy (***Chapter 9***).

Public outreach is an important source control BMP focusing on reducing urban runoff pollution through behavioral changes, and is one of the three initiatives in the Implementation Strategy (***Section 9.3)***. Several studies by the City of Los Angeles have shown that the Stormwater Program has significantly increased public awareness of water quality and urban runoff pollution. However, the effectiveness of public outreach in reducing urban runoff pollution through behavioral changes is difficult to measure. A few studies have shown that the effectiveness usually is in the range of 10 to 40% (***Ref. 6-6***), depending on the program and the pollutants and audiences that are targeted. Even though many pollutants require a greater reduction, public outreach remains a critical element because pollutant reduction at the source is much less costly than removing pollutants after their release into the environment.

6.2.2 Urban Runoff Volume Reduction

The objective of these BMPs is to reduce the pollutant loading by reducing the volume of urban runoff that is ultimately discharged into the receiving waters. This can be done at the source where the runoff is generated (for example, the capture of roof water and use of stormwater in garden irrigation), anywhere along the storm drain system (for example, the diversion of urban runoff from storm drains to public parks for irrigation and/or infiltration), or at the receiving water body (for example, regional wetlands for urban runoff treatment and infiltration). An example of successful urban runoff reduction in the City of Los Angeles is the use of Low-Flow Diversions (LFDs) that divert urban runoff from the storm drains at Santa Monica Bay to the sewer system for treatment at the Hyperion Treatment Plant. These are further discussed in ***Section 7.3.1***. Also the Standard Urban Stormwater Mitigation Plans (SUSMPs) for new development and redevelopment are an example of urban runoff volume reduction, but at the source. SUSMP requirements include either on-site infiltration of runoff or on-site treatment of the first flush (0.75”) of the storm (Note: new directions for SUSMP from the LARWQCB put a larger focus on volume reduction, whereas the focus before was more on removal of pollutants. Hence, SUSMP is listed in this section). The SUSMP categories include restaurants, retail gasoline outlets, parking lots 5,000 square feet or larger or with 25 or more parking spaces, housing developments of ten or more units among others. Likewise, various business categories are required to develop Site Specific Mitigation Plans when they do not fall under the SUSMP category.

Compared to BMPs for removing pollutants from urban runoff (treatment control BMPs, ***Section 6.2.3***), the advantages of reducing the volume of urban runoff include the following:

- Targets all pollutants that are present in urban runoff;
- Can be implemented throughout the City (watershed-wide approach);
- Can be combined with other City policies in multi-benefit projects;
- Assists with flood control; and
- Provides a new source of water for beneficial use (irrigation, groundwater recharge).

BMPs for urban runoff volume reduction have the highest impact on the water quality of receiving waters if highly polluted urban runoff is targeted. This first requires extensive monitoring of urban runoff to prioritize the high pollution areas in the City. Nevertheless, reducing the volume of urban runoff from relatively clean areas in the City will benefit the water quality and reduce the need for or size of BMPs for pollutant removal.

One of the issues of reducing the volume of urban runoff is that a suitable destination or use for the water must be found. This can be a major challenge for urbanized areas with a high percentage of highly impervious areas. In addition, large areas such as parks and other open areas will be needed to collect and temporarily store the urban runoff from larger storm events until the runoff has been transferred to its final destination, which should be done in a way that is compatible with other uses of these open areas.

6.2.3 Removal of Urban Runoff Pollutants

Treatment control BMPs can often be considered as the "last line of defense". Treatment control BMPs remove pollutants from urban runoff by physical, chemical or biological processes or a combination of these processes. These practices improve the water quality of urban runoff before discharge into the receiving waters, but they may also be needed as a cleaning step prior to the use of stormwater runoff in irrigation, infiltration or groundwater recharge. Often, a series of BMPs is used so that they work in series to achieve a higher degree of treatment or to remove different classes of pollutants. Treatment control BMPs can be implemented at the source where the pollutants are generated (e.g., residential homes, businesses, etc.). However, treatment control BMPs are more often implemented as larger scale projects to remove runoff pollutants from the storm drain system. Typical examples of treatment control BMPs already implemented in the City of Los Angeles are the hydrodynamic separators, Fresh Creek and P.J. Hannah netting systems and catch basin inserts and covers for the removal of trash (***Section 7.4***).

6.3 Selection of Structural Best Management Practices

Selection of structural BMPs for implementation depends on many considerations, a process discussed in more detail in ***Section 9.2*** and ***Appendix 9-4***. An important tool for the Southern California area is the Los Angeles County-wide Structural BMP Prioritization Methodology, which is developed by Los Angeles County, City of Los Angeles, Heal the Bay and Geosyntec with the main purpose of identifying structural BMPs for management of wet weather urban runoff in Los Angeles County.

Selection and prioritization of structural BMPs for implementation should primarily be based on BMP performance criteria. However, there still is much uncertainty about the effectiveness of BMPs in removing pollutants, as illustrated by the wide range of pollutant effluent concentrations from detention basins in ***Appendix* 6-2**. The International Stormwater BMP Database (***Ref.* 6-2**) collects and summarizes BMP performance data for a wide range of structural BMPs and pollutants with the objective to provide a better understanding of factors influencing BMP performance and help to promote improvements in BMP design, selection and implementation.

In addition to pollutant removal efficiencies, other considerations for selecting structural BMPs include:

- How much runoff volume the BMP reduces.
- How much runoff is treated (versus bypassed).
- Whether the BMP can demonstrate a statistical difference in effluent quality compared to influent quality.
- What distribution of effluent quality is achieved.
- How well the BMP reduces peak runoff rates, especially for smaller, frequent storms.
- Operational and/or maintenance frequencies and the effect on the BMP performance.

References

6-1. California Stormwater Quality Association (2003). California Stormwater Best Management Practice Handbooks (www.cabmphandbooks.com).

6-2. International Stormwater BMP Database (www.bmpdatabase.org).

6-3. US EPA (2005). Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters; EPA 841-B-05-005.

6-4. Center for Watershed Protection (www.cwp.org).

6-5. Donald Bren School of Environmental Sciences & Management (2003). Analysis of Management Strategies for Stormwater Conveyance Systems to Control Input of PCB-Contaminated Sediments to San Francisco Bay (www.bren.ucsb.edu/research/2003Group_Projects/bay/Final/bay_brief.pdf).

6-6. Division of Public Works, Frederick County, Maryland (2003). Strategic plan to improve water quality through public outreach in Frederick County, Maryland (http://64.233.179.104/scholar?hl=en&lr=&q=cache:MXomnG2ORPcJ:www.co.frederick.md.us/NPDES/files%255CPublicOutreach.doc+Maximum+expected+magnitude+of+change+from+education+and+participation+programs+over+6-12+months+by+Taylor+and+Wong+2002).

Chapter 7
TMDL Implementation Plans

7.1 Introduction

This section provides an overview of the compliance requirements and ongoing implementation activities associated with each of the TMDLs adopted in watersheds encompassing the City.

7.2 Existing TMDL Requirements

As of December 2008, the LARWQCB has adopted 14 TMDLs in the Los Angeles area (***Table 5-1***). The schedule for TMDL development established by the Consent Decree between Heal the Bay and US EPA (***Chapter 5, Appendix 5-2***) will probably result in over 60 TMDLs in the Los Angeles area by 2012. Each TMDL, which includes an implementation schedule, is incorporated into the Basin Plan as an amendment. Key milestones in this schedule typically include:

- **Coordinated Monitoring Plan (CMP)** – a CMP is developed and implemented jointly by responsible jurisdictions. The CMP is developed to demonstrate compliance with TMDL monitoring requirements.

- **Implementation Plan** – Many, but not all, TMDLs require that the responsible jurisdictions develop a joint Implementation Plan. This plan outlines the drainage areas to be addressed and how compliance with wasteload allocations will be achieved.

- **Compliance Dates** – TMDL compliance is typically expected to occur in a phased manner over a specified number of years. Compliance milestones are often expressed as a percent reduction of exceedance days or pollutant loads.

To streamline the TMDL development process, some of the TMDLs adopted in the Los Angeles area address multiple pollutants. For example, the Marina Del Rey Harbor Toxic Pollutants TMDL addresses five pollutants: Chlordane, total PCBs, copper, lead, and zinc; and the Ballona Creek Metals TMDL addresses seven pollutant concerns: arsenic, cadmium, copper, lead, silver, zinc, and water column toxicity.

Thirteen of the TMDLs adopted by the Regional Board have been approved by EPA and are in effect. The Machado Lake (Dominguez Channel watershed) Nutrients TMDL has not yet received EPA approval and thus is not effective at this time. ***Table 7-1*** summarizes the requirements associated with each of these TMDLs in the Los Angeles area. It is important to note that currently the City complies with all TMDL implementation requirements.

Table 7-1
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Ballona Creek	Ballona Creek	Trash	8/11/05	Original trash TMDL effective 8/1/02; TMDL was revised by the Regional Board in 2004 Compliance with final waste load allocation achieved through full capture system (defined in TMDL) Phased reductions of trash from existing baseline loads to zero over a 10-year period (projected to end in 2015)
	Ballona Creek, Ballona Estuary and Sepulveda Channel	Bacteria	4/27/07	4/08 □Coordinated Monitoring Plan □In Progress 10/09 □Submit Implementation Plan 4/13 □Comply with allowable exceedance days and rolling geometric mean targets for summer and winter dry weather (DW) 7/21 □Comply with allowable exceedance days and rolling geometric mean targets for wet weather (WW)
	Ballona Creek	Metals (copper, lead, selenium, zinc)	1/11/06	1/07 □Coordinated Monitoring Plan □Completed/Pending approval by LARWQCB 1/10 □Submit Implementation Plan 1/12 □50□ drainage area (DA) in compliance, dry weather (DW); 25□ DA in compliance, wet weather (WW) 1/14 □75□ DA in compliance, DW 1/16 □100□ DA in compliance, DW; 50□ DA in compliance, WW 1/21 □100□ DA in compliance, WW
	Ballona Creek Estuary	Toxic Pollutants[3] (sediment/fish tissue/mussels □ cadmium, copper, lead, silver, zinc, chlordane, DDT, total PCBs, total PAHs)	1/11/06	1/07 □Coordinated Monitoring Plan □Completed/Pending approval by LARWQCB 1/11 □Submit Implementation Plan 1/13 □25□ DA in compliance 1/15 □50□ DA in compliance 1/17 □75□ DA in compliance 1/21 □100□ DA in compliance

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Dominguez Channel	Los Angeles Harbor	Bacteria	3/10/05	9/05 – Submit workplan to implement Tier 1 BMPs at Inner Cabrillo Beach (ICB) - Completed 9/05 – Implement BMPs at ICB including trash receptacles and educational signage - Completed 9/05 – Submit workplan for Tier 2 BMPs at ICB - Completed 9/05 – Submit workplan to assess water quality in the Inner Harbor of the Main Ship Channel (MSC) - Completed 3/06 – Complete implementation of source control BMPs at ICB - Completed 3/07 – Evaluate compliance based on implementation of Tier 1 & 2 BMPs 9/07 – Based on results of MSC water quality studies, submit workplan for source control or diversion BMPs – Completed/Pending approval 3/08 – If southern portion of ICB not in compliance, submit report for Tier 3 actions to be taken 3/10 – All tier 3 actions completed at ICB 3/10 – 100% compliance achieved To date, all compliance requirements have been met with submissions but some are still pending approval by the Regional Board
	Machado Lake	Trash	3/6/08	TMDL was adopted by the Regional Board 6/7/07 6 months from effective date (ED) – submit Trash Monitoring and Reporting Plan Implement monitoring plan within 6 months of approval Submit monitoring results; recommend trash baseline WLA and propose full capture system prioritization 2 years from monitoring plan approval date Years 4 to 8 from TMDL effective date, implement installation of full capture system to ultimately achieve 100% reduction of trash from WLA baseline
	Machado Lake	Nutrients	3/11/09	Adopted by LA Regional Board: 5/1/08 Caltrans and MS4 Permittees: Submit Monitoring and Reporting Program Plan (1 year after ED); submit TMDL Implementation Plan (2 years after ED); meet interim total nitrogen WLA (5 years after ED); meet final WLAs and LAs (9.5 years after ED)

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Los Angeles River	Los Angeles River	Trash	9/23/08	Original trash TMDL effective 8/1/02; a revised TMDL was adopted by the Regional Board 8/9/07 Compliance with final waste load allocation achieved through full capture system (defined in TMDL) Phased reductions of trash from existing baseline loads to zero over a 9 year period (projected to end in 2016)
	Los Angeles River & Tributaries	Metals (cadmium, copper, lead, selenium, zinc)	1/11/06	4/07 – Submit CMP - Completed 1/10 – Submit Implementation Plan 1/12 – 50% drainage area (DA) in compliance in DW; 25% DA in compliance in WW 1/20 - 75% DA in compliance, DW 1/24 - 100% DA in compliance, DW; 50% in compliance, WW 1/28 - 100% DA in compliance, WW
	Los Angeles River Watershed	Nitrogen Compounds and Related Effects (algae, pH, odor, scum)	9/27/04	9/04 – Apply interim NH3-N, NO3-N, NO2-N limits to POTWs; apply wasteload allocations (WLA) to minor point source dischargers - Completed 9/05 – Submit monitoring workplan to estimate ammonia and nitrogen loadings from storm drains - Completed 9/05 – Submit workplan for evaluating effectiveness of nitrogen reductions on removing impairments from algae, odor, scum and pH – Completed/pending 9/05 – Submit workplan to evaluate site-specific objectives for ammonia, nitrate and nitrite - Completed 3/07 – Submit results of Water Effect Ratio study for ammonia downstream of Tillman WWTP - Completed 3/08 – Regional Board considers site-specific objectives and revision of WLAs - Site-specific objectives for ammonia were adopted by Regional Board 6/7/07 - Completed 3/08 – interim limits expire; WLAs apply to POTWs - New permit requirements for Los Angeles Glendale and Donald C. Tillman treatment facilities, July and October 2007, respectively - Completed 9/08 – Evaluate monitoring data and determine need for revising WLAs 3/09 – TMDL revised as needed based on findings of studies

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date(1)	Requirements & Accomplishments(2)
Santa Monica Bay	Santa Monica Bay Beaches	Wet Weather Bacteria	7/15/03	11/03 □Submit Coordinated Shoreline Monitoring Plan (CSMP) - Completed 7/04 □Submit jurisdictional implementation plans □Completed 7/09 □10□ reduction in applicable total exceedance days 7/13 □25□ reduction in applicable total exceedance days 7/18 □50□ reduction in applicable total exceedance days 7/21 □100□ reduction in applicable total exceedance days; target geometric mean met
	Santa Monica Bay Beaches	Dry Weather Bacteria	7/15/03	Implement monitoring program as described in CSMP - Ongoing 11/03 □Identify and eliminate illegal discharges □Identified, elimination ongoing 7/06 □Summer dry weather allowable exceedance days and rolling geometric mean target must be met 7/09 □Winter dry weather allowable exceedance days and rolling geometric mean target must be met
	Marina Del Rey Harbor Mothers□ Beach and Back Basins	Bacteria	3/18/04	7/04 □CMP, List of small drains discharging to waterbody - Completed 3/05 □Submit Implementation Plan - Completed 3/07 □Comply with DW requirements 3/21 □Comply with WW requirements
	Marina Del Rey Harbor Back Basins	Toxic Pollutants (sediment - chlordane, total PCBs, copper, lead, zinc)	3/22/06	3/07 □Coordinated Monitoring Plan - Completed 3/11 □Submit Implementation Plan 3/13 □25□ DA in compliance 3/15 □50□ DA in compliance 3/17 □75□ DA in compliance 3/21 □100□ DA in compliance

(1) Effective Date □Date of EPA Region 9 approval; dates obtained from LARWQCB web site that provides links to all TMDLs adopted by Regional Board resolution: http://www.swrcb.ca.gov/rwqcb4/html/bpaRes/bpa.html (last assessed March 2009).
(2) Most compliance schedules also include opportunity for special studies to support scheduled TMDL re-openers. Any deadlines for completion of special studies or schedules for re-openers were not included in the information in this table.
(3) Ballona Creek Toxic Pollutants TMDL may be revised based on developing State sediment quality objectives.

7.3 TMDL Implementation Plans

For the effective TMDLs, the following Implementation Plans have been submitted to the LARWQCB (see ***Table 7-1***): (1) Santa Monica Bay Wet and Dry and Wet Weather Bacteria TMDLs and (2) Marina Del Rey Harbor Mother's Beach and Back Basin Bacteria TMDL. Other TMDLs still requiring the development of implementation plans as a TMDL compliance requirement include:

- Ballona Creek, Ballona Estuary and Sepulveda Channel – Bacteria (October 2009)
- Ballona Creek - Metals (January 2010)
- Los Angeles River & Tributaries – Metals (January 2010)
- Ballona Creek Estuary – Toxic Pollutants (January 2011)
- Marina Del Rey Harbor and Back Basins – Toxic Pollutants (March 2011)

It is too soon to assess the effectiveness of the two Implementation Plans that have been completed. Instead, the following sections describe the implementation plan established for each TMDL and the implementation activities completed or ongoing.

7.3.1 Santa Monica Bay Dry and Wet Weather Bacteria TMDLs

An Implementation Plan has been submitted to the LARWQCB for Santa Monica Bay to address water quality impairments caused by elevated bacteria: (1) Santa Monica Bay Beaches Dry Weather Bacteria TMDL; and (2) Santa Monica Bay Beaches Wet Weather Bacteria TMDL. These TMDLs became effective on July 15, 2003.

The area draining to Santa Monica Bay includes 27 subwatersheds covering many governmental jurisdictions. For the purposes of TMDL implementation, this area was divided into several Jurisdictional Groups. The City of Los Angeles is the lead agency for Jurisdictional Group 2 and is a participating agency in Jurisdictional Groups 3 and 7.

Jurisdictional Groups 2 and 3 (J2/3) submitted a joint plan to the RWQCB in 2005 (***Ref. 7-1***).

7.3.1.1 Implementation Plan Strategy

The following sections briefly summarize the overall strategy for runoff management and pollution reduction. ***Appendix 7-1, Tables 1 and 2*** summarize the recommended BMP types and policy changes incorporated into the J2/3 Implementation Plan.

Wet Weather Runoff Implementation
The Wet Weather Implementation Plan was developed using an "integrated resources approach," which has the following attributes:

- Integrates urban runoff planning with planning for other water system needs, such as recycled water and potable water;
- Focuses on beneficial use of stormwater runoff, including groundwater infiltration at multiple points throughout a watershed;
- Addresses multiple pollutants; and
- Incorporates enhancement of other public goals, such as water supply, recycling and storage, environmental justice, parks, greenways, open space, and active and passive recreational and environmental education opportunities.

The plan relies on phased TMDL compliance and is being implemented in two overlapping stages:

Stage 1 (2013 – 2015) – This stage emphasizes institutional (nonstructural BMPs) and subregional structural runoff management solutions that can be quickly implemented and monitored for effectiveness. Non-structural BMPs include revision and development of City policies, ordinances, and guidelines for urban development and redevelopment that focus on using green solutions to manage urban runoff, developing ordinances to promote low impact development (LID) and stormwater use, and coordinating activities Citywide, as well as expansion of the outreach program. Subregional structural runoff management solutions to reduce the volume of wet weather runoff that reaches the receiving waters include the installation of decentralized, small-scale, local storage, and stormwater use or infiltration projects at public facilities, as well as consideration of residential options, such as cisterns/rain barrels and redirected downspouts.

Stage 2 (2013 – 2021) – This stage will consider the need to implement regional, end-of-pipe solutions, such as diversion of wet weather runoff to the wastewater treatment system or the construction of storage and runoff treatment plants. These are generally single-purpose facilities that offer little benefit beyond pollution reduction and represent a less holistic approach to runoff management. For this reason, the need to pursue these options is deferred until the effectiveness of a concerted effort to implement institutional and subregional structural solutions can be evaluated.

Dry Weather Runoff Implementation

Dry weather flows are controlled through the construction of low-flow diversions (LFDs) in storm drains to prevent these dry weather flows from reaching beach areas. Diverted flows are directed to the sanitary sewer system via the Coastal Interceptor Sewer, which then sends the flows to the Hyperion Treatment Plant. LFDs are currently operated only from April through October for diversion of summer dry weather runoff, but planned upgrades will allow for year-round operation (except during wet weather) to include diversion of winter dry weather runoff. This will require an amendment to the wastewater service agreements with the 29 contract agencies in areas adjoining the City.

7.3.1.2 Implementation Activities

The following sections summarize the status of implementation activities to control wet and dry weather sources of pollutants.

Wet Weather Pollution Reduction Implementation

The Cities of Los Angeles and Santa Monica have been working together to develop and implement wet weather BMP projects to reduce urban runoff pollution (and reduce runoff) impacts to Santa Monica Bay, ***Appendix 7-1, Table 3***. To date, six wet weather BMP projects have been completed in J2 and J3 of the Santa Monica Bay watershed. An additional 13 projects are in various stages of implementation. ***Figure 7-1*** illustrates various project locations.

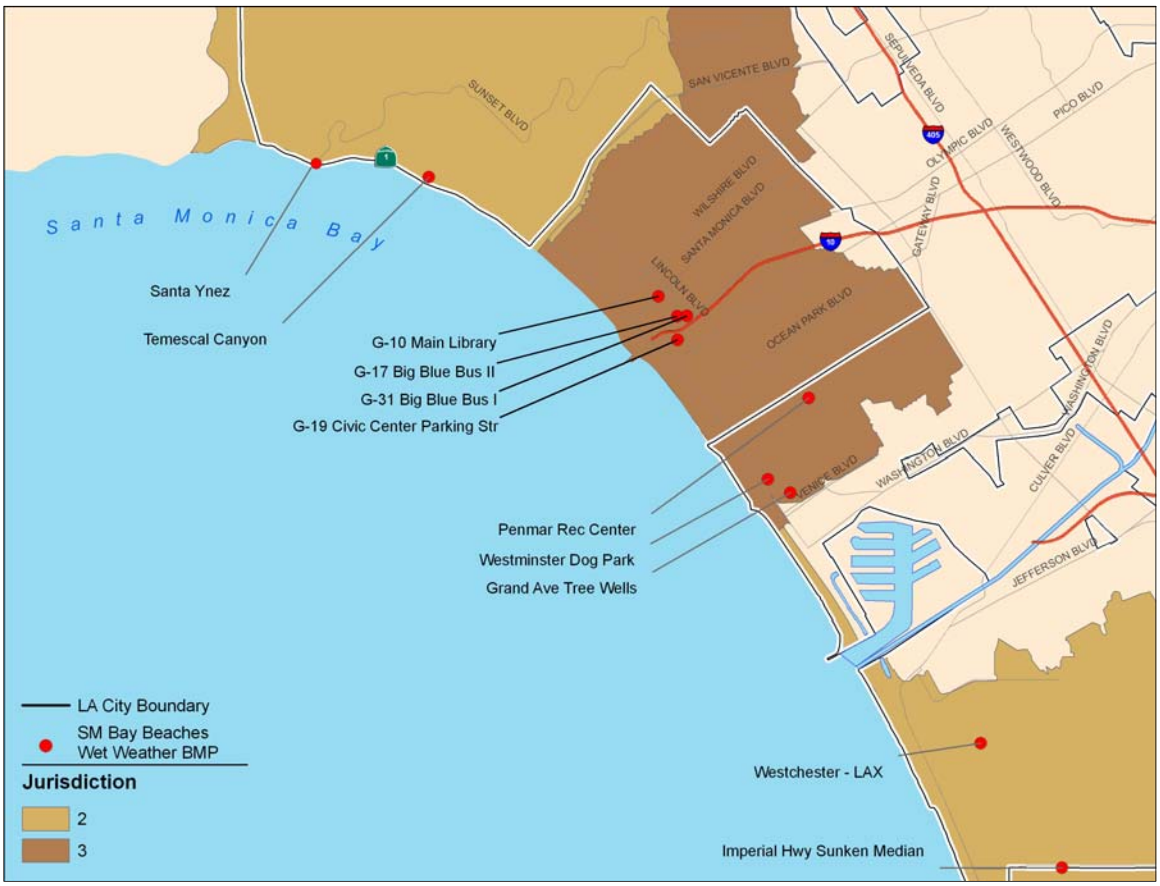


Figure 7-1
Locations of BMPs for Santa Monica Bay Beaches Wet Weather Bacteria TMDL

Dry Weather Pollution Reduction Implementation

The Cities of Los Angeles and Santa Monica and the County of Los Angeles have constructed 23 LFDs along Santa Monica Bay to divert dry weather flow into the wastewater system for treatment at Hyperion Treatment Plant and the Santa Monica Urban Runoff Recycling facility, ***Appendix 7-1, Table 4***. ***Figure 7-2*** shows the locations of diversion projects. Monitoring locations have been established near most of the locations of these LFDs to help evaluate the water quality benefits achieved in the bay.

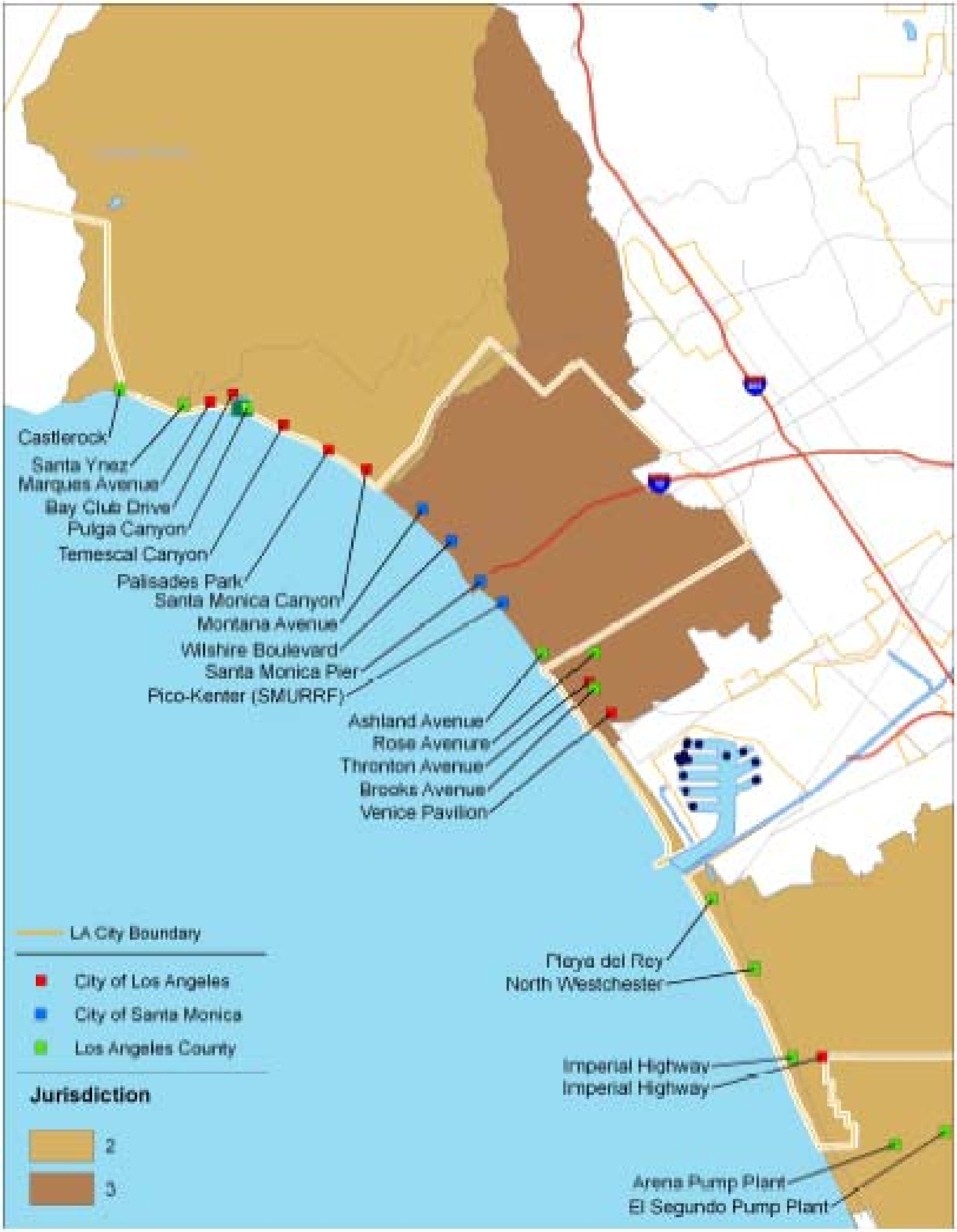


Figure 7-2
Locations of Low Flow Diversions for Santa Monica Bay Beaches Dry Weather Bacteria TMDL

7.3.2 Marina Del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL

The Implementation Plan for the Marina Del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL was submitted to the LARWQCB on October 31, 2005 (***Ref. 7-2***). The Plan was prepared cooperatively by the four responsible agencies in the watershed, Los Angeles County, the Cities of Los Angeles and Culver City, and the California Department of Transportation, through a collaborative effort with interested stakeholders, including the LARWQCB and the Santa Monica BayKeeper organization.

7.3.2.1 Implementation Plan Strategy

The responsible agencies developed a "Hybrid Approach" strategy that considers the following elements when selecting BMPs for a particular site:

Cost – builds in a cost/benefit/effectiveness analysis as part of the BMP selection process.

Low Risk – considers the use of multiple control programs to reduce the risk associated with reliance on a single approach.

Maximum Beneficial Use of Stormwater - incorporates stormwater use as an element into subregional controls where possible.

The Marina del Rey Harbor, Mother's Beach and Back Basins Bacteria TMDL Implementation Plan relies on the use of the following three BMP categories:

Public Information and Participation Program (PIPP) - The Plan recommends that all PIPP efforts associated with the TMDL, which includes public education, be coordinated with the existing PIPP efforts associated with the NPDES MS4 Permit.

Nonstructural BMP Program – Program consists of non-structural BMPs designed to prevent or minimize pollutant loads in stormwater runoff. Program activities typically involve transforming or modifying behaviors or practices through regulations, programs and public outreach. They are implemented by improving management of a variety of systems or facilities, e.g., storm drain systems, sanitary systems, street maintenance activities, recreational and public facilities, public parking facilities, boating activities, industrial and commercial facilities, illicit connections and discharges and development planning activities.

Structural BMPs Program – Program includes both non-stormwater controls, e.g., dry weather LFD, and stormwater discharge controls. Implementation of any future structural BMPs will need to consider the existing high groundwater table, tidal influences, flooding concerns, limited publicly owned lands, and planned marina redevelopment activities.

Details regarding each of the above programs are provided in the Implementation Plan (***Ref. 7-2***). ***Appendix 7-1, Tables 1 and 2***, summarizes the recommended non-structural and structural BMPs and policy changes contained in the plan. The status of BMP activities implemented to date is summarized in ***Appendix 7-1, Table 5***. These activities range from installation of LFDs to source identification/ control and efforts to increase circulation in one of the Marina basins. ***Figure 7-3*** illustrates proposed LFDs for the Marina area.

7.3.2.2 Implementation Activities

The City of Los Angeles has been working closely with County of Los Angeles (lead agency for this TMDL) to implement the Plan described above.

7.4 Other TMDL Implementation Activities

As noted in ***Section 7.3.***, only two TMDL Implementation Plans are currently being implemented. Other TMDL Implementation Plans will be prepared at a later date. Regardless, numerous activities designed to improve water quality are already underway in the Los Angeles region without a formal implementation plan.

One area where considerable work is underway is compliance with trash TMDLs for the Los Angeles River and Ballona Creek. These waters require a regular reduction of trash per year such that 100 percent reduction is achieved over a 10-year period. For the Ballona Creek Trash TMDL, the City successfully met the first compliance milestone established for September 2006 when a 20 percent trash reduction was to be achieved. To support this effort:

WPD conducted a study in 2001 to determine the different trash generation areas within the City of Los Angeles. The study took available datasets for trash collected from City-owned catch basins and projected the data spatially to identify geographically the areas of the City that generated proportionately more trash (***Figure 7-4***).

WPD developed a compliance strategy for the trash TMDL utilizing a two-pronged approach to protect the beneficial uses of the City's receiving waterbodies:
(1) Implementation of institutional type controls (i.e., public education, street sweeping, enforcement, etc.); and (2) installation of structural trash control devices (i.e., catch basin inserts, catch basin opening screen covers, netting systems, hydrodynamic devices, etc.). To date, over 7,400 catch basins have been retrofitted with catch basins inserts (August 2007 count) and over 14,300 catch basins have been retrofitted with screen covers (October 2007 count).

On November 2, 2004, Los Angeles voters passed Proposition O with an overwhelming majority of 76% to provide funding for water quality improvements including TMDLs. The $500 million bond authorized the City of Los Angeles to fund projects that protect public health, capture stormwater for beneficial uses, and meet the Federal CWA through removal and prevention of pollutants entering City creeks, rivers, and beaches.

Figure 7-3
Proposed Locations of Low Flow Diversions for Marina del Rey Harbor Mothers Beach and Back Basins Bacteria TMDL

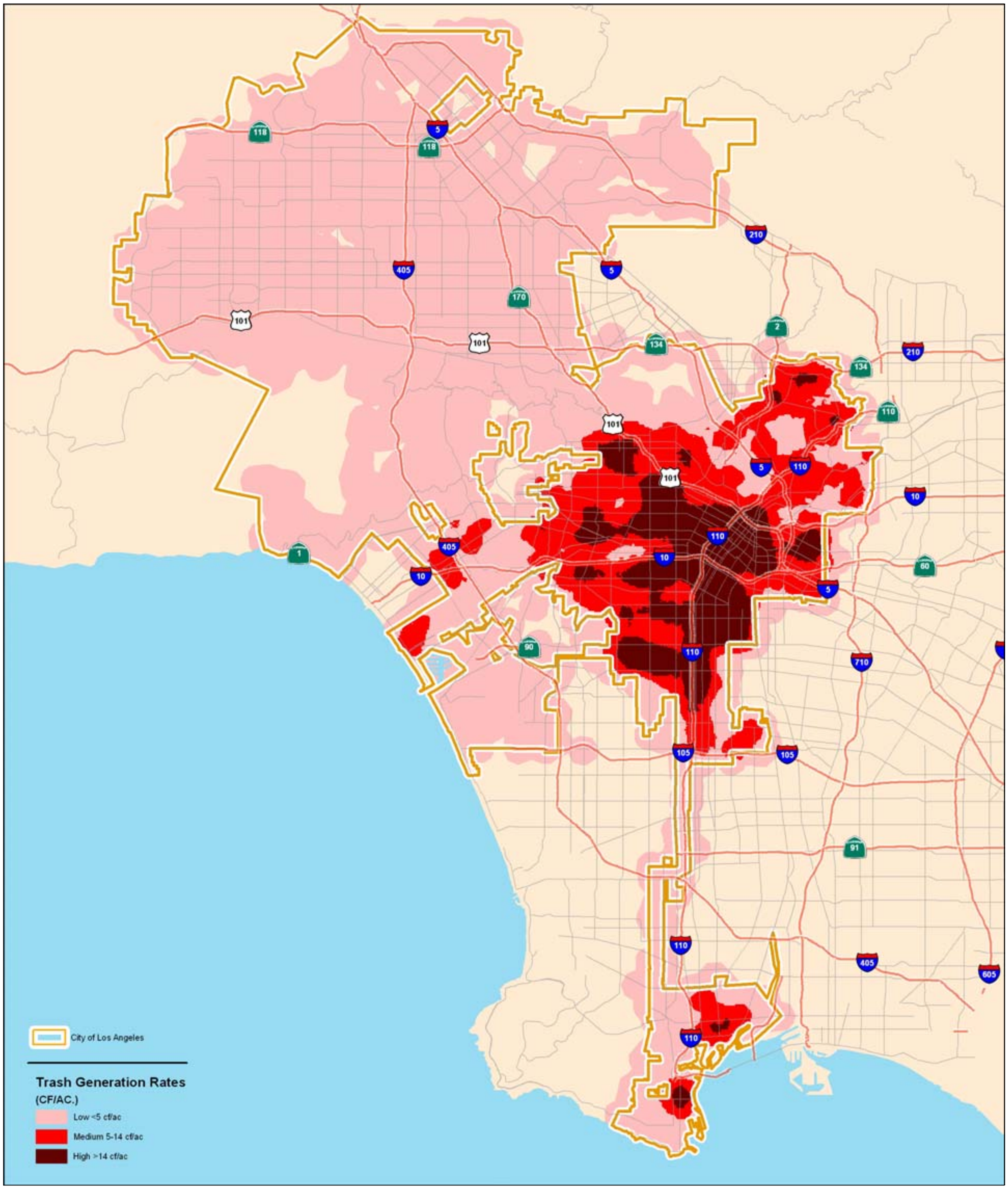


Figure 7-4
Prioritization of High Trash Generation Areas

Some 26 multi-benefit projects have been approved that address water quality, habitats, groundwater recharge, stormwater beneficial use and open space (***Figure 7-5*** and ***Appendix 7-1, Table 6***). Such projects include the Machado Lake Ecosystem Rehabilitation, Echo Park Lake Restoration, Santa Monica Bay Beaches Low-Flow Diversions Expansion, South Los Angeles Wetland, Cabrillo Beach Water Quality Improvement, Catch Basin Screens and Insert, and Strathern Pit Multi-Use and Water Recharge. In April 2007, ground was broken for the first of the approved projects, the Cesar Chavez Recreation Complex. Updates on the status of all Proposition O clean water bond projects may be found at: http://www.lapropo.org. ***Appendix 7-2*** details the Proposition O Project Selection Criteria, approved by the Boards of Public Works and used for selecting the projects listed in ***Appendix 7-1, Table 6***. Since then, the selection criteria have been revised (***Appendix 7-3***) for possible use in the future.

7.5 Summary

Two TMDL Implementation Plans have been developed and a number of others must soon be developed to meet existing TMDL compliance requirements. The City is also actively implementing projects to support anticipated TMDL requirements, especially through Proposition O. Three common elements in these plans include:

- Use of an iterative approach to provide opportunity to adapt the plan to changing conditions or priorities;
- Use of a combination of non-structural and non-structural BMPs depending on local conditions; and
- Use of an integrated water resource approach that considers the water conservation benefits of stormwater use.

The Implementation Strategy for the WQCMPUR incorporates these common elements as part of a strategy for all Los Angeles area watersheds.

Figure 7-5
Proposed Locations and Drainage Areas of Proposition O Clean Water Bond Projects

References

7-1. City of Los Angeles and City of Santa Monica. 2005. Santa Monica Bay Beaches Bacteria Total Maximum Daily Load Implementation Plan for Jurisdictional Groups 2 and 3. June 16, 2005.

7-2. County of Los Angeles, City of Los Angeles, City of Culver City, and California Department of Transportation. 2005. Los Angeles County Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL Implementation Plan. October 31, 2005

Chapter 8
Watershed Management Plans

8.1 Introduction

According to the U.S. EPA (***Ref. 8-1***):

> "A watershed plan is a strategy and a work plan for achieving water resource goals that provides assessment and management information for a geographically defined watershed. It includes the analyses, actions, participants, and resources related to development and implementation of the plan. The watershed planning process uses a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, and develop and implement protection or remediation strategies as necessary."

Within the four watersheds of the Los Angeles region, there have been many watershed management plans developed. As such, it is important to understand what has been previously written to identify common goals and opportunity for synergy between these plans and the WQCMPUR. These plans, regardless of the stakeholder input and geographic areas, have common threads, which are to improve water quality and restore and create aquatic habitat. Accordingly, a selected list of these plans was reviewed and has been summarized to identify elements that support the purposes of the WQCMPUR and therefore should be incorporated into the WQCMPUR's Implementation Strategy.

Many of these plans have similar goals as the WQCMPUR, suggest appropriate multi-use BMPs, identify potential policy changes and identify funding possibilities. The WQCMPUR addresses new requirements, but builds on these other documents in order to take advantage of what has already been done in the region.

As stated in the above quote, a watershed management plan has many components that are applicable to the WQCMPUR. However, the following summary ultimately focuses on the action items and projects that will come out of each plan that are applicable to managing urban runoff, as these will ultimately assist in achieving water quality compliance.

8.2 Water Quality Components of Existing Watershed Management Plans

As one of the goals of the WQCMPUR is to create a consistent plan for water quality improvement throughout the watersheds, many of these common items will become recommendations in the Implementation Strategy. As can be seen in ***Table 8-1***, the number of "implementation actions" or BMPs that are common elements between the plans are extensive. The plans, as a whole, provide a good starting point for useful technologies and effective BMPs.

Table 8-1
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Green Solutions												
Infiltration/Reduction of Runoff												
Infiltration BMPs (inf. basin, inf. trench, culvert, porous pavement, grass/gravel pavers, dry well, mulching, planters, rain gardens, retention grading, tree wells, permeable catch basin bottoms, etc.)	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Vegetated swale/basin or bioswale		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Increase/protect public open space	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water quality components at golf courses											✓	
Concrete removal in channels and restoration			✓	✓	✓	✓	✓	✓			✓	✓
Restore a Functional Riparian Ecosystem		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Restore sensitive habitat			✓	✓	✓	✓	✓	✓			✓	✓
Tree Planting	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
Minimize disturbance of soils and vegetation			✓	✓	✓	✓	✓		✓		✓	✓
Green roofs			✓	✓	✓	✓	✓		✓		✓	✓
Minimize dry weather urban runoff discharges	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Smart Irrigation	✓	✓	✓		✓		✓	✓	✓	✓		
Green Belt along power line transmission corridor	✓	✓	✓		✓		✓	✓	✓	✓		
Stormwater Use												
Cisterns/Rain Barrels	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Onsite Storage and Use of Stormwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Source Control												
Source control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Change to use non-toxic fertilizer, herbicide and pesticide	✓		✓	✓	✓			✓		✓		✓

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Reduce runoff from animal holding areas	✓		✓	✓	✓	✓		✓	✓			✓
Localized Treatment												
Constructed Wetlands and bioretention	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dry Weather Diversions (or wet)	✓		✓			✓	✓		✓			
Media Filtration	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Local storage, treatment (chlorination) and use of stormwater	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Surface runoff treatment for equestrian trails											✓	
Implement water quality treatment at multiple scales to maximize efficiency	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Develop "treatment terraces" within the channel to treat stormwater flows that "daylight" or surface in the River.	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Provide buffers along sensitive water bodies	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Daylight historic streams to restore wetlands	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Increase planting within the LA River and Compton Creek	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Regional Solutions												
Regional Groundwater Recharge (at Spreading Basins)	✓	✓	✓	✓		✓	✓				✓	
Treatment and Discharge at Urban Runoff Plants; End of Pipe Treatment	✓	✓		✓						✓		
Treatment and Reuse at Urban Runoff Plants	✓	✓		✓	✓			✓		✓		
Storage (multi-use retention basin, extended detention basin, underground retention/infiltration, and underground detention)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Properly conduct "controlled burns" in open space areas to reduce large fires.	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Safe Drinking Water Association Projects	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Groundwater Remediation	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Treatment Options												
In-line treatment systems in storm drains and channels	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Trash and debris capture, either Inline or End of Pipe (vortex separators, trash nets, Continuous Deflection Separator (CDS) units, etc)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Catch basin inserts	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Biological treatment of stormwater	✓			✓	✓	✓		✓	✓			✓
Oil absorbing bilge pads to capture and recycle used oil from boats	✓			✓	✓	✓		✓	✓			✓
Onsite treatment facilities at industrial sites	✓			✓	✓	✓		✓	✓			✓
Education and Outreach												
General Public Education												
Public Education and Outreach (k-12, coordinated between jurisdictions)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Reduce non-point source pollutants through public education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Develop and implement 5-year urban runoff public education strategy	✓	✓		✓	✓	✓	✓		✓		✓	✓
Catch basin/storm drain stenciling program	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Public signage	✓			✓		✓	✓	✓		✓	✓	✓
Industry Education												
Implement general good housekeeping practices by commercial and industrial facilities and construction activities.			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Industry/BMP/Activity/Pollutant/Community specific BMP outreach	✓		✓	✓	✓	✓		✓			✓	✓
Planning and Design BMPs												
Street Planning and Design												
Green the Neighborhoods	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Modification of streets to reduce paved areas and retain stormwater	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Incorporate green streetscapes and public landscapes	✓	✓	✓	✓	✓			✓	✓		✓	
Minimize impervious areas and directly connected impervious surfaces	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Street Cleaning												
Street and storm drain maintenance	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
High-tech or more efficient street cleaners	✓	✓	✓	✓	✓	✓		✓				✓
Other												
Place rail lines underground for more river parks	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Non-motorized crossings of the LA River	✓	✓	✓	✓	✓		✓	✓			✓	✓
Conjunctive use of groundwater basin for enhanced storage during wet periods for use during dry periods.	✓	✓	✓	✓	✓	✓		✓				✓
Expand reclaimed water infrastructure	✓	✓	✓	✓	✓	✓		✓				✓
Sediment Management												
Improve sediment management - slow & filter runoff, erosion control measures	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Evaluate and establish priorities for erosion control and remediation projects to remove legacy pollutants and implement priority projects.	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Encourage infill development	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Waste Collection												
Trash Collection												
Increase number of public receptacles in high priority areas (trash, cigarette, recyclable containers)	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Increase trash removal prior to forecast of large storms	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Expand on green waste (yard waste, etc) collection	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Litter and Pet Waste												
Increased litter removal	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Provide pet waste collection along parks and trails	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓
Other												
Ensure that sufficient pump out facilities are available, maintained, and used at existing or new moorage facilities.	✓		✓	✓	✓	✓	✓				✓	✓
Training												
Employees												
Ensure adequate staffing and training in local municipalities and agencies for implementation of storm water/urban runoff management.			✓	✓	✓	✓	✓	✓	✓		✓	✓
Support NPDES program - inspections, training of staff/number of staff, legal support, etc.			✓	✓	✓	✓	✓	✓	✓		✓	✓
Public												
Septic systems- inspections, correct malfunctioning tanks, provide alternatives/guides to owners, look at groundwater movement	✓			✓								
Maintenance												
Monitor and clean out pollutants that accumulate in structural and non-structural BMPs	✓		✓	✓	✓	✓		✓	✓			✓

Table 8-2 summarizes recommended policy changes. Several plans have similar recommended policy changes. The plans, as a whole, provide a road map for policy change, which the WQCMPUR will enhance through additional specific policy changes. The following are the key common elements between plans:

- Change zoning and land use to accommodate runoff management options;
- Improve communication between jurisdictions;
- Integrate watershed planning with water supply, natural resources, land use, and transportation plans;
- Expand the SUSMP program requirements; and
- Change roadway improvements to include vegetated medians, buffers and/or parkways, and porous pavement.

Table 8-3 summarizes the funding recommendations that were identified in the plans. As with the recommended implementation actions and policy changes, there are several proposed funding sources that are common in the plans:

- Bonds/Propositions;
- Taxes;
- Federal funding sources;
- Grants from federal, state, and nongovernmental agencies;
- Reallocation of jurisdictional budgets; and
- SWRCB and RWQCB funds.

While the plans as a whole discuss a great deal of capital funding options, they do not fully address operation and maintenance costs. Ensuring that the implemented water quality improvement projects receive consistent operation and maintenance funds is crucial to the success of the program.

8.3 Description of Existing Watershed Management Plans

8.3.1 Bay Restoration Plan, Santa Monica Bay Restoration Project, 1994

The Bay Restoration Plan was prepared by the Santa Monica Bay Restoration Project (SMBRP), and it is a comprehensive plan of action for Bay protection and management that address critical environmental problems facing the Bay such as stormwater and urban runoff pollution, habitat loss and degradation, and public health risks associated with seafood consumption and swimming near storm drain outlets. It also outlines specific programs to address the environmental problems facing the Bay and identifies implementers, timelines, and funding needs.

The Plan lists more than 30 priority actions to control major sources of pollution to the Bay. Since 1992, the Project has secured $8 million in bond funding for pollution control projects such as dry-weather runoff diversions from seven storm drain outlets along Santa Monica Bay beaches, a state-of-the-art urban runoff treatment and reclamation facility in Santa Monica (Santa Monica Urban Runoff Recycling Facility (SMURRF)), and many devices to capture trash, oil, grease, and sediments in storm drains throughout the watershed.

In March of 2000, California voters passed Proposition 12, the Safe Neighborhood Parks, Clean Water, Clean Air, and Coastal Protection Bond Act. Included in the bond measure was $25 million specifically for projects within Santa Monica Bay. To date, the Project has funded almost $3 million for projects that reduce pollutants entering the Bay (***Ref. 8-2***).

8.3.2 Los Angeles River Master Plan, 1996

In 1996, the Los Angeles River Master Plan was prepared by the County of Los Angeles, Department of Public Works and adopted by the Los Angeles County Board of Supervisors with help from a consortium of agencies, municipalities, environmental groups, and individuals. The plan examined the mainstem of the river, reach by reach, and Tujunga Wash tributary to identify ways to revitalize the publicly-owned rights-of-way.

As of October 2007, the Los Angeles River Master Plan is in implementation phase. The Master Plan Advisory group continues to meet periodically and subsequent guidelines are being issued for signage and landscaping. More than one hundred projects are listed on Los Angeles County Department of Public Works. Majority of the projects are addition of new bikeways, construction of greenways, improving river access roads, and general aesthetic enhancement projects (***Ref. 8-3***).

8.3.3 Common Ground: from the Mountains to the Sea: Watershed and Open Space Plan: San Gabriel and Los Angeles Rivers, 2001 & 2002

The San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy (RMC) and the Santa Monica Mountains Conservancy (SMMC) joined together to create "Common Ground: From the Mountains to the Sea: San Gabriel and Los Angeles Rivers Watershed and Open Space Plan." The plan sets forth a detailed list of guiding principles, provides general characteristics of the watershed, and includes project selection criteria from the SMMC's work program. It falls short of identifying actual project selection criteria, specific projects to be implemented or budgets (***Ref. 8-4***).

8.3.4 Santa Monica Sustainable City Plan, 2001

A comprehensive update process was begun in 2001 to improve and expand the Sustainable City Program and to begin addressing issues related to sustainability in the community. The program set new goals for the future. The Sustainable City Plan (SCP) adopted by City Council in February 2003, and updated in October 2006 includes goals for the City government and all sectors of the community, to conserve and enhance the local resources, safeguard human health and the environment, maintain a healthy and diverse economy, and improve the livability and quality of life for all community members in Santa Monica (Santa Monica, 2006).

SCP is broad in concept, and only a portion of goals directly relate to watershed protection: (1) SM Bay beach closures – 0 days target for dry weather, 3 days target for wet weather, and(2) Urban runoff – upward trend of permeable land (***Ref. 8-5***).

8.3.5 Arroyo Seco Watershed Restoration Feasibility Study, 2002

The California Coastal Conservancy and Mountains Recreation and Conservation Authority funded the "Arroyo Seco Watershed Restoration Feasibility Study" that was prepared by North east Trees and the Arroyo Seco Foundation. This study characterizes the ecosystem health, physical and cultural characteristics of the watershed; makes recommendations for future studies and technical analyses. Proposed projects are sorted by stream reach and identify the watershed goals to be fulfilled, years to complete, and across a large range of costs. The plan deals with economics and governance structures (***Ref. 8-6***).

8.3.6 Ballona Creek Watershed Management Master Plan, 2004

In May 2001, the State Water Resources Control Board awarded a grant of $200,000 for the development of a Ballona Creek Watershed Management Plan (BCWMP) to a partnership consisting of Ballona Creek Renaissance (BCR), the Watershed Management Division of the Los Angeles County Department of Public Works, and the Santa Monica Bay Restoration Project. The BCWMP was completed in September 2004. The broad goal of the Plan was to: "Set forth pollution control and habitat restoration actions to achieve ecological health." The plan:

- Identified target areas for source control of pollutants;
- Identified habitat/open space restoration potential in the watershed and potential benefits for improving water quality if implemented;
- Developed measurable water quality improvement and habitat restoration goals;
- Selected and prioritized best management practices (BMPs) that are most cost-effective for achieving the goals;
- Developed a community-based watershed monitoring plan to track environmental conditions and evaluate plan implementation; and

- Identified and obtained commitment from responsible parties for implementation of the plan.

The BCWMP served to coordinate across jurisdictions efforts to improve water quality, habitat and open space in the Ballona Creek Watershed and identify a series of actions to be implemented by individuals, neighborhoods, organizations, cities, and local, state, and federal agencies. Twenty-three water quality improvement projects are listed as complete or under construction (***Ref. 8-7***).

8.3.7 Dominguez Watershed Management Master Plan, 2004

The Dominguez Watershed Management Master Plan (DWMMP), completed in April 2004, was prepared by County of Los Angeles Department of Public Works Watershed Management Division. The DWMMP is a comprehensive document to assist stakeholders in the protection, enhancement, and restoration of the environment and beneficial uses of the Dominguez Watershed. The plans goals include:

- Assess, identify, and addresses watershed issues;
- Involve public by identifying their issues of importance;
- Protect, preserve, restore, and enhance the watersheds beneficial uses and ecological health;
- Identify funding opportunities; and
- Develop an effective approach to meeting water quality regulations for the watershed.

The document does not specify any implementation projects to be completed. The document serves more as an action plan that calls for use of structural and source control BMPs along with operation and maintenance and habitat enhancement.

Eighteen projects are listed as action items associated with the goal to protect and enhance water quality. The projects range from creating wetlands to treating urban water runoff to public outreach programs. The projects reduce/eliminate impairments and impairment contributing factors (***Ref. 8-8***).

8.3.8 City of Los Angeles Water Integrated Resources Plan, 2004

The Water Integrated Resources Plan (Water IRP) was prepared by the City of Los Angeles Department of Public Works Bureau of Sanitation and Department of Water and Power in order to meet the Clean Water Act (CWA) requirements that cities update their facility plans. The purpose of the Water IRP was to develop and implement an integrated resource planning process that addresses the City's water resources and wastewater/ biosolids collection, treatment, recycling, and disposal practices though the year 2020 that explicitly recognizes the complex relationships that exist among all of the City's water resources activities and functions.

With respect to stormwater element of the Water IRP, the preferred alternative establishes a target of treating and discharging, diverting, or infiltrating a portion of the runoff. The goals for managing runoff (managing refers to both reducing the volume of runoff and/or reducing the amount of pollutants in the runoff) includes:

- **Dry weather**: Manage 42% of the dry-weather (41 mgd).
- **Wet weather**: Manage 47% of the wet weather urban runoff (791 mg per storm event)

In response to this plan, the City Council adopted a resolution calling for City Departments to implement a number of measures to manage urban runoff:

- Direct Public Works to review SUSMP requirements to determine ways to require where feasible on-site infiltration and/or treat/beneficial use, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible (e.g., similar programs developed by City of Santa Monica).
- Direct Building and Safety to evaluate and modify applicable codes to encourage all feasible BMPs for maximizing on-site capture and retention and/or infiltration of stormwater instead of discharge to the street and storm drain, including porous pavement.
- Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities in coordination with LA River Revitalization Master Plan, and large developments greater than 1 acre. Program feasibility should consider slope and soil conditions.
- Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement (i.e., change/support landscape ordinance and encourage the use of permeable pavement).
- Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible. For example, conduct pilot program in East Valley, taking into consideration soil conditions and Proposition project criteria, as well as along the future LA River Revitalization Master Plan.
- Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a power line easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).
- Direct Public Works and DWP to work with LAUSD to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as IRP

Implementation Strategy government/city-owned facilities with stormwater management BMPs. [Provide wet weather runoff storage (cisterns) to beneficially use wet weather runoff for irrigation. Also, schools and government properties to reduce paving and hardscape and add infiltration basins to allow percolation of wet weather runoff into the ground where feasible.] As appropriate, integrate with LAUSD's new schools development program.

- Direct Public Works, General Services, and Recreation and Parks to identify sites that can provide onsite percolation of wet weather runoff in surplus properties, vacant lots, parks/open space, abandoned alleys in East Valley, and along the LA River in the East Valley where feasible. Program feasibility should consider slope and soil conditions.

- Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.

- Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.

- Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions

- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks. Coordinate and evaluate the impact with the LA River Master Plan.

- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains that are tributary to the Los Angeles River to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.

The City Departments identified in these measures are currently working to conduct the required evaluation studies and execute the required projects. These efforts are led by the Wastewater Engineering Services Division of the Bureau of Sanitation (***Ref. 8-9 and 8-10***).

8.3.9 Compton Creek Watershed Management Plan, 2005

The Compton Creek Watershed Management Plan (CCWMP) was completed in July 2005, and prepared by the Los Angeles & San Gabriel Rivers Watershed Council with the assistance of EIP Associates and Heal the Bay (***Ref. 8-11***). The CCWMP introduces the watershed concept to the people that reside, do business, and provide services within the Compton Creek Watershed. The Compton Creek WMP was developed to accomplish the following goals that relate to water quality:

- Improve water quality;
- Improve wetland and riparian habitat quality and quantity;
- Maintain flood protection; and
- Optimize water resources to reduce dependence on imported water.

Outlined in the CCWMP is a table of potential projects that, upon completion, could help achieve the overall objectives of the CCWMP.

8.3.10 Greater Los Angeles County Integrated Regional Water Management Plan, 2006

The Integrated Regional Water Management Plan (IRWMP) is a regional planning effort that was a product of Proposition 50, Chapter 8, which is general State bond, which required the IRWMP as a condition to state funding. The IRWMP creates a blueprint for achieving quantifiable targets for improving water quality and water supply, enhancing habitat and open space/recreation, and sustaining infrastructure for local communities in the Greater Los Angeles County Region.

One of the objectives of the IRWMP is to coordinate the prioritization of regional projects with multi benefits. Included in the plan are projects submitted by stakeholders; these projects address water supply, water quality, and open space/habitat/recreation benefits. Most of the projects that IRWMP supports provide multiple benefits in line with the plan's goal to "implement multiple objective planning and projects."

For the first stage of IRWMP implementation funding, 13 projects were submitted for Proposition 50 grant funding including three City of Los Angeles projects that are now in the implementation phase. In April 2007, the state awarded $25 million for these projects. Of this amount, $10 million was awarded to the City of Los Angeles for three projects that are currently being implemented. Urban runoff and stormwater quality improvements are a goal of many of these projects (***Ref. 8-12***). Under Proposition 84, $1 billion in additional state funds is anticipated for IRWMP projects.

8.3.11 LA River Revitalization Master Plan, 2007

The Los Angeles River Revitalization Master Plan (LARRMP) was prepared by the City of Los Angeles, Department of Public Works-Bureau of Engineering and the Department of Water and Power. The goal of the LARRMP is to create a 20-year plan for development and management of the Los Angeles River. The final plan, which was completed in April 2007, includes the following goals:

- Improve the environment, enhance water quality, improve water resources, and improve the ecological functioning of the River.
- Provide public access to the River.

- Provide significant recreation space and open space, new trails, and improve natural habitats to support wildlife.
- Preserve and enhance the flood control features of the River.
- Foster a growth in community awareness of the Los Angeles River, and pride in the Los Angeles River.
- Establish a River Improvement Overlay (RIO), which is a district that requires certain design standards for all new developments within that district, specifically addressing environmentally sensitive urban design, land use and development guidelines such as building orientation, parking location, landscape design, and stormwater mitigation. This RIO will create economic development opportunities to enhance and improve River-adjacent communities by providing open space, housing, retail spaces such as restaurants and cafes, educational facilities, and places for other public institutions.

The plan involves an adaptive, phased approach with near (10-15 years) and long-term goals (20-50 years) (***Ref. 8-13***).

8.3.12 Green Visions for 21st Century Southern California (Ongoing)

In 2003, a partnership between Southern California's state land conservancies and the University of Southern California's Center for Sustainable Cities and GIS Research Laboratory, was forged to create a visionary plan and practical planning tools to promote habitat conservation, watershed health, and recreational open space. The plans decision support tools will help to nurture a living green matrix for southern California. The goals of the Plan are to:

- Protect and restore natural areas;
- Restore natural hydrological functions;
- Promote equitable access to open space; and
- Maximize community support via multiple-use facilities.

The online planning tools are available to anyone in the region. The program has funds from state bonds for disbursement to local projects (***Ref. 8-14***).

Table 8-2
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Compton Creek Watershed Mgmt Plan (2005)	Water IRP (2004)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Green Solutions												
Include stormwater BMPs in all new parks									✓	✓		
Pubic agencies and districts should implement asset management programs which will preserve and protect the environment.												
Modify General Plans to include water quality elements.								✓				
Adopt a watershed-wide approach to water quality treatment that emphasizes treatment "at the source" and incorporates permeable surfaces.												
Support annual Coastal Cleanup Day and Adopt-a-Beach	✓											
Develop sediment quality objectives and site-specific cleanup levels necessary to support beneficial uses of Santa Monica Bay.	✓											
Create sponsorship program for natural resources								✓				
Planning and Design												
Street Planning and Design												
Changes to design of pedestrian segment of roadways to include green solutions						✓						
Changes to roadway improvements - include vegetated medians, buffers and/or parkways, porous pavement						✓	✓		✓	✓		

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Compton Creek Watershed Mgmt Plan (2005)	Water IRP (2004)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Plans and Guidelines												
Develop sub-watershed plans that are consistent with watershed based plans						✓						
Develop guidelines specific to Ballona Creek Watershed						✓						
Promote incorporation of storm water/urban runoff management into the Local Coastal Plan.	✓											
Implementation												
Have the Dept. of City Planning oversee implementation of the RIO and Community Plan Updates												
Determine the best ways to implement plans - create new entities vs. existing agencies												
Projects should be prioritized and implemented based on developed project selection criteria												
Utilize applied scientific research to guide public policy						✓						
Target specific industries such as metal fabrication, auto, metal scrap yards for specific TMDLS								✓				
Coordination												
Jurisdictions and Agency Coordination												
Improve communication between jurisdictions		✓				✓		✓				

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Coordinate open space planning, land acquisition and management among jurisdictions						✓						
Coordination with Federal and State Agencies												
Need for partnerships									✓			
Establish entity to promote restoration and provide public education forum									✓			
Inter-Discipline Coordination												
Integrate watershed planning with water supply, natural resources, land use, and transportation plans						✓		✓		✓		
Develop guidelines for coordinating water quality regulations with land use, resource protection and management, and other regulatory functions on a watershed basis.	✓											
Information Coordination												
Have GIS database that includes multiple agencies data (state and local)						✓						
Create clearinghouse for Ballona Creek Watershed information						✓						
Implementation Coordination												
Joint Powers Authority (JPA) or Council of Governments (COG) - City, County and Corps working together to Implement the regional and subregional plans/projects												

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Sign a MOU between LAC-DPW and the City of Los Angeles authorizing cross-jurisdictional entry into storm drains to investigate spill incidents.	✓											
Develop committee to track progress of projects and policies								✓		✓		
Ordinances and Codes												
Land Use												
Land use ordinances.	✓											
Land use ordinances to require native landscaping												
Changes to zoning/land use to accommodate runoff management options		✓	✓					✓		✓		
Develop and adopt policies to redo the impacts of transportation activities on pollutant loading in storm water runoff.	✓											
Infiltration, Conservation, Habitat												
Evaluate and modify codes to encourage on-site capture and retention and /or infiltration								✓		✓		
Ordinances to reduce area on private properties that can be paved with impervious pavement								✓		✓		
Ordinances to promote water conservation and efficiency	✓											
Increase policies and ordinances to protect wetlands and riparian areas						✓						
Develop "Model City Codes and Ordinances"							✓					

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Pet Waste												
"Pooper-scooper" ordinance strengthening									✓			
Implement measures that prevent discharges of pollutants into marina waters.	✓											
Establish ordinance against pigeon feeding									✓			
Incentives												
Rewards												
Implement incentives to encourage new and existing developments to detain stormwater onsite to reduce runoff			✓			✓						
Provide incentives for on-site treatment and reuse of runoff						✓						
Economic incentives to reduce toxic discharges to sewer and storm drain systems.	✓											
Economic incentives or rebates to promote native landscaping and conservation measures (smart irrigation)												
Pursue policies or incentives to reduce the spillable inventory of hazardous materials in the Santa Monica Bay watershed.	✓											
Develop a monitoring and credit program with Raymond Basin Management Board and regulatory agencies.					✓							
Incentives for product substitution (e.g. alternative packaging materials)									✓			

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	**The Santa Monica Bay Restoration Plan (1994)**	**Los Angeles River Master Plan (1996)**	**Common Ground: from the Mountains to the Sea (2001)**	**Santa Monica Sustainable City Plan (2001)**	**Arroyo Seco Watershed Restoration Feasibility Study (2002)**	**Ballona Creek Watershed Mgmt Plan (2004)**	**Dominguez Watershed Mgmt Master Plan (2004)**	**Water IRP (2004)**	**Compton Creek Watershed Mgmt Plan (2005)**	**IRWMP (2006)**	**Los Angeles River Revitalization Master Plan (2007)**	**Green Visions for 21st Century Southern California (ongoing)**
Encourage native planting in all public sector projects (drought tolerant)									✓			
Public recognition for conservation efforts									✓			
Fines												
Create fines for runoff									✓			
Enforcement actions	✓								✓			
Existing Program Expansion												
SUSMP												
Expand the SUSMP Program Requirements						✓		✓	✓	✓		
CEQA												
Expand CEQA: to look at cumulative effects of all projects in the proposed project area						✓			✓			
Develop and adopt policies which require all California CEQA compliance documents and site drainage designs to address potential impacts.	✓		✓									
NPDES												
Have NPDES permits issued on a watershed basis						✓			✓			
Revise current NPDES permits and incorporate new program elements.	✓											
Coordinate all components of NPDES with other regulatory functions on a watershed basis.	✓											

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	the Mountains to the Sea (2001)	Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Other												
Oversee development/implementation of mass emissions approach.	✓											
Establish initial mass loading discharge performance goals for a set of pollutants of concern	✓											
Support the cooperative efforts led by EPA and participated in by the State Storm Water Task Force and environmental groups on investigating the necessity for and feasibility of developing effluent limits for storm water runoff. Create a local working group.	✓											
Adapt LA River Landscape Guidance to Compton Creek	✓											
Monitoring Inspection												
Monitor compliance of point-sources of pollution regularly					✓							
O&M												
Create provisions for long term O&M					✓							

Table 8-3
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Awarded Funds												
Grants from federal, state, and nongovernmental agencies	✓		✓		✓	✓	✓	✓	✓	✓	✓	
Propositions	✓		✓		✓	✓	✓	✓		✓	✓	
Bonds			✓				✓	✓		✓	✓	
Budget Funds												
Reallocation of jurisdictional budgets							✓				✓	
Disbursements from taxes							✓			✓	✓	
Fees							✓	✓		✓		
Benefit assessments										✓		
Trust accounts and/or funds.			✓				✓					
Loans												
Low interest loans from federal and state agencies.							✓		✓			
Section 108 loan guarantees											✓	
Programs												
Implement "Adopt a Waterway Program"							✓					
Adopt a mitigation banking policy							✓					

Table 8-3 (Continued)
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Other Agencies Funds												
SWRCB and RWQCB funds							✓		✓		✓	
Federal funding sources						✓			✓	✓	✓	
California Resources Agency						✓			✓			
Department of Conservation						✓			✓			
Metropolitan Water District (MWD)									✓		✓	
State Funding Sources									✓	✓		
US Army Corps of Engineers					✓							
Wildlife Conservation Board									✓			
Department of Transportation									✓			
Environmental Enhancement and Mitigation Program									✓			
Southern California Wetlands Recovery Project									✓			
Integrated Waste Management Board									✓			
Bay-Delta Authority (CALFED)									✓			
Private Sources			✓		✓	✓						
Redlodge clearinghouse						✓			✓			
National Fish and Wildlife Foundation						✓			✓			
Urban Forests Ecosystem Initiative						✓			✓			
California Watershed Network						✓			✓			
Cyber-Sierra						✓			✓			
Private loans											✓	

Table 8-3 (Continued)
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Private investment											✓	
Santa Monica Bay Restoration Foundation	✓											
Local sponsors			✓		✓							
Corporate entities			✓									
Partnerships and/or sponsorships.							✓					
California Coastal Conservancy												
Santa Monica Bay Restoration Commission												

8.4 Conclusions

The following points are derived from the review of these other watershed management plans:

- Water quality compliance is discussed in several of these plans; however, it has not been the focal point of these plans.
- These existing master plans cover many of the same issues that the WQCMPUR covers.
- It is clear that funding and sources of funding needs to be further addressed, especially when considering operation and maintenance costs.

References

8-1. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds, 2005 (last visited 2/19/08). Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters. (online at: www.epa.gov\owow\nps/watershed_handbook/#contents)

8-2. Santa Monica Bay Restoration Project, 1994. Bay Restoration Plan.

8-3. County of Los Angeles, Department of Public Works, 1996. Los Angeles River Master Plan. (online: http://ladpw.org/wmd/watershed/LA/LA_River_Plan.cfm)

8-4. San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy, 2002. Common Ground: From the Mountains to the Sea: San Gabriel and Los Angeles Rivers Watershed and Open Space Plan. (online: www.rmc.ca.gov/plans/common_ground.html)

8-5. Santa Monica City Council, 2006. Santa Monica Sustainable City Plan. (online: http://santa-monica.org/epd/scp/pdf/SCP_2006_Adopted_Plan.pdf)

8-6. California Coastal Conservancy (2002). Arroyo Seco Watershed Restoration Feasibility Study. (online: www.arroyoseco.org/watershed.htm)

8-7. County of Los Angeles Department of Public Works , 2004. Ballona Creek Watershed Management Master Plan. (online: http://www.ladpw.com/wmd/watershed/bc/bcmp/masterplan.cfm)

8-8. County of Los Angeles Department of Public Works Watershed Management Division, 2004. Dominguez Watershed Management Master Plan. (online: www.ladpw.com/wmd/watershed/dc/DCMP/masterplan.cfm)

8-9. CH:CDM, 2004. Integrated Resource Plan, Facilities Plan, Volume 1 through 4. (online: www.lacitysan.org/irp/)

8-10. CH:CDM (CH2MHill and Camp Dresser & McKee Inc, a joint effort), 2001. Integrated Plan for the Wastewater Program. (online: www.lacitysan.org)

8-11. Los Angeles and San Gabriel Rivers Watershed Council, 2005. Compton Creek Watershed Management Plan.

8-12. Leadership Committed of the Greater Los Angeles County Integrated Regional Water Management Plan, 2006. Greater Los Angeles County Integrated Regional Water Management Plan. (online: www.ladpw.org/wmd/irwmp/)

8-13. City of Los Angeles, Department of Public Works-Bureau of Engineering and the Department of Water and Power, 2007. Los Angeles River Revitalization Master Plan. (online: www.lariverrmp.org/)

8-14. University of Southern California's Center for Sustainable Cities, 2003. Green Visions for 21st Century Southern California. (online: http://www.greenvisionsplan.net/html/index.html)

Chapter 9
Implementation Strategy

9.1 Introduction

The WQCMPUR Implementation Strategy is the long-term integration of watershed-specific management plans with general guidelines and technical, physical, and procedural methods to achieve water quality goals. The water quality goals for each of the four watersheds in the Los Angeles area are defined by the NPDES MS4 Permit and the many existing TMDLs or ones that will be developed in the near future.

The WQCMPUR Implementation Strategy is divided into three initiatives that are closely related (***Table 9-1***):

- The **Water Quality Management Initiative** describes how Water Quality Management Plans for each of the City's four watersheds and TMDL-specific Implementation Plans will be developed to ensure compliance with water quality regulations. While the WQCMPUR is a high level planning tool providing the strategic guidelines, the Water Quality Management Plans and TMDL-specific Implementation Plans will select and prioritize the BMPs for implementation in the watersheds. BMP selection will include structural BMPs (e.g., green and natural solutions, integrated water resources approach), as well as institutional BMPs.

- The **Citywide Collaboration Initiative** recognizes that urban runoff management and urban (re-)development are closely linked, requiring collaboration of many City agencies. This initiative requires the development of City policies, guidelines and ordinances for green and sustainable approaches for urban runoff management with short and long-term goals:

  - **Short-term**: compliance with water quality regulations in adopted TMDLs through structural BMPs using green and sustainable solutions and institutional BMPs; and

  - **Long-term**: development of a green and sustainable Los Angeles that gradually reduces future pollution of urban runoff.

- The **Outreach Initiative** promotes public education and community engagement with a focus on preventing urban runoff pollution. This initiative also has short and long-term aspects:

  - **Short-term**: outreach that targets specific pollutants and polluted areas to assist with compliance with adopted TMDLs.

- **Long-term**: outreach to promote environmental stewardship among all in the City.

The WQCMPUR Implementation Strategy specifies "recommended activities" for each of these initiatives that will help to achieve or is necessary to achieve water quality goals. In the discussion of each initiative or sub-initiative, recommended activities are prioritized using a two-tiered approach, as follows:

- "High priority recommended activities" have been included in the Implementation Strategy Action Plan, ***Section 9.8***, with the identification of the lead City agency and a proposed timeline for completion.

- "Other recommended activities" have not been included in the Implementation Strategy Action Plan because they may be less immediately urgent and/or they may need further development and evaluation.

As discussed in ***Section 9-8***, implementation of high priority recommended activities depends on the availability of financial resources for the Watershed Protection Program. The WQCMPUR does not need an Environmental Impact Report. California Environmental Quality Act requirements will be evaluated on an individual basis for specific projects.

9.2 Water Quality Management Initiative

The City will continue with the implementation of projects that are already included in the Capital Improvement Program (CIP). ***Appendix 9-1*** lists the projects that are funded through Proposition O, as well as other projects (mostly related to flood control) that are funded through the Stormwater Pollution Abatement Fund.

As TMDLs will be included in the NPDES MS4 Permit, the Water Quality Management Initiative is to address the implementation of adopted and future TMDLs and other water quality regulations. This initiative consists of the following three subinitiatives, ***Figure 9-1***:

- Subinitiative 1 - Water Quality Management Plans;

- Subinitiative 2 - Jurisdictional Partnerships; and

- Subinitiative 3 - Research and Evaluation.

Subinitiative 1 - Water Quality Management Plans

Four Water Quality Management Plans will be developed under this subinitiative - one for each watershed: Ballona Creek, Los Angeles River, Dominguez Channel, and Santa Monica Bay. These plans will address the requirements associated with adopted TMDLs and consider expected future TMDL requirements. Therefore, Water Quality Management Plans will establish a quantitative nexus between the selected combination of BMPs and the attainment of water quality standards and wasteload allocations that are specified in TMDLs. The development of Water Quality Management Plans will use various tools and resources such as Geographic Information Systems (GIS), water quality modeling, technical reports developed by various organizations, and field and desk-top investigations of potential locations for

Table 9-1
Key Elements of the Implementation Strategy

Initiative	Subinitiative	Purpose
Water Quality Management	Water Quality Management Plans	Establish four Water Quality Management Plans that include NPDES MS4 Permit and TMDL-specific requirements
	Jurisdictional Partnerships	Establish agreements within each watershed to support Water Quality Management Plan implementation
	Research & Evaluation	Continue water quality monitoring, pilot studies and research to support Water Quality Management Plan implementation
Citywide Collaboration	General Plan Update	Guide establishment of citywide policies for urban runoff management towards compliance with NPDES MS4 Permit
	Green Solutions	Implement low impact development activities to promote green landscapes, stormwater use, and multi-benefit projects
	Runoff Management	Implement a runoff management program that increases infiltration and reduces pollutant loading and peak flows
	Source Reduction	Reduce waste and toxics material generation at the source and improve inspection and enforcement activities
Outreach	Pollutant-Specific Outreach	Develop outreach for specific pollutants, but integrate education messages/materials where possible
	Stormwater NPDES and TMDLs Outreach	Inform general public, community, business and environmental leaders and organizations about meeting NPDES MS4 Permit and TMDL requirements
	School Outreach	Continue to enhance school education programs, teacher training and community linkages
	Business Outreach	Target appropriate businesses to address most significant pollutant concerns
	Employee Training Program	Review training materials and evaluate effectiveness of program
	Mass Media Advertising	Continue advertising programs; revise or enhance as needed
	Stakeholder Involvement	Coordinate stakeholder involvement in City activities including Proposition O project implementation
	Collaboration with Other Programs	Continue collaboration with non-profits, government agencies and other organizations to support TMDL implementation efforts

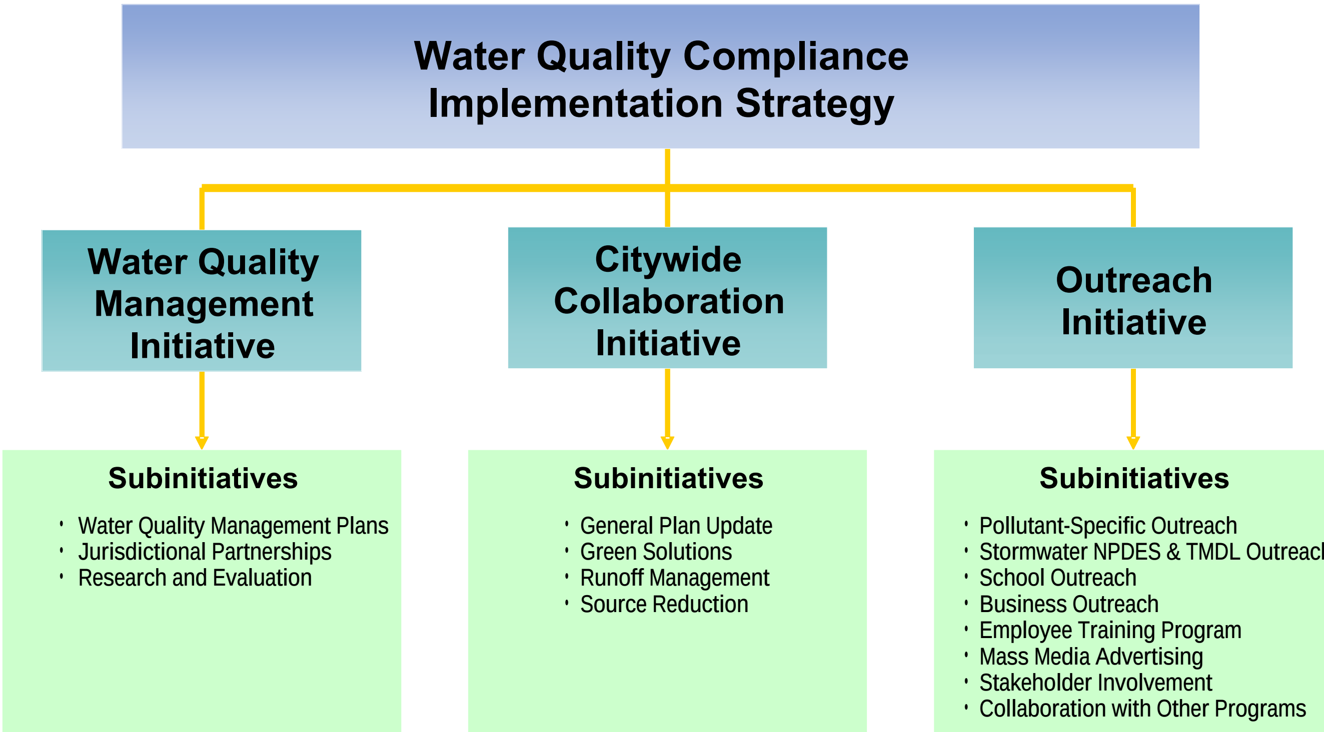


Figure 9-1
Key Strategy Elements

urban runoff management projects (e.g., ***Ref. 9-1***). Water Quality Management Plans will be periodically reviewed and, where needed, refined to incorporate new data and information as it becomes available.

Development of each Water Quality Management Plan is a multi-step process that includes the following elements:

Characterization of the Watershed
Each Water Quality Management Plan will characterize the watershed with respect to flow, water quality, land use, soil infiltration capabilities, and jurisdictional and property ownership. Much of this information has already been included in existing watershed management and other regional plans and will be used for developing the Water Quality Management Plans.

Development of Potential Strategies to Manage Urban Runoff
The development of optimal strategies for managing urban runoff will vary among watersheds based on unique watershed characteristics. Key factors that are part of the development of a watershed-specific strategy include:

- **TMDL Requirements** – Determine the reduction of pollutant loadings to impaired waters in the watershed as required for meeting the wasteload allocations specified in the TMDLs.

- **Ongoing Watershed Planning Activities** – Establish a synergy between development of Water Quality Management Plans and other ongoing watershed planning activities through collaboration and partnerships with the organizations that lead these other planning activities.

- **Multiple Benefit Projects** – Identify opportunities for incorporating an integrated water resources approach (such as the Water IRP) and green solutions into each Water Quality Management Plan.

Evaluation of BMP Alternatives to Manage Urban Runoff
Opportunities for BMP implementation will be evaluated to determine if expected pollutant reductions will meet targets in a cost-effective manner. BMP alternatives will be evaluated using the following steps***, Appendix 9-2***:

> **Step 1** – Prioritization of Catchments with the highest pollutant loads;
>
> **Step 2** - Identification of BMP Alternatives;
>
> **Step 3** - Screening BMP Alternatives; and
>
> **Step 4** - Selection of the Best Alternative.

This process will estimate the resultant changes (the "quantitative nexus") in concentration and flow expected in the receiving waterbody after the implementation of the selected BMPs.

The evaluation of BMP alternatives rests on the framework established in the Los Angeles County-wide Structural BMP Prioritization Methodology (***Ref. 9-2***). This planning tool has recently been developed by WPD, County of Los Angeles and Heal the Bay and focuses on the use of structural BMPs to control wet weather runoff. In addition to this methodology, the evaluation of BMP alternatives will need to consider the following key issues: (1) establishing design storm criteria; (2) establishing BMP performance criteria that affect the sizing and selection of BMP facilities; (3) establishing a methodology that describes the "Quantitative Nexus" between implementation of the prescribed BMPs and attainment of water quality standards (***Appendix 9-3***); (4) review and evaluation of BMP alternatives through field inspections and by stakeholder organizations; and (5) developing guidelines and requirements for operation and maintenance of structural BMPs.

Ultimately, a BMP project will be selected for implementation using the following criteria:

- The primary purpose of the project is urban runoff management-related;

- A quantitative nexus exists between implementation of the BMP(s) and water quality standards attainment (***Appendix 9-3***);

- The BMP design is consistent with the selected design criteria;
- The BMP project would receive a score of at least 75 points from the criteria used to select Proposition O projects (***Appendix 7-2*** for selection criteria);
- Flood control is improved or not degraded (through peak flow reduction and infiltration, for example); and
- The project supports, to the extent possible, other beneficial outcomes, including groundwater recharge, on-site stormwater use for infiltration and irrigation, increased open areas for recreation and habitat improvements in local waterways.

Additional opportunities exist by integrating urban runoff management with other plans or projects that do not primarily focus on improving the water quality.

Development of TMDL-specific Implementation Plans
Each Water Quality Management Plan will include needed TMDL-specific Implementation Plans to fulfill TMDL requirements. The implementation activities reported in these plans will be consistent with the overall Water Quality Management Plan and will require coordination with other responsible jurisdictions in the watershed, as discussed under Subinitiative 2.

Each Water Quality Management Plan or TMDL-specific Implementation Plan will:

- Quantify benefits of and expected outcomes of each proposed BMP project;
- Identify responsibility for design, implementation and operations and maintenance of BMP projects;
- Provide a recommended BMP implementation schedule;
- Develop metrics to measure progress towards compliance; and
- Estimate cost of compliance for the watershed and sources of funding.

High Priority Recommended Activity (Section 9.8)

1) Complete projects that have already been included in the CIP, i.e., Proposition O projects and others (Leads: WPD, BOE);

2) Complete Phase II of the Los Angeles County-wide Structural BMP Prioritization Methodology (Leads: WPD, LA County, Heal the Bay);

3) Establish design storm and BMP performance criteria that guide the selection of BMPs in Water Quality Management Plans (Lead: WPD);

4) Develop a methodology for establishing a quantitative nexus between BMP selection and water quality standards attainment, to be used in each Water Quality Management Plan (Lead: WPD);

5) Develop Water Quality Management Plans for the Ballona Creek, Los Angeles River, Santa Monica Bay and Dominguez Channel watersheds, including the development of TMDL-specific Implementation Plans as required by LARWQCB (Lead: WPD); and

6) Implement future CIP projects, as identified in Water Quality Management Plans and TMDL-specific Implementation Plans (Leads: WPD, BOE).

Other Recommended Activities

7) Establish measures of success specific to each watershed's Water Quality Management Plan (Lead: WPD);

8) Review and, if needed, revise each Water Quality Management Plan once every five years (Lead: WPD); and

9) Establish a Water Quality Management Plan web page linked to the WPD Watershed Protection Program website (Lead: WPD).

Subinitiative 2 - Jurisdictional Partnerships

While the WQCMPUR is a document for the City, it is acknowledged that water quality issues go beyond the City boundaries, affecting the entire watershed(s). Therefore, establishing partnerships with key governmental jurisdictions within each watershed is critical, in particular because of the overlapping and shared responsibility for compliance with water quality regulations within each watershed and the necessity to share the costs of achieving compliance. In addition, establishing successful partnerships will facilitate common BMP locations, facilitate regional projects, reduce costs and help to establish standards of data management.

A general partnership already exists through the joint implementation of the NPDES MS4 Permit that regulates stormwater discharges in Los Angeles County. Other partnerships also exist for managing TMDLs that have already been adopted. This program element focuses on further developing partnerships by establishing Memoranda of Understanding or Agreements that facilitate the following:

- Identifying jurisdictional representatives with decision-making authority;
- Participating in the development of Water Quality Management Plans and TMDL-specific implementation plans that apportion implementation responsibilities;
- Sharing of information on urban development standards;
- Sharing TMDL implementation costs; and
- Developing, improving and standardizing water quality data collection, including runoff flow data.

High Priority Recommended Activities (Section 9.8)

10) Identify key agencies and establish jurisdictional partnership agreements for developing, implementing and cost-sharing of Water Quality Management Plans and TMDL-specific Implementation Plans (Lead: WPD).

Other Recommended Activities

11) Establish regional project teams (jurisdictional agencies, non-governmental organizations, others) to develop data collection/sharing protocols regarding water quality, operation and maintenance of water quality improvement projects, and other environmental benefits (Lead: WPD).

Subinitiative 3 - Research & Evaluation

There are many BMPs available, but much less is known about their effectiveness, O&M requirements and cost effectiveness. This subinitiative consists of two program elements that will attempt to address these issues:

BMP Evaluation and Pilot Studies

Prior to and after widespread implementation of any BMP technology, pilot studies will be used to evaluate their effectiveness. Pilot studies not only need to focus on the technological aspects of a structural BMP (e.g., evaluating how well a green roof design functions), but they may also be used to test the effectiveness of non-structural BMPs (e.g., increased education, implementation of a streamlined permit program, or implementation of new building specifications for green streets).

Research

The WPD currently works with vendors to test and evaluate new products that can mitigate pollutants in urban runoff. WPD will continue to evaluate BMP technologies as resources are available. WPD also participates in research efforts by organizations such as the Water Environment Research Foundation (WERF). As resources allow, the City may also sponsor its own research to address issues unique to the City. An example of an important area where the City can benefit from research is the implementation of stormwater use as a component of urban runoff management.

High Priority Recommended Activity (Section 9.8)

12) Continue participation in regional and national research opportunities with organizations such as WERF (Leads: WPD, RAD).

Other Recommended Activities

13) Conduct pilot studies to evaluate the effectiveness of BMPs recommended and selected for urban runoff management (Lead: WPD); and

14) Subject to resource availability, support independent or collaborative research and encourage peer review to address specific City research needs and BMP implementation projects (Lead: WPD).

9.3 Citywide Collaboration Initiative

This initiative focuses on the review, revision and development of citywide policies, ordinances, specifications, incentive opportunities, and guidance documents that control and direct how the City manages urban runoff. These "tools" may range from the high-level policies that direct how the City carries out day-to-day activities to program details such as specifications for tree planting in medians, and the use of easements or parks to increase infiltration of urban runoff. This initiative recognizes that management, implementation and budgeting of urban runoff programs are key elements in (re)-developing Los Angeles, requiring citywide collaboration with and shared responsibilities by all City agencies involved with urban development, ***Figure 9-2***.

This initiative complements and expands upon existing collaborative efforts for a green and sustainable Los Angeles by specifically addressing urban runoff concerns (***Appendix 9-4***). Examples are the City of Los Angeles Water Integrated Resources Program (Water IRP) (***Ref. 9-3***), Los Angeles Green Building Program (***Ref. 9-4***), and the Green Los Angeles Action Plan (***Ref. 9-5***). The Water IRP has a specific urban runoff component as discussed in ***Section 8.3.8***. ***Table 9-2*** summarizes the linkage between the Water IRP directives and recommended citywide collaboration.

Four subinitiatives will be implemented under this initiative, focusing on the General Plan updates (including City ordinances and policies), green solutions, runoff management and source reduction.

Subinitiative 1 - General Plan Update

Many of the issues of concern regarding the quality of urban runoff are related to urban growth including land use, zoning, and development requirements. Accordingly, it is critical that urban runoff management be incorporated into General Plan policies to ensure that new development and redevelopment projects incorporate urban runoff management into their design. In addition, open space including private land, and residential and commercial properties could be considered as potential locations for urban runoff management. The City of Los Angeles General Plan is a comprehensive, long-range planning document that serves as a policy guide for all City programs (***Ref. 9-6, Appendix 9-4***). Twelve elements, as illustrated in ***Figure 9-3***, make up the General Plan, which must be internally consistent and integrated with planning activities of regional agencies such as the Southern California Association of Governments and the Los Angeles County Metropolitan Transportation Authority. ***Figure 9-3*** illustrates that one element of the General Plan, the Land Use Element, is actually made of many Community Plans that address specific needs and concerns of individual parts of the City. General Plan elements are periodically reviewed and revised under the purview of the City's Planning Department.

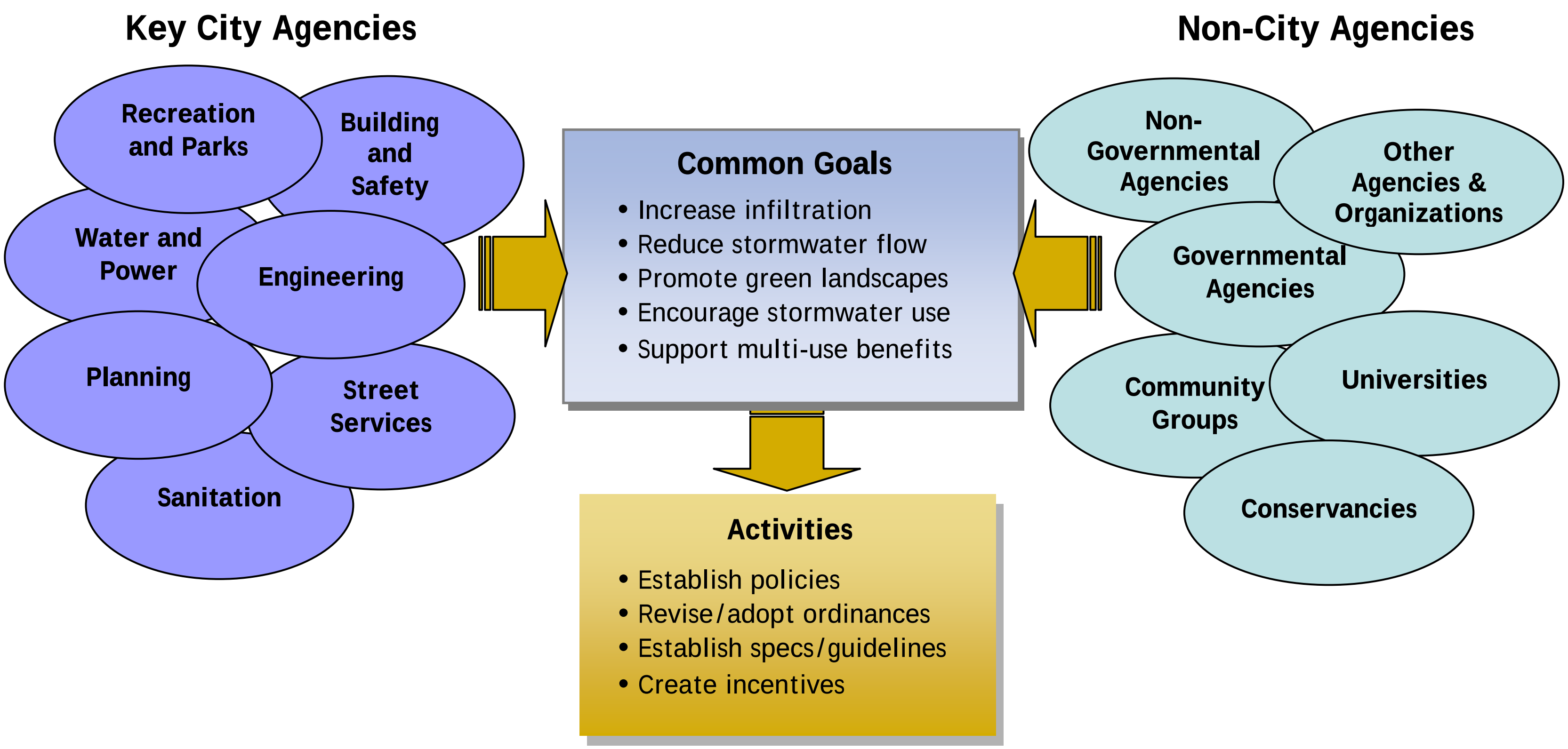


Figure 9-2
Citywide Collaborative Effort

This initiative will seek to better coordinate the water quality management related activities of City Departments and external jurisdictions and interest groups by expanding partnerships to identify common goals and shared activities and projects.

Table 9-2
Relationship Between Water IRP Directives and WQCMPUR

Water IRP Go-Policy Directives	Linkage to WQCMPUR
Direct Public Works to review SUSMP requirements to determine ways to require where feasible on-site infiltration and/or treat/use, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible.	Green Solutions, Runoff Management, Infiltration
Direct Building and Safety to evaluate and modify applicable codes to encourage BMPs for maximizing on-site capture and retention and/or infiltration of stormwater (instead of discharge to the street and storm drain, including porous pavement).	Green Solutions, Public Development, Runoff Management, Infiltration
Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities in coordination with LA River Revitalization Master Plan, and large developments greater than 1 acre. Program feasibility should consider slope and soil conditions.	Runoff Management, Infiltration
Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement (i.e., change/support landscape ordinance and encourage the use of permeable pavement).	Green Solutions, Open Area (LID strategy)
Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible. For example, conduct pilot program in East Valley, taking into consideration soil conditions and Proposition O project criteria, as well as along the future LA River Revitalization Master Plan.	Green Solutions, Public Right-of-Ways
Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a power line easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).	N/A
Direct Public Works and DWP to work with LAUSD to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as IRP Implementation Strategy government/city-owned facilities with stormwater management BMPs. As appropriate, integrate with LAUSD's new schools development program.	Green Solutions, Open Area Runoff Management, Infiltration
Direct Public Works, General Services, and Recreation and Parks to identify sites that can provide onsite percolation of wet weather runoff in surplus properties, vacant lots, parks/open space, abandoned alleys in East Valley, and along the LA River in the East Valley where feasible. Program feasibility should consider slope and soil conditions.	Green Solutions, Open Area, Community Gardens, Public Right-of-Ways
Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.	Green Solutions, Open Area, Public Right-of-Ways
Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.	Green Solutions, Public Right-of-Ways
Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions	Green solutions

Table 9-2 (Continued)
Relationship Between Water IRP Directives and WQCMPUR

Water IRP Go-Policy Directives	Linkage to WQCMPUR
In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks. Coordinate and evaluate the impact with the LA River Master Plan.	Water Quality Management Plan Ballona Creek Watershed
In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains that are tributary to the Los Angeles River to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.	Water Quality Management Plan Los Angeles River Watershed

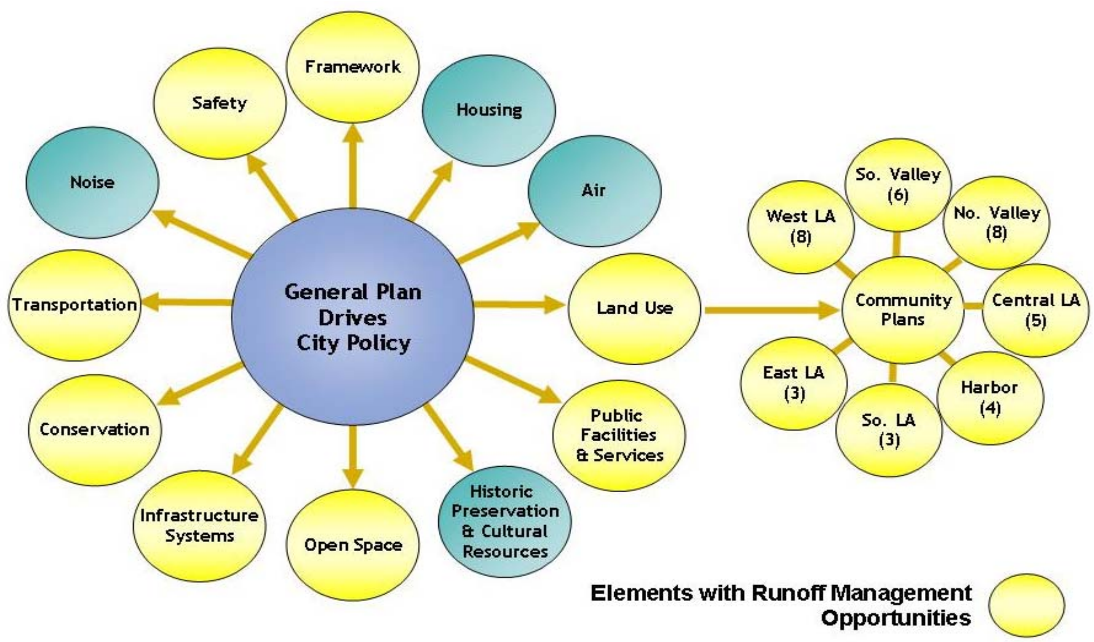


Figure 9-3
City of Los Angeles General Plan Elements

Implementation Approach

WPD will work closely with the Planning Department by providing advice on citywide implementation of urban runoff management opportunities.

High Priority Recommended Activities (Section 9.8)

15) Review the General Plan, including Community Plans, and related City polices and ordinances for opportunities to implement urban runoff management goals of the WQCMPUR for existing and new development (Lead: DCP; Support: WPD).

Subinitiative 2 - Green Solutions

Green solutions are defined as structural BMPs focused on: a) reducing the volume of urban runoff (thereby indirectly improving water quality); and b) removing pollutants from urban runoff through natural processes. Green solutions often are local urban runoff management alternatives that increase the area of green space and they often have a water resources element (infiltration of urban runoff for groundwater recharge, or capture and use for irrigation), ***Ref. 9-7***. Implementation of green solutions can transform the City in many positive ways. The benefits may go beyond the primary purpose of improving the water quality as they may include, for example, reducing air pollution, cooling urban surface temperatures, supporting flood control requirements, conserving water supply, and improving quality of life. ***Appendix 9-4*** provides examples of how green solutions are being implemented in other cities.

This subinitiative has four program elements that are closely related to Low Impact Development (LID): an approach for land planning and engineering design with the goal of maintaining and enhancing the pre-development hydrologic characteristics of an area.

High Priority Recommended Activities (Section 9.8)

16) Develop and implement a citywide LID[1] strategy (Lead: WPD).

Open Area

The purpose of this program element is to preserve and increase open areas, undeveloped and developed, in the City to help meet urban runoff goals. The value of open areas for urban runoff management depends on the location. Undeveloped open areas are often in the upstream parts in some of our watersheds but, while valuable, they provide limited benefits for urban runoff management. However, the open areas located near storm drains in urbanized areas with significant upstream pollutant loadings may provide significant benefits for urban runoff management. These open areas are often developed (e.g., parking lots, parks, schools, playgrounds, etc.) and they are typically more distributed throughout the watershed, often downstream of areas where urban runoff management is needed. The infiltration capacity of developed open areas will vary based on the nature of the existing development. However, many of these areas have the potential to be retrofitted as sites for infiltration and beneficial stormwater use.

---

[1] The development of an LID policy for new development and redevelopment projects will be coordinated with a number of City agencies including the Planning and Transportation Departments and the Bureau of Street Services. Various resources, including the Low Impact Development Center and EPA, will be consulted to develop an ordinance that has minimum numeric requirements for compliance. Examples of where such requirements will be considered include area of disturbance thresholds for determining when LID requirements must be implemented for redevelopment projects; pre- and post-site hydrology criteria; and a maximum allowance for construction of impervious surfaces.

Currently, the City of Los Angeles is developing a Stream Protection Ordinance to restore and protect open space associated with natural streams while sustaining development and growth of city neighborhoods. Development of this ordinance was initiated by the Board of Public Works. An ordinance task force, which is coordinated by the Watershed Protection Division, consists of the Departments of Building & Safety, Planning & Zoning and Public Works, several Council Districts, environmental organizations, representatives from the real estate development industry and other interested stakeholders. Adoption of the Stream Protection Ordinance, which is expected in the near future, will protect habitat, reduce runoff pollutant loads, and reduce stormwater peak flows. Stream protection, in particular the restoration of natural functions of streams, has been shown to reduce the levels of nutrients (nitrogen and phosphorus), sediment (less erosion), bacteria and metals.

Implementation Approach
The City will continue to promote conservation of undeveloped, permeable open areas that already exist, including undeveloped mountainous areas and stream corridors. The City will also maximize urban runoff management using developed open areas and, where it is appropriate, to store and treat urban runoff for beneficial stormwater use.

High Priority Recommended Activities (Section 9.8)
17) Develop and implement a Stream Protection Ordinance (Leads: WPD, BOE).

Other Recommended Activities
18) Identify available developed open areas and open space in all watersheds (including privately owned) for implementation of urban runoff BMPs and establish a program for land acquisition (Lead: WPD);

19) Create partnerships, including outreach and incentives, with owners of large areas of open land, such as schools, golf courses, or privately owned lots for beneficial stormwater use (Lead: WPD, others); and

20) Establish urban runoff review policy with Recreation and Parks Department to implement urban runoff management opportunities in both existing and planned parks (Leads: WPD, RAP).

Community Gardens

Community gardens are neighborhood spaces that bring residents together to grow crops, whether for personal use or for community profit. Community garden land maintains and/or reclaims green space within urban settings, preserving areas for biological uptake and possibly providing areas for the infiltration of urban runoff. Over 70 active community gardens exist in Los Angeles County, many in the City of Los Angeles, serving 3,900 families.

Implementation Approach
The City will evaluate the availability of community gardens for urban runoff management and determine if they are appropriate sites for urban runoff BMPs. This evaluation should include mitigation measures to avoid contamination of garden vegetables and other edible plants.

Other Recommended Activities
21) Evaluate existing community gardens for potential retrofits for urban runoff management considering water quality, soil quality, and public health and safety concerns associated with the discharge of urban runoff to or from community gardens and develop implementation strategies that address outreach and incentives (Lead: WPD); and

22) Evaluate the leasing of land from private landowners to convert vacant lots into combination of open area for urban runoff management and auxiliary benefits such as community gardens (Lead: WPD).

Public Right of Ways

Public right of ways, developed as “green streets,” provide opportunities for intercepting rainwater for beneficial use and reducing peak flows. Initial rainwater is intercepted by tree canopies and much of the remaining rainwater is captured and infiltrated in green medians, easements, and constructed stormwater retention areas. In addition, the use of public right of ways for managing urban runoff can be enhanced in some areas by the use of pervious pavements and subsurface structures, which allow some of the rainwater falling on the pavement to directly infiltrate.

Implementation Approach
The City will evaluate the use of public right of ways for managing urban runoff (e.g., green streets, permeable pavement) and develop guidelines, specifications and, if needed, ordinances.

High Priority Recommended Activities (Section 9.8)
23) Evaluate the use of public right of ways (streets, alleys, parking lots, etc.) for local management of urban runoff to reduce urban runoff to storm drains (Leads: WPD, BSS).

Other Recommended Activities
24) Partner with Los Angeles County, Caltrans and other agencies on the use of public right of ways for management of urban runoff (Lead: WPD, others);

25) Evaluate the use of financial incentives for participation by private entities in green street projects (Lead: WPD); and

26) Where technically feasible, consider the use of permeable paving in new development and redevelopment projects (Lead: WPD).

Public Development (Green Roofs)

The application of green solutions to public developments can provide opportunities for onsite infiltration and for storage, treatment and use of stormwater runoff from adjacent locations. With regard to water quality, green roofs are most effective in developed areas that do not have much land available for other BMPs. Other benefits of green roofs include providing a natural cooling method for the building, aesthetic properties, and potential recreational uses. These benefits are consistent with the LID goals.

The City's Environmental Affairs Department (EAD) has already prepared a guidance document for the development of green roofs (***Ref. 9-8***). In addition, green roof events have previously been held at the Environmental Affairs Department and the Metropolitan Water District facilities.

Implementation Approach
The City will continue its approach in promoting the implementation of green roofs on publicly-owned properties and build upon the efforts of EAD. Increased use of green roofs and demonstration of their success in managing urban runoff can be used to encourage the incorporation of green roofs into the design of private developments.

Other Recommended Activities

27) Increase the awareness of green roofs and promote the benefits to urban runoff management (Lead: WPD, EAD);

28) Develop guidelines that encourage or even require the incorporation of green solutions into public developments (Lead: WPD, EAD, DBS); and

29) Lead by example by incorporating green roofs, where appropriate, into new City facilities (Lead: WPD, EAD, DBS).

Subinitiative 3 - Runoff Management

This subinitiative focuses on the management of urban runoff by controlling the flowrate and the volume of urban runoff that reaches streams, rivers, and beach waters. Reducing the rate and volume of urban runoff allows the reduction of the mass flux of pollutants transported to waterbodies. Additional benefits include the reuse of captured urban runoff, e.g., for infiltration, irrigation and groundwater recharge and less impact on downstream habitats by reduced peak flows.

Reduction of the volume and flowrate of urban runoff requires a watershed-wide approach with a strong focus on local management of urban runoff at the source ("upstream" BMPs at the street or parcel level). This could reduce the need for large downstream BMPs, which are relatively expensive and often more difficult to implement because of space limitations in the more urbanized areas of the City.

This subinitiative contains three program elements (infiltration, water conservation and stormwater use) and is related to the City of Los Angeles Water Integrated Resources Program (Water IRP) and WPD's SUSMP program.

High Priority Recommended Activities (Section 9.8)

30) Support implementation of the urban runoff goals of the Water IRP (***Section 8.3.1***, ***Table 9-2***) (Leads: WESD, WPD); and

31) Revise the SUSMP requirements, as needed, to incorporate onsite infiltration requirements for new development and redevelopment (Lead: WPD).

Infiltration

BMPs such as infiltration trenches, porous pavement, downspout redirections, green streets, berms, bio-swales, tree wells and vegetated street medians reduce the amount of urban runoff by infiltration and are typically implemented for local management of urban runoff (dry and wet-weather). This program element is related to Low Impact Development and green solutions as discussed in the previous subinitiative.

Implementation Approach

The City will evaluate existing and future possibilities for promoting local infiltration of urban runoff. When evaluating the potential for incorporating infiltration BMPs into a project, current and anticipated future regulations will be considered to ensure that groundwater quality is preserved or improved. Where necessary, studies may be needed to ensure that infiltration does not result in any such environmental concerns. Accordingly, coordination among several agencies will be necessary, e.g., the California Department of Public Health (CDPH), Los Angeles County Department of Health Services (LACDHS) Los Angeles Department of Water and Power (LADWP), and the Upper Los Angeles River Area Watermaster.

High Priority Recommended Activities (Section 9.8)

32) Evaluate the retrofit of publicly owned properties (e.g., parks and other open areas) and parking lots (publicly-owned and private) for infiltration opportunities (Leads: WPD, RAP).

Other Recommended Activities

33) Conduct research to develop (1) infiltration testing protocols, (2) infiltration design specifications, (3) maintenance and operations requirements, and (4) life-cycle costs (Lead: WPD);

34) Initiate a "downspout redirection" pilot program to maximize capture of stormwater (Lead: WPD);

35) Evaluate the retrofit of privately owned properties for infiltration projects, including the use of incentives, public education and outreach (Lead: WPD); and

36) Seek grants for demonstration programs to further the development of infiltration technology (Lead: WPD).

Water Conservation

Urban runoff, in particular during dry weather, is partly caused by landscape irrigation and other activities. Hence, measures for conserving water in those activities that cause excessive generation of urban runoff will benefit urban runoff management as well as reduce the City's demand for potable water.

Implementation Approach

The City will evaluate and build upon urban runoff management elements (e.g., smart irrigation, evapotranspiration controllers, native plants, etc.) in existing and future water conservation efforts and policies.

Other Recommended Activities

37) Support implementation of the landscape ordinance, as revised by the Planning Department, ***Ref. 9-9*** (Leads: DCP, WPD);

38) Support development and implementation of the State's Updated Model Water Efficient Landscape Ordinance AB 1881, ***Ref. 9-10*** (Leads: DCP, WPD); and

39) Investigate ways, including the use of incentives, to further reduce or eliminate the generation of dry weather urban runoff from private properties, i.e., from landscape irrigation and the washing of sidewalks and driveways (Lead: WPD, BSS).

Beneficial Stormwater Use

The use of stormwater as a water resource involves the capture, storage, and treatment of stormwater that can then be used in place of potable water. Beneficial use options include irrigation, groundwater recharge, diversion to constructed wetlands, and diversion to lakes that require supplemental water. Implementation of this program element is consistent with LID principles and reduces dependence on imported water.

Implementation Approach

In support of Proposition O projects, the WPD has started with establishing a regulatory framework for beneficial stormwater use, including the development of guidelines and requirements.

High Priority Recommended Activities (Section 9.8)

40) Collaborate with appropriate agencies (e.g., City, CDPH, LACDHS, others) to establish water quality requirements for the use of stormwater (Lead: WPD, others).

Other Recommended Activities

41) Develop guidelines and specifications for local storage, treatment, distribution systems, and operation and maintenance of stormwater use systems (Lead: WPD); and

42) Evaluate the availability of open areas owned by City, County, State and Federal agencies and privately owned open areas (e.g., home owners, commercial property, golf courses) for beneficial stormwater use options and develop implementation strategies (including outreach and incentives) (Lead: WPD).

Subinitiative 4 - Source Reduction

This subinitiative focuses on prevention of urban runoff pollution by reducing waste that could enter the environment, eliminating the use of products or processes that can introduce toxic chemicals into the environment and enforcing existing and proposed regulations that focus on source control. There are three proposed program elements.

Waste Reduction

Waste reduction refers to the reduction of waste that is generated and ultimately disposed of in City landfills or ends up as litter on City streets and in storm drains. This waste introduces toxic materials into waterbodies beyond the physical presence of the trash. This program element is directly related to trash TMDLs and, possibly, toxic pollutants TMDLs.

Implementation Approach

Reducing the amount of wastes in the watershed will be coordinated with the City's Zero Waste Plan as well as the Zero Waste California program. The State program involves "managing the estimated 92 million tons of waste generated each year by reducing waste whenever possible, promoting the management of all materials to their highest and best use, regulating the handling, processing, and disposal of solid waste, and protecting public health and safety and the environment" (***Ref. 9-11***). The City is also preparing a Solid Waste Integrated Resources Plan that has specific waste reduction goals. In addition to these goals, through the Plastic/Polystyrene Task Force, the City is working with other cities, the State, and businesses to reduce waste from products that cause runoff pollution. The City has implemented programs to recycle plastic bags and polystyrene containers. The City is also already working to reduce the use of Styrofoam and other non-degradable products to support compliance with trash TMDLs.

Other Recommended Activities

43) Coordinate implementation of the WQCMPUR with ongoing waste reduction efforts and, where appropriate, evaluate additional waste reduction activities to meet critical TMDL trash targets.

Toxics Reduction Program

The term "toxics" includes metals, organic chemicals, hazardous materials, and pesticides. Their removal from the environment is often challenging and costly, therefore, the focus of this program element is on prevention by controlling or banning the use of toxic substances in the watershed. This program element is directly related to toxic pollutants TMDLs.

Implementation Approach

A great deal of work in this area has been done by County, State and Federal agencies. The City will coordinate with these agencies and, if needed, develop a toxic reduction program specific for Los Angeles that builds upon current outreach activities for reducing the use of certain toxics (e.g., Outreach Initiative, Subinitiative 4 – Business Outreach). This will require identification of: a) the toxics to be targeted; b) the public and private sectors that release these toxics; and c) the tools for reducing the use of these toxics.

Other Recommended Activities

44) Collaborate with appropriate agencies to implement integrated pest management strategies to reduce the use of pesticides (Lead: WPD);

45) Collaborate with regulatory agency programs, such as the Department of Toxic Substance Control's Green Chemistry Initiative, to find alternate chemicals and processes for reducing pollutant loads derived from industry (Lead: WPD);

46) Collaborate with California Stormwater Quality Association's (CASQA) Watershed Management and Impaired Waters subcommittee on new source control approaches (Lead: WPD);

47) Review and revise outreach programs that educate the public on the use and proper disposal of toxic chemicals, e.g. disposal of mercury thermometers, and provide information to targeted industries (Lead: WPD); and

48) Evaluate development of City ordinances that ban or reduce the use of selected chemicals (Lead: WPD).

Enforcement

An important element of source control is the establishment of sufficient authority to regulate pollutants where they are generated. The Industrial Waste Inspections program is part of WPD. Under this program, specific staff members designated as inspectors are "public officers" who can and do issue "notice to comply" or "notice of violation." The finding of a violation is based on the Los Angeles Municipal Code, section 64.70, and issuance of a "notice of violation" can have fines associated with it.

Implementation Approach
As part of the implementation of this strategy, the existing water quality enforcement program will be periodically evaluated to as to how it is supporting water quality goals. This evaluation consists of two parts: 1) as a high level review to determine if sufficient enforcement authority exists; and 2) as new or revised ordinances are established through the implementation of the WQCMPUR, then the City enforcement provisions and authority will need to be reviewed and revised as appropriate.

Other Recommended Activities
49) Review existing enforcement provisions to ensure that they are properly implemented and evaluate adequacy of authority and the fines that may be levied (Lead: WPD).

9.4 Outreach Initiative

The Outreach Initiative focuses on enhancing existing public education and community involvement activities to reach the appropriate target audiences and establish methods to quantify the water quality benefits achieved through outreach activities. The City's outreach program is a collaborative effort with other agencies and supports the Los Angeles County NPDES MS4 Permit. In addition, collaboration will be sought with non-governmental organizations that often have specific knowledge of local neighborhoods and established relationships with communities.

The City's outreach program is structured around the following public education and involvement strategies (***Ref. 9-12)***:

- **Preventing Pollution** – Educate polluters about ways they can prevent pollution through BMPs related to specific pollutants and polluting activities.

- **Building a Team of Messengers** – Using the interest expressed by voters through Proposition O (***Chapter 7*** and ***Appendix 7-1***), keep residents enthused about water quality, engage them in activities that demonstrate pride in neighborhoods, motivate (apply social pressure) polluters and non-polluters to be part of the solution for pollution prevention.

By pursuing both strategies in parallel, the end result should be a progressive reduction of pollutants in Los Angeles' waterways that will contribute to meeting TMDL water quality requirements and deadlines. The results should be quantifiable wherever possible, as discussed in ***Section 9.4.2***.

9.4.1 Outreach Subinitiatives

WPD coordinates the City's existing outreach program and will continue to improve and expand it through the implementation of eight subinitiatives:

- Subinitiative 1 – Pollutant-Specific Outreach

- Subinitiative 2 – Stormwater NPDES and TMDLs Outreach
- Subinitiative 3 – School Outreach
- Subinitiative 4 – Business Outreach
- Subinitiative 5 – Employee Training Program
- Subinitiative 6 – Mass Media Advertising
- Subinitiative 7 – Stakeholder Involvement
- Subinitiative 8 – Collaboration With Other Programs

Each subinitiative specifies the existing activities and opportunities and recommends future activities.

Subinitiative 1 – Pollutant-Specific Outreach

Existing Activities

Education campaigns are designed to target the behaviors that are causing pollution and to motivate the members of the public engaged in those behaviors to make changes. The City's current outreach program targets the pollutants associated with the trash TMDLs, dry and wet weather bacteria TMDLs, and nitrogen TMDLs. To address these pollutants and others (e.g., used oil), the City is currently creating education campaigns for litter/trash, dog waste, used oil, fertilizers and pesticides using several outreach activities.

High Priority Recommended Activities (Section 9.8)

50) Integrate messages and materials about specific toxics, metals, and other pollutants with existing education campaigns.

51) Evaluate existing outreach activities for their effectiveness in targeting new pollutants.

Subinitiative 2 -- Stormwater NPDES and TMDLs Outreach

Existing Activities

The City's current outreach program includes activities to inform the general public as well as community, business and environmental leaders and organizations about meeting the NPDES MS4 Permit requirements, achieving TMDL compliance, and implementing approved Proposition O projects:

- **Websites** - Two City websites, www.lastormwater.org and www.lapropo.org, were created by and are maintained by the Department of Public Works. Through these websites and their site links, the general public can get information on "how-to" tips, BMPs, regulations related to the NPDES MS4 Permit and TMDLs, watershed-level water quality data, neighborhood events, educational materials, and detailed information about Proposition O projects in the implementation stage.

- **Public information materials and programs** - The City distributes print materials to the general public through libraries and at community events. These are the same materials that can be retrieved through the websites identified above.

- **Project-specific Proposition O outreach programs** - Each major Proposition O project currently in implementation includes an outreach element.

High Priority Recommended Activities (Section 9.8)

52) Outreach to community, business, and environmental leaders will target many of the City's most influential messengers with information about the NPDES MS4 Permit, TMDLs, and Proposition O projects. The focus of this outreach will be to keep them well-informed, to maintain their enthusiasm for investments and efforts to improve water quality, to encourage them to exert social pressure to adopt new non-polluting behaviors, and to encourage them to support the implementation of needed projects and programs. An outreach work plan is being prepared that will include these elements:

    - Presentations to Neighborhood Councils, other community organizations including Los Angeles area houses of worship with very large congregations, and academic institutions;

    - Presentations to Los Angeles Business Improvement Districts; and

    - Partnerships and joint ventures with environmental organizations for community outreach.

Subinitiative 3 – School Outreach

Existing Activities

The City's current school outreach program revolves around three key strategies:

- Teach kids to be environmental stewards;

- Empower kids to take action and become messengers; and

- Use schools as a base of support to build-out community engagement (e.g., community cleanups, Adopt-a-beach, Ocean Day).

School outreach programs address different ages and needs:

Elementary Grades - Program focuses on elementary school assembly programs, supporting teachers after the assembly programs by providing hands-on classroom activities and lesson plans, and the widely publicized "Ocean Day" beach cleanup field trip. The City partners with the California Coastal Commission to provide teachers with the specially-designed curriculum project “Waves, Wetlands, and Watersheds.”

Secondary School Grades -- Program focuses on teaching students who might engage in polluting behaviors. When working with school clubs and youth community service programs, the City teaches students about the problem/solutions with stormwater pollution and encourages them to become mentors to younger kids and to lead specific aspects of the outreach project.

Linking to Other Environmental Educators - The City’s program also emphasizes connecting kids to non-profit organizations who are already working in their communities. Los Angeles’ non-profits offer watershed education for students ranging from K-12. Examples include (not a complete list):

- **Los Angeles Conservation Corps** – SEA labs, traveling tide pools, service learning programs;
- **TreePeople** – Eco-Tour Program and La Kretz Urban Watershed Education Gardens;
- **Heal the Bay** – Key to the Sea, Adopt-a-Beach, Heal the Bay curriculum; and
- **Santa Monica BayKeeper** – In-class presentations on kelp reforestation.

High Priority Recommended Activities (Section 9.8)
There are several opportunities to expand school outreach. Recommended future activities for this subinitiative include:

53) Expand partnerships with City Council offices, LAUSD, MTA, and environmental organizations in all watersheds (such as Santa Monica Mountains Conservancy, Los Angeles and San Gabriel Rivers Watershed Council, Friends of the LA River, Ballona Creek Watershed Task Force and associated organizations, others), to provide outreach services and support to conduct City-sponsored events with Los Angeles’ kids, like Ocean Day.

54) Work with LAUSD to incorporate the curricula of the comprehensive state program, the Education and Environment Initiative (EEI), into all disciplines (science, history/social sciences, English/language arts, and mathematics) for all K-12 grades in the City’s public schools. Build upon existing curricula that have been developed by other organizations (e.g., TreePeople, Adopt-a-Watershed).

55) Promote teacher training through partnerships with non-profit organizations. These organizations are conducting successful teacher training programs, e.g., Heal the Bay’s teacher training for “Key to the Sea” and “Adopt-a-Beach”.

56) Develop pollution prevention education beyond high school. The City has already partnered with California's community colleges to provide in-classroom training of BMPs related to automobile maintenance and repair. This effort to reach students continuing their education past high school can be expanded to include other professions including landscape maintenance, landscape design and horticulture, construction management, forestry, and urban planning.

57) Form and train a speaker's bureau of City employees working water quality jobs to talk to students in high school or college taking courses that could lead to jobs in the water quality arena. Speakers would encourage environmental stewardship and potentially open doors to students to enter the profession.

Subinitiative 4 – Business Outreach

Existing Activities

The City's current outreach program is beginning to target businesses in areas with the greatest potential to reduce pollution related to urban runoff. Businesses are targeted in two ways: (1) **by pollutant**; and (2) **by problem area**. Key pollutants and the associated businesses being targeted include:

- **PAHs/Used Oil** – Auto repair shops and gas stations
- **Bacteria** – Food service and related industries
- **Litter** – Key retail businesses in problem areas
- **Sediments** – Construction and new development
- **Metals** – Manufacturing facilities
- **Nutrients/Pesticides** – Landscaping companies and nurseries

To produce a visual picture of areas to specifically target, the City is developing GIS maps of problem areas using water quality monitoring data, catch basin clean out data, and census bureau business data by SIC codes.

The City has begun implementing the following activities in the current phase of the business outreach campaign:

- Partnering with Business Improvement Districts;
- Partnering with Industry Associations, including:
    - Developing and participating in conferences relevant to the business sectors mentioned above;
    - Distributing information through trade/industry associations; and

- Working with problem businesses individually identified through City inspections.

- Partnering with specific businesses to target specific pollutant sources, e.g., oil waste or battery disposal;
- Pilot business-driven cleanups;
- Building stakeholder-driven partnerships;
- Multi-language outreach; and
- Outreach targeting business owners, managers, and personnel.

High Priority Recommended Activities (see Section 9.8)
Recommendations for future programs include:

58) Expand business-focused anti-litter education to address keeping plastic packaging out of waterways through recycling or disposal.

59) As additional TMDLs are adopted, examine whether or not the existing business outreach efforts address the new pollutants and/or affected water bodies. Modify existing business outreach accordingly. Evaluate opportunities for outreach to the landscape profession (design, architecture and maintenance).

60) Begin discussions with Business Improvement Districts about positive reinforcement approaches such as incentives, employee education, certification, and clean business recognition, versus a focus on enforcement, including the use of fines.

Subinitiative 5 – Employee Training Program

Existing Activities
The City conducts stormwater management training to its departments that have a direct impact on urban runoff pollution (e.g., about 6,500 employees received training on Stormwater Pollution Prevention Plans in 2007). Orientation of new City employees includes a video presentation on how they can reduce the amount of pollutants in urban runoff by modifying their behavior and actions while carrying out their job responsibilities. The WPD also provides training to City Departments on urban runoff management and stormwater pollution prevention. In the past, these training programs had a strong focus on the City Departments that are directly related to the Public Agencies Activities Program and the implementation of SUSMPs (***Section 6.2.1***). Plans are currently being developed to broaden the training of City employees to other departments, including the Department of Transportation, the Bureau of Street Services, and the Department of General Services. Additionally, stormwater issues that require establishment of City policies will be presented to the supervisors and upper management staff of all Departments and Bureaus.

High Priority Recommended Activities (Section 9.8)

61) The City will review training materials from EPA and other MS4 programs and evaluate the effectiveness of the City's program.

62) The City will begin periodic self-audits to ensure that staff are implementing appropriate stormwater management procedures; especially at City maintenance yards. The EPA has developed a tool to support self-audits (***Ref. 9-13***).

Subinitiative 6 -- Mass Media Advertising

Existing Activities

The current outreach program uses several methods to reach the general public, including mass media (paid) advertising. In keeping with the City's approach of targeting TMDLs and specific geographic areas, primary advertising outlets are community-based newspapers. The current strategy for media planning and buying advertising campaign:

- Bases media decisions on highest reach and frequency within a targeted pollution "hotspot" area;
- Considers buying media when the messages have the most relevance (e.g., spring and summer if related to pesticides and fertilizers; fall before the first rains or during an event when awareness is already heightened); and
- Stretches the available budget by continuing to secure lower rates and bonus media, and aggressively negotiating discounts and pro bono space.

High Priority Recommended Activities (Section 9.8)

There are three primary recommendations for building on the previous creative execution for advertising:

63) Continue to broaden the relevance to inland residents;

64) Develop new or focus existing creative advertising that addresses priority TMDLs; and

65) Create new "visuals" to better connect people to the problem and to the solution.

Subinitiative 7 -- Stakeholder Involvement

Existing Activities

The City seeks stakeholder involvement during master plan development (i.e., Water IRP, WQCMPUR), facility siting and design of specific projects, and in all aspects of its public outreach program.

The City has begun implementing several of the first projects approved for funding with Proposition O Clean Water Bond funds. Each of these projects incorporates an outreach program that typically includes:

- Stakeholder involvement from pre-design through construction;
- Public information through the City's website, www.LApropO.org;
- On-site informational signage or advertorials in community newspapers; and
- Presentations to Neighborhood Councils and other community organizations.

High Priority Recommended Activities (Section 9.8)

66) As additional Proposition O projects and urban runoff management activities associated with the WQCMPUR are initiated (***Sections 9.6 and 9.8***), outreach programs with opportunities for stakeholder involvement will continue to be developed and implemented.

Subinitiative 8 – Collaboration with Other Programs

Existing Activities

The City's stormwater public education and outreach program is one of the longest running environmental education programs in California. Collaboration with other programs has been a mainstay of the outreach program from the beginning.

The benefits of collaborating with other programs are several and profound:

- Internal stakeholders (including within Public Works, the Mayor's Office, City Council and Neighborhood Councils) and external stakeholders (including community-based organizations, environmental groups, businesses, and more broadly, voters and residents) need to remain convinced about the importance of good water quality and they need to be excited about the status and successes of projects that are funded by Proposition O;
- Organizations that have been actively involved in watershed planning efforts bring a unique understanding of the needs, goals and objectives of local and regional stakeholders;
- Collaborating with other programs – developed by other cities, the County, the State, regional agencies, non-profit organizations, and others – and engaging residents to become more active in the process of cleaning up Los Angeles urban runoff, causes messages about water quality and protecting the environment to reach more people, be heard more clearly, and be implemented more economically. This is especially important in light of the current economic downturn while at the same time community awareness of environmental challenges and the desire for community-based action are increasing.

- Credibility is gained through collaboration and developing important partnerships. Non-profit organizations, especially organizations involved in watershed management planning, are often viewed in the community as the bearers of truth. Regulators are often viewed as protectors of the environment. When the City, non-profits, regulators, and a number of public agencies are saying relatively similar messages, the public has increased faith in the message and a stronger tendency to take action according to what they are hearing.

High Priority Recommended Activities (Section 9.8)

67) The City will continue to look for new partnering opportunities. For example, an outreach plan is currently being prepared for Green LA, the Mayor's policy on Climate Change. Likewise, opportunities for collaboration between Green LA and the City's stormwater public education program and partnerships and joint ventures with stakeholder organizations will be evaluated and implemented.

9.4.2 Outreach Quantification

For implementation strategies that include public outreach, it is important to quantify the effectiveness of outreach BMPs because of the potentially large impact on water quality improvement (e.g., quantitative nexus, ***Section 9.2***). Accurately measuring these improvements in water quality is challenging because: 1) the success of public outreach usually is not immediate, but may take several years to take effect; 2) most watersheds have multiple activities for water quality improvement, which makes it difficult to single out the impact of outreach BMPs.

Existing Activities

The City's current outreach program includes methods to measure the effectiveness of outreach. These focus primarily on whether or not the target audience successfully receives the intended information and often measures whether or not the outreach resulted in the target audience *following through* with the intended action (new non-polluting behaviors). Examples are tracking used oil collected at recycling centers and private partnership drop-off locations; or tracking the number of students who participate in local cleanup events. The current methods of measuring the effectiveness of the City's outreach program are all valid and important to continue.

At least one City program – education of restaurant managers and personnel – measures a direct correlation between education and water quality. City inspectors prioritize educating the restaurant industry, and use different level of enforcement measures, to achieve fewer fats, oil, and grease (FOG) spills in sewers. Restaurants are taught to contain FOG, rather than pour it down sewer drains or dump in nearby storm drains. The City tracks sewer spills caused by FOG, and targets education/inspections toward areas of hot spots.

Implementation Approach

To improve quantification accuracy, two approaches are recommended. For the short term, quantification can be improved by conducting a study or survey in Los Angeles that estimates what percent of the population would change a given behavior once educated on specific topics (e.g., used oil recycling, pet waste pickup).

For the longer term, the data required to quantify an outreach program requires a comparison of pre-outreach water quality monitoring to post-outreach water quality monitoring. The recommendation is to conduct a pilot study using a target subwatershed for a target pollutant(s).

High Priority Recommended Activities (Section 9.8)

68) Behavior change survey: Conduct a survey asking the public what their current behavior is, educating them on what changes would improve the water quality, and then asking them if they will change their behavior based on the new information. This would be done for specific behavior changes for activities related to specific pollutants of concern. Follow up periodically to estimate expected behavior with time.

69) Water quality improvements by outreach: Select specific outreach BMPs that are targeted in areas without structural BMPs. Identify some possible, measureable parameters for long-term tracking; follow-up by measuring the pollutants of concern in the target waterbody or watershed prior to the public education campaign and periodically, thereafter. The period of this recommended activity should be realistic in terms of developing performance data (it may take several years or longer to significantly change peoples' habits and lifestyles).

9.5 Resources Requirements

Additional resources will be needed to implement the Implementation Strategy. The following list summarizes potentially required resources:

- Technical staff for:
  - BMP design and construction oversight;
  - BMP operation and maintenance;
  - Pilot and research studies (design, oversight, data analysis);
  - Field investigations;
  - Monitoring and data analysis;
  - GIS development;
  - Modeling analyses;
  - Guidance and specifications development;

  - Implementation of effectiveness evaluation program; and
  - Outreach development, training, coordination, and implementation.
- Support staff for:
  - Staff for development of initiatives; writing and updating of plans; oversight of new programs and initiatives;
  - Coordination with other agencies, departments and potential partnerships;
  - Enforcement;
  - Coordination with various industries;
  - Outreach; and
  - Stakeholder facilitation.
- Production of outreach and training materials.
- Capital costs of BMPs and pilot projects.
- Operation and Maintenance (O&M) costs.
- Employee training for O&M.

9.6 Stakeholders Role

To facilitate stakeholder participation, WPD will provide a link to WQCMPUR activities on the WPD website, http://www.LAstormwater.org (high priority recommended activity 70). The City will continue to engage stakeholders in various activities, including:

- **City Policy Development** – Revision and update of the City's General Plan provides an opportunity for stakeholders to participate in discussions that will shape future urban growth policies.
- **Ordinance Development** – Stakeholders may take part in ordinance development either through direct participation or by providing review and comment on draft documents.
- **Guidance/Specifications Development** – Stakeholders with appropriate expertise or interest will be asked to participate in the development of guidance or technical specification documents.
- **Water Quality Management Plan Development** – Development of each Water Quality Management Plan will be an open process where stakeholders will

provide input, especially during the development of potential strategies for each watershed, evaluation of BMP alternatives, and preparation of TMDL-specific Implementation Plans.

- **Implementation of Water Quality Improvement Projects** – The City will evaluate and seek opportunities for collaboration and partnerships with stakeholder organizations in the implementation of all water quality improvement projects.

9.7 Measuring Success

For assessment of the implementation of the WQCMPUR, metrics for measuring success will be developed (high priority recommended activity 71) and incorporated into the Implementation Strategy Action Plan (***Section 9.8***). Metrics and assessment of the implementation of the WQCMPUR will in general address three areas:

- Water quality related:
  - Status of compliance with water quality standards and wasteload allocations (***Appendix 5-1***);
- Progress related:
  - Water quality indicators such as the number of beach closures;
  - Volume or Percentage of urban runoff recharged;
  - Percent attainment of urban runoff goals of the Water IRP;
  - Tons of pollutants captured;
  - Number of green street projects;
  - Number of green roof projects; and
  - Acres of open areas retrofitted to capture, treat and use stormwater runoff
- Outreach and source control related:
  - Status of city-wide collaboration activities; and
  - Estimates of the pollution prevented through source reduction activities, particularly through implementation of the Outreach Initiative (***Section 9.4.2***).

9.8 Implementation Strategy Action Plan

A ten-year Implementation Strategy Action Plan is provided in ***Table 9-3***. This Action Plan contains the high-priority recommended activities from ***Sections 9.2, 9.3 and 9.***4, which are considered the most important tasks for implementation under the

WQCMPUR. The Implementation Strategy Action Plan also identifies the lead agencies and tentative milestones for completion. It is important to note that the implementation of high priority recommended activities depends on the financial resources available to the Watershed Protection Program (***Chapter 10***). Whereas some high priority recommended activities in ***Table 9-3*** have already begun and may be implemented under the existing budget (in particular plan development and institutional BMPs), others will require additional financial resources before they can be implemented (in particular structural projects that require capital investments and O&M). It should also be noted the completion milestones of high priority recommended activities depend on the funding available. Any delay in additional funding will cause these milestones to be completed at a later time.

Given the uncertainties and costs involved in the execution of this Implementation Strategy, an adaptive implementation process[2] has been included, ***Figure 9-4***. Accordingly, this Implementation Strategy will be reviewed and, if necessary, revised at least once every five years (high priority recommended activity 72). These reviews will focus on the following:

- Status of meeting Action Plan milestones;
- Incorporation of new information, where appropriate, from the following:
  - Outcomes from citywide collaboration and outreach activities;
  - New/revised water quality regulations; and
  - Findings from pilot studies and research projects
- Updates to the Action Plan schedule, if appropriate;
- Establishment of new implementation recommendations, where appropriate; and
- Stakeholder review of recommended updates to the plan.

---

[2] The National Research Council (NRC) recommends the use of an adaptive implementation process to address uncertainty in the TMDL process (***Ref. 9-14***):

> "Adaptive implementation is … the application of the scientific method to decision-making. It is a process of taking actions of limited scope commensurate with available data and information to continuously improve our understanding of a problem and its solutions, while at the same time making progress toward attaining a water quality standard. Plan for future regulatory rules and public spending should be tentative commitments subject to revisions as we learn how the system responds to actions taken early on."

Table 9-3
Implementation Strategy Action Plan with High Priority Recommended Activities

Initiative	RA	Lead	Task	Year 1	2	3	4	5	6	7	8	9	10
Water Quality Management	1	BOE WPD	Implement TMDL compliance projects currently identified in CIP	•	•	•	•	•					
	2	WPD	Complete BMP Prioritization Methodology Phase II	•									
	3	WPD	Establish BMP siting, design storm and BMP performance criteria	•									
	4	WPD	Develop methodology for quantitative nexus between BMP selection and water quality standards attainment	•									
	5	WPD	Develop Water Quality Management Plan (WQMP) for Ballona Creek Watershed	•	•					R			
	5	WPD	Develop WQMP for Los Angeles River Watershed		•	•					R		
	5	WPD	Develop WQMP for Santa Monica Bay Watershed			•	•					R	
	5	WPD	Develop WQMP for Dominguez Channel Watershed				•	•					R
	6	BOE WPD	Implement future CIP projects for TMDL compliance			•	•	•	•	•	•	•	•
	10	WPD	Establish jurisdictional partnership agreements in each watershed	•	•	•	•	•					
	12	WPD	Participate in regional and national research opportunities	•	•	•	•	•	•	•	•	•	•
Citywide Collaboration	15	DCP WPD	Review and update General Plan for implementation of urban runoff management goals	•	•	•							
	16	WPD	Develop Low Impact Development strategy	•	•	•							
	17	WPD	Develop Stream Protection Ordinance	•	•								
	23	WPD BSS	Evaluate the use of public right of ways for local management of urban runoff (green streets)	•	•								
	30	WESD WPD	Support implementation of urban runoff goals of Water IRP	•	•	•	•	•	•	•	•	•	•
	31	WPD	Revise SUSMP requirements	•	•								
	32	WPD DRP	Evaluate use of publicly owned land for infiltration and urban runoff management	•	•	•							
	40	WPD	Establish water quality requirements for use of stormwater runoff	•	•								
Outreach	50-67	WPD	Evaluate and implement future outreach program elements as identified in Section 9.4.1	•	•	•	•	•	•	•	•	•	•
	68-69	WPD	Implement pilot studies to quantify benefits of non-structural BMPs	•	•	•	•						
	70	WPD	Create link to WQCMPUR activities on WPD website	•									
All Initiatives	71	WPD	Develop metrics for measuring success	•	•	•	•	•					
	72	WPD	Implementation strategy assessment and review					R					R

RA □ Recommended Activity in Chapter 9; this Action Plan only includes the high priority recommended activities.
R □ Review and revise document

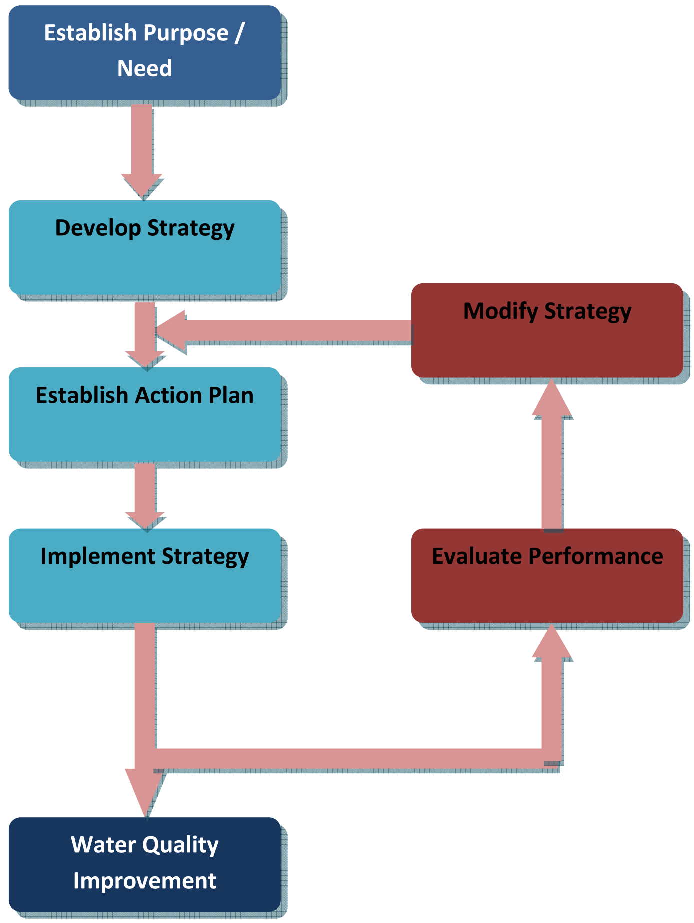


Figure 9-4
Adaptive Implementation Process

References

9-1. City of Los Angeles Watershed Protection Division (2007). Case Study: Application of Various Structural BMPs in Compton Creek Watershed (draft).

9-2. Los Angeles County-wide Structural BMP Prioritization Methodology Guidance Manual (2006), prepared by Geosyntec Consultants for the County of Los Angeles, Department of Public Works, Heal the Bay, and City of Los Angeles, Bureau of Sanitation.

9-3. City of Los Angeles Integrated Resources Program (http://www.lacity.org/san/irp).

9-4. Los Angeles Green Building Program (http://www.lacity.org/ead/EADWeb-Sustainable/green_building_program.htm).

9-5. Green LA: An Action Plan to Lead the Nation in Fighting Global Warming (May 2007) (http://www.lacity.org/ead/EADWeb-AQD/GreenLA_CAP_2007.pdf).

9-6. General Plan of the City of Los Angeles (http://www.ci.la.ca.us/PLN/Cwd/GnlPln/History.htm).

9-7. Natural Resources Defense Council (2006). Rooftops to Rivers: Green Strategies for Controlling Stormwater and Combined Sewer Overflows (http://www.nrdc.org/water/pollution/rooftops/rooftops.pdf).

9-8. CLA Environmental Affairs Department (2007). Green Roofs – Cooling Los Angeles (http://lacity.org/ead/EADWeb-AQD/Green%20Roofs%20Resource%20Guide%202007.pdf).

9-9. CLA Planning Department (2005). City of Los Angeles Landscape Ordinance (No. 170,978, as amended through April 10, 2005) (http://cityplanning.lacity.org/Forms_Procedures/landsc%20guidelines%204-05.pdf).

9-10. California Department of Water Resources. Updated Model Water Efficient Landscape Ordinance AB 1881 (http://www.owue.water.ca.gov/landscape/ord/updatedOrd.cfm/).

9-11. California Integrated Waste Management Board. Zero Waste California (http://www.zerowaste.ca.gov/).

9-12. Groner, S., S. Groner Associates. Personal Communication, January 2008.

9-13. U.S. Environmental Protection Agency. 2007. MS4 Program Evaluation Guidance. Office of Wastewater Management, Washington, DC. EPA-833-R-07-003. January 2007.

9-14. National Research Council (NRC). 2001. Assessing the TMDL Approach to Water Quality Management. Prepared by the Committee to Assess the Scientific Basis of the Total Maximum Daily Load Approach to Water Pollution Reduction. National Academy Press, Washington DC.

Chapter 10
Financial Plan

10.1 Introduction

The City of Los Angeles faces challenges to meet existing and emerging water quality regulations for urban runoff over the next two decades. The City covers a large urbanized area (approximately 469 square miles), ***Figure 10-1***, and encompasses a complex topography as previously discussed in ***Chapter 2***. The numerous pollutants of concern, reviewed in ***Chapter 4***, are diverse in nature and source; new pollutants are likely to also become regulated. Emerging water quality regulations set limits to the amount of urban runoff pollutants that can be discharged into receiving waters, ***Chapters 3 and 5***. To satisfy these requirements, the City will need to implement a broad array of measures or BMPs to reduce urban runoff pollution, which have been categorized in ***Chapter 6***. In addition, urban runoff management in Los Angeles will need to be coordinated with other implementation and watershed management plans in the City, ***Chapters 7 and 8***.

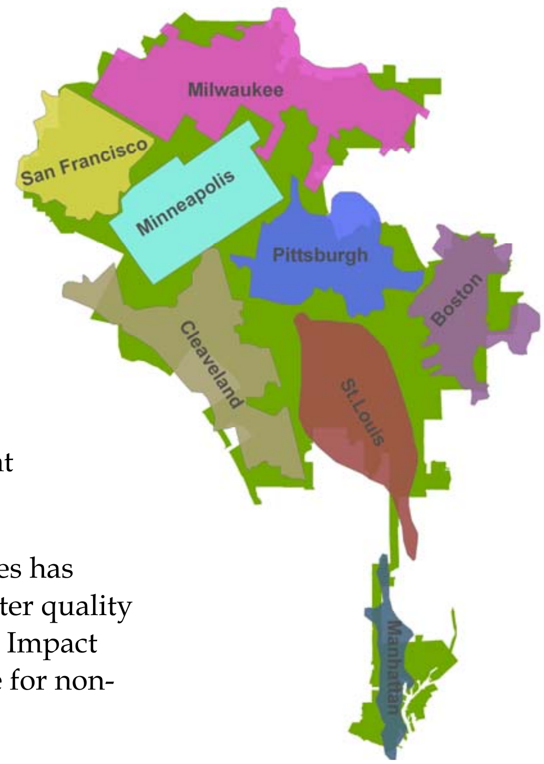


Figure 10-1 City of Los Angeles
Eight large metropolitan areas could fit within the City boundaries.

To address all these factors, the City of Los Angeles has developed, ***Chapter 9***, a strategy to coordinate water quality management programs with an emphasis on Low Impact Development (LID), green programs, a preference for non-structural BMPs, and an adaptive management philosophy. Based on the currently available knowledge, this strategy is the best approach to bring the City to water quality compliance, but the projected costs are significant. As such, additional funding is necessary to meet the many challenges over the next 20 to 30 years. Without additional financial resources, there will be a delay in implementing many water quality improvement projects, which could potentially cause violations of water quality regulations, and subject the City of Los Angeles to penalties and lawsuits.

This chapter provides a review of current sources of revenue, estimates costs for water quality compliance, and identifies new potential sources of revenue. Each avenue has its own specific hurdles to overcome. Increases in taxes or fees as a sustainable funding source may be necessary, but should be viewed in the context that:

- The current stormwater fee allocated to the City's Watershed Protection Program is one of the lowest in the nation;

- Current revenues are fully allocated to the City's existing Watershed Protection Program and are not sufficient for addressing emerging water quality regulations; and
- Implementation of the WQCMPUR may result in benefits that exceed the cost impact of implementing water quality improvement projects.

10.2 Existing Cost Estimates for TMDL Implementation

Figure 10-2 illustrates the results of recent studies to evaluate the possible cost of implementing TMDLs in the Los Angeles region that are required by the Clean Water Act (CWA), ***Refs. 10-1 to 10-6***. These cost estimates cover a range of $1 billion to over $70 billion. The studies made significantly different assumptions regarding the strategies to satisfy the TMDLs. At the high end of the estimates are approaches that rely on the use of regional and sub-regional stormwater treatment plants with proven technologies likely to be capable of meeting water quality regulations. Such plants might be similar to existing wastewater treatment plants using tertiary treatment, but there are limited opportunities for locating such plants. Many of those cost studies did not adequately account for land acquisition costs in the City of Los Angeles, otherwise some of these estimates could have been as high as $200 billion. This approach is

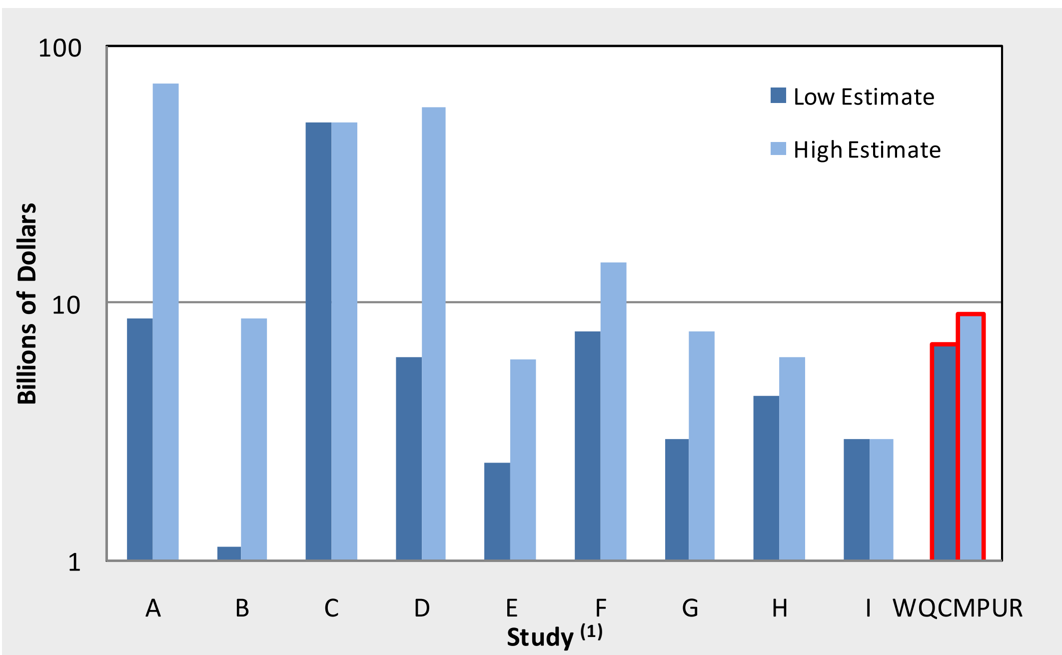


Figure 10-2
Comparison of TMDL Implementation Cost Estimates for Los Angeles
Estimates from recent independent studies for water quality compliance are compared with the 2007 compliance estimates per the WQCMPUR.

(1)
A – Stanley & Holman, 1998; ***Ref. 10-1***.
B – EPA, 1999; cited in ***Ref. 10-2***.
C – Moore, 2003; ***Ref. 10-5***.
D – Kuprenas, 2003; ***Ref. 10-3***.
E – CA Cities Survey, 2004; cited in ***Ref. 10-2***.
F – LA Region TMDLs; cited in ***Ref 10-2***.
G – CALTRANS, 2005; ***Ref. 10-6***.
H – Currier, 2005; Appendix H; ***Ref. 10-2***.
I – ASCE, 2005; ***Ref. 10-4.***

not considered fiscally realistic. At the other extreme, some studies assumed that TMDLs could be satisfied with non-structural BMPs focused on source control, with the addition of some infiltration projects. The authors of these studies acknowledged that there was considerable uncertainty in the ability of the non-structural approaches to meet the TMDL requirements.

The LARWQCB, as part of the TMDL development and approval process, prepares staff reports, ***Refs. 10-7 to 10-11***, that include general cost estimates for implementing TMDLs. ***Table 10-1*** summarizes the LARWQCB estimates for several approved TMDLs in the Los Angeles Region. The LARWQCB estimates are based, in part, on some of the previously mentioned cost studies. There is a great deal of uncertainty in the estimates because of the number of BMP options and the performance assumed for each BMP. It appears that the LARWQCB cost estimates suggest a range of approaches similar to the lower estimates, ***Ref. 10-4*** in ***Figure 10-2***. Therefore, the TMDL implementation costs in ***Table 10-1*** should be considered low estimates.

10.3 Cost Estimate for Water Quality Compliance

The City will be faced with significant new expenditures to satisfy water quality regulations over the next 20 to 30 years. The costs largely depend on the approach of implementation: focus on treatment or on programmatic elements. The City could rely heavily on technologies from wastewater treatment applied to urban runoff treatment. The cost of such an approach would be daunting, however, as indicated by the cost estimates previously discussed in ***Section 10.2***, the City could also take an approach that might be technically challenging with less costs. This latter approach, discussed in ***Chapter 9***, assumes there would be:

- An emphasis on non-structural, source-control BMPs where appropriate;
- Incorporation of multi-use, multi-benefit projects, supporting the goals of the Water IRP;
- A preference for green solutions and Low Impact Development;
- A focus on runoff reduction; and
- A reliance on treatment (structural) BMPs, when necessary.

Table 10-1
Summary of LARWQCB Cost Estimates to Implement TMDLs in Various Watersheds

Watershed	TMDL	Year	Capital Cost	Annual O&M	Comments
Santa Monica Bay	Bacteria (wet weather)	2002	$379M	$3.7M	RWQCB Staff estimate for *interim* strategy with stormwater diversion at 12 locations; long-term integrated resource strategy is estimated to cost more. (see RWQCB Staff report of 11-7-2002 (wet weather))
Santa Monica Bay	Bacteria (dry weather)	2002	$46M	$1.5M	RWQCB Staff estimate for *interim* strategy with stormwater diversion at 12 locations; long-term integrated resource strategy is estimated to cost more. (see RWQCB Staff report of 1-14-2002 (dry weather))
LA River	Trash		$554M		Based on Draft RWQCB Report estimate: {estimated cost of $14/household} x {12 years} x {3.3 million households}. (see RWQCB Staff reports of 1/6/2004)
LA River	Metals	2005	$1,039-1,426M	$135M	RWQCB estimate based on "phased implementation approach," implementation of IRP goals (not included in cost estimate), street sweeping and incorporation of structural BMPs. (see RWQCB Staff report of 6-2-2005)
Ballona Creek	Metals	2005	$245-335M	$37M	Similar strategies are suggested for the Ballona Creek Metals and Toxic TMDLs, consisting of a combination of implementation of IRP goals (not included in cost estimate), street sweeping and incorporation of structural BMPs. (see RWQCB Staff reports of 7-7-2005 (BC-metals) and 7-7-2005 (BC-toxics))
Ballona Creek	Toxic pollutants (Estuary)	2005	$245-335M	$37M	
Ballona Creek	Bacteria	2006	$375-917M	$12.5 - 6.7M	Cost for "Preferred Strategy", relying on a combination of flow and bacteria source control, limited treatment and discharge, and diversion to HTP. Costs are for interim control only. (see RWQCB Staff reports of 7-21-2006(BC))
Marina del Rey Harbor	Toxic Pollutants	2005	$5.5-7.6M	$0.8M	Cost for structural BMPs that would result in compliance of 70% of the urbanized portion of the watershed.
Marina del Rey Harbor (Mother's Beach and Back Basins)	Bacteria	2003	1) $36.6M 2) $3.1M 3) unknown	1) $0.07M 2) $0.03M 3) unknown	For compliance with dry and wet weather includes (1) diversion/ treatment strategy, (2) improved circulation and (3) structural and non-structural BMPs.

Note: Capital costs estimates in this Table have not been adjusted to 2008 because: (1) of the complexity of the estimates, and (2) some implementation activities have already been initiated. The cost summaries in the TMDL staff reports imply that there may be some overlapping costs because some BMPs implemented for one set of TMDLs may also benefit other TMDLs.

Cost Estimate Methodology: Preliminary estimates of the City's cost to implement programs for water quality compliance in the four regional watersheds area are summarized in ***Tables 10-2*** and ***10-3.*** The general methodology was to develop unit costs for each TMDL category based on area. The specific steps to generate these estimates are the following:

1. Define the City-owned portions of the four watersheds.

2a. The 2006 CWA 303(d) List (***Appendix 5-2)*** lists over 250 impairments in the Los Angeles River, Santa Monica Bay, Dominguez Channel and Ballona Creek (including Marina del Rey) watersheds. It is expected that these impairments will be grouped into a smaller number of TMDLs (as discussed in ***Chapter 5***) by commonalities of characteristics, sources and watershed or sub-watershed areas. It is assumed that TMDLs in each watershed can be grouped into six major pollutant categories: metals, organics, trash, bacteria, toxics and nutrients.

   Use available LARWQCB cost estimates for implementing adopted TMDLs as a baseline, ***Table 10-2***. Not all watersheds or TMDLs have an estimated cost.

2b. Use an internal WPD cost estimate for implementing adopted TMDLs as an alternate baseline, ***Table 10-3***. Note: the LARWQCB estimate was used for the LA River Watershed.

3. Calculate unit costs for each TMDL (with a baseline cost estimate) for each watershed by dividing the total TMDL implementation cost by the total watershed area. Unit costs are expressed in $ per acre. Again, not all TMDLs will have a unit cost.

4. Calculate the cost for compliance on City-owned watershed property for each TMDL in each watershed. Cost is calculated by multiplying unit cost per acre by the total watershed acreage and the percentage of City-owned property. Since many combinations of watersheds and pollutant categories do not have a unit cost per acre, it was assumed that implementation costs for specific pollutant categories were the same for comparative watersheds. For TMDLs that address organics, it was assumed that implementation would be the same as for toxic pollutants TMDLs. For TMDLs that address nutrients, it was assumed these have been largely addressed by recent upgrades to three WWTPs.

5. Calculate the total compliance estimate by adding all the individual TMDL implementation cost estimates.

Total Approximate Cost Estimates for Water Quality Compliance: ***Table 10-2*** estimates the approximate cost for water quality compliance using the LARWQCB estimates (***Table 10-1***) as a baseline. ***Table 10-3*** estimates the approximate cost for water quality compliance using internal WPD cost estimates as a baseline. Both

Table 10-2 Estimate of City of Los Angeles Implementation Costs (RWQCB basis)

The table summarizes a TMDL implementation cost estimate based on LARWQCB implementation cost estimates as a starting point. The costs described in the TMDLs may be duplicative in certain cases, as some BMPs could benefit more than one TMDL category. In other cases, no costs were included for IRP projects that might benefit water quality goals.

	LA River	SMB: J2 & J3	BC (&MdR)	DC	Comment
Total Area (acres)	533,416	34,457	82,114	84,693	
% in City of Los Angeles	33%	58%	81%	26%	
Estimated Costs for Selected TMDLs ($ billion)					
RWQCB TMDL Estimate - Metals	$3.74 billion		$1.08 billion		RWQCB Staff Report (LAR metals), 6/2/2005 - 1994-97 $ - 20 years, Page 75 RWQCB Staff Report (BC metals), 7/7/2005 - 1997 $ - 20 years, Page 57
RWQCB TMDL Estimate - Organics					
RWQCB TMDL Estimate - Trash	$0.55 billion		$0.11 billion		From Draft Staff Report: 3.3M households x 12 years x $8.8/household. Includes O&M. RWQCB Draft staff report for BC- trash, 1/16/2004
RWQCB TMDL Estimate - Bacteria		$0.46 billion	$0.62 billion		RWQCB Staff Report (SMB - WW Bacteria (Interim)), 11/07/02, Page 70 - draft - 2001-$, 7%)+ 01/14/02 dry weather TMDL RWQCB Staff Report (BC-Bacteria), 7/21/2006, Page 53 - final, preferred
RWQCB TMDL Estimate - Toxics			$0.99 billion		RWQCB Staff Report (BC Estuary only - toxics), 7/7/2005 - 1997 $ - 20 years
RWQCB TMDL Estimate - Nutrients					Assumes covered by WWTP upgrades
Unit Costs ($/acre)	**(blue ⇒ adjusted)**				
Unit cost per acre - Metals	$9,420/acre		$13,100/acre		RWQCB assumed LAR costs applied to Machado Lake TMDL (DC).
Unit cost per acre - Organics			$7,490/acre		Rate assumed same as for bacteria
Unit cost per acre - Trash	$1,040/acre		$1,320/acre		
Unit cost per acre - Bacteria		$13,300/acre	$7,490/acre		
Unit cost per acre - Toxics			$16,100/acre		
Unit cost per acre - Nutrients					
Cost Projections ($ billion)					
Projected City Cost - Metals	$1.66 billion	$0.19 billion	$0.87 billion	$0.21 billion	Used LAR rate for SMB & DC
Projected City Cost - Organics	$1.32 billion	$0.15 billion	$0.50 billion	$0.16 billion	
Projected City Cost - Trash	$0.18 billion	$0.02 billion	$0.09 billion	$0.02 billion	Used LAR rate for SMB & DC
Projected City Cost - Bacteria	$1.32 billion	$0.27 billion	$0.50 billion	$0.16 billion	Used unit cost for BC for LAR and DC
Projected City Cost - Toxics	$0.43 billion	$0.05 billion	$1.07 billion	$0.05 billion	Assumes it applies on 15% to LAR, SMB, DC
Projected City Cost - Nutrients	$0.03 billion				Upgrades already applied to LAG, DCT & BUR
Total Estimated Implementation Costs for TMDLs for City				**$ 9.2 billion**	

Table 10-3 Estimate of City of Los Angeles Implementation Costs (WPD basis)

Independently, the City's Bureau of Sanitation, Watershed Protection Division, estimated in a white paper (October 2007) the cost for TMDL implementation using a similar methodology as for Table 10-2. This alternate estimate projects costs about 15% lower. The starting points for the estimate that were significantly different, from those used in ***Table 10-2***, are shaded.

	LA River	SMB: J2 & 3	BC (&MdR)	DC	Comment
Total Area (acres)	533,416	34,457	82,114	84,693	
% in City of Los Angeles	33%	58%	81%	26%	
Estimated Costs for Selected TMDLs ($ billion)					
RWQCB TMDL Estimate - Metals	$1.34 billion		$0.37 billion		2007 WPD White Paper: Report on the Financial Needs of the Stormwater Program (Oct. 2007)
RWQCB TMDL Estimate - Organics					
RWQCB TMDL Estimate - Trash	$0.55 billion				From RWQCB Draft Staff Report: 3.3M households x 12 years x $8.8/household. Includes O&M.
RWQCB TMDL Estimate - Bacteria		$0.57 billion	$0.33 billion		SMB From final and draft RWQCB staff reports. RWQCB interim cost was increased by 50%.
RWQCB TMDL Estimate - Toxics			$0.37 billion		2007 WPD White Paper: Report on the Financial Needs of the Stormwater Program (Oct. 2007)
RWQCB TMDL Estimate - Nutrients					Assumes covered by WWTP upgrades
New MS4 Additional Costs					$1.5M/year
Unit Costs ($/acre)					
Unit cost per acre - Metals	$2,510/acre		$4,510/acre		RWQCB assumed LAR costs applied to Machado Lake TMDL (DC).
Unit cost per acre - Organics			$4,510/acre		Rate assumed same as for Toxics
Unit cost per acre - Trash	$1,040/acre		$1,530/acre		RWQCB Draft staff report for BC appears to have estimated rates that are 47% higher than LAR
Unit cost per acre - Bacteria		$16,500/acre	$4,020/acre		
Unit cost per acre - Toxics			$4,510/acre		
Unit cost per acre - Nutrients					
Cost Projections ($ billion)					
Projected City Cost - Metals	$0.44 billion	$0.09 billion	$0.30 billion	$0.10 billion	Used BC rate for SMB and DC
Projected City Cost - Organics	$0.79 billion	$0.09 billion	$0.30 billion	$0.10 billion	
Projected City Cost - Trash	$0.18 billion	$0.02 billion	$0.10 billion	$0.02 billion	
Projected City Cost - Bacteria	$2.91 billion	$0.33 billion	$0.27 billion	$0.36 billion	Used SMB rate for LAR and DC
Projected City Cost - Toxics	$0.12 billion	$0.01 billion	$0.30 billion	$0.01 billion	Assumes it applies on 15% to LAR, SMB, DC
Projected City Cost - Nutrients	$0.03 billion				Upgrades already applied to BUR, DCT, LAG
Total Estimated Implementation Costs for TMDLs				**$ 6.9**	**billion**

approaches result in a comparable result with an estimated total cost for water quality compliance ranging from $7 to $9 billion.

Uncertainties in Estimating Costs: The range of $7 to $9 billion reflects underlying uncertainties in the cost estimate. For example, the actual costs may be higher because:

- Cost estimates were based on 2007 dollars and don't account for inflation;
- New regulations may be adopted that require further action; and
- The cost of land and the acreage needed for implementing BMPs is difficult to estimate.

On the other end, the actual costs may be lower because:

- Many types of BMPs remove more than one pollutant (for instance BMPs that rely on infiltration of urban runoff), thereby addressing multiple TMDLs at the same time;
- Urban runoff management strategies will become more cost effective as new technologies are developed and research in urban runoff management and water quality progresses; and
- Source control becomes more effective and accepted as a means of reducing or eliminating pollutants.

The cost estimate prepared in this section is about in the middle of other available estimates that were summarized in ***Figure 10-2***. Use of any of these cost estimates for other than scoping purposes should be carefully considered.

Annual Cost Estimates for Water Quality Compliance: ***Figure 10-3*** provides an extrapolation of annual capital expenditures for water quality compliance over a 20-year period starting after realization of new revenue sources. The City's Bureau of Sanitation often estimates O&M costs at 6% of the expected capital expenditures. This number reflects both the importance of O&M costs and the uncertainty of maintenance requirements on new and unproven technologies. It does not reflect improvements in technology or adaptive management (as it applies to O&M) that is expected to occur over a 20-year period. Also, O&M requirements may be reduced because of economies of scale. Therefore, ***Figure 10-3*** projects the 6%-level of O&M costs over the same 20-year period as well as O&M costs at the 3%-level. The absolute spread between these two lines increase significantly beyond 5 years and the 3% figure might be viewed as a goal for future "programmatic" costs, in particular because the costs for O&M will continue beyond the 20-year period shown.

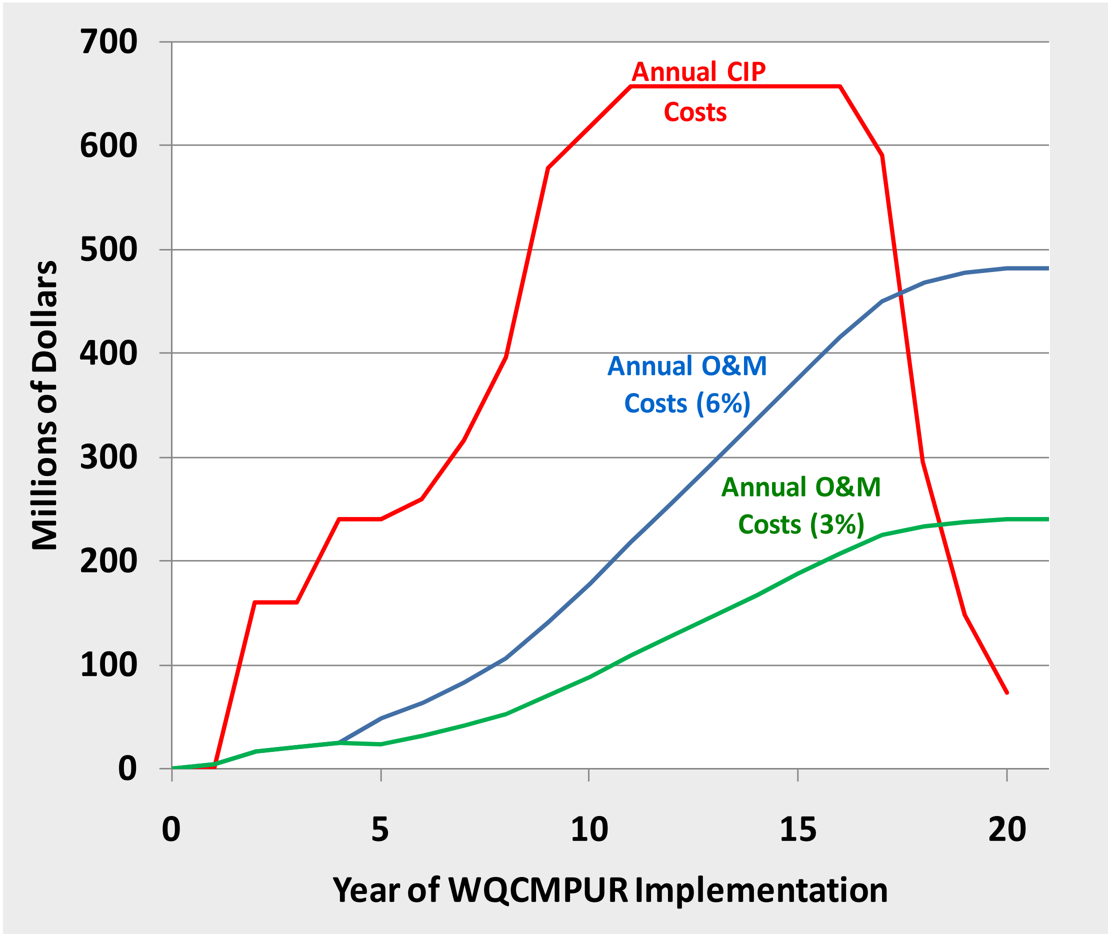


Figure 10-3
20-Year Projected Capital and O&M Costs for Implementing the WQCMPUR after Securing Funds for Implementation Projects in Year 0.
Basis: 2007 dollars

10.4 Current Revenues

Except for Proposition O bond proceeds, almost all current revenues for the City's Watershed Protection Program and urban runoff-related projects are derived from the Stormwater Pollution Abatement Charge (SPAC). Minor other sources of revenue include grants and other miscellaneous sources that tend to be limited and sometimes require a matching element.

Stormwater Pollution Abatement Charge: The Stormwater Pollution Abatement Fund (SPAF) was established in 1990-91 by the City Council to collect revenues from the SPAC on each property tax bill. The SPAC is actually collected by the County of Los Angeles and distributed to the City of Los Angeles. The SPAC to a property owner is determined by a formula that is proportional to the amount of runoff from each property in the City; the formula is based on a monthly rate of $1.92 per equivalent dwelling unit (EDU) on each parcel[1]. The proceeds from the fund must be expended only for stormwater and pollution abatement related activities. They can be applied, however, to operation and maintenance as well as capital improvement projects.

SPAC fees were not required to be voter approved when originally implemented. However, the City now needs property owner or voter approval to increase property related fees such as the SPAC per restrictions of California Proposition 218 (1996). Proposition 218 exempts water, sewer, and refuse fees from the voter approval process, but legislation is currently being considered to include stormwater fees in the exemption.[2] Mostly as a result of the passage of Proposition 218, an attempt to increase the SPAC has not been undertaken since 1994. Therefore, the SPAC has not kept pace with revenue requirements to satisfy increasingly stringent regulatory requirements and SPAF revenues have been relatively constant over the years at approximately $28 million per year. Insignificant fluctuations are a result of delinquent property tax payments and/or requests for changes in how parcel runoff factors are applied to a particular property (usually initiated as a result of land-use changes).

Figure 10-4 illustrates that the Los Angeles SPAC rate is relatively low compared to cities in the western United States that might be expected to have similar issues as Los Angeles. Some of these cities have stormwater related fees that are as much as 8 times higher than current Los Angeles rates.

Proposition O Bond Proceeds: Proposition O (2004) authorized the City to issue a series of general obligation bonds up to $500 million for projects to protect public health by cleaning up pollution, including bacteria and trash, in the City's

---

[1] The unit of measure for the City of Los Angeles is based on the Basic Assessment Unit (BAU), which is defined (in Section 64.51.01 of the Los Angeles Municipal Code (LAMC)) as, "the proportionate run-off from the average single-family residential parcel. The average single-family residential parcel has an area of 0.1526 acres (6,650 square feet) and a run-off factor of 0.4176.The product these (0.0637) is defined as the Basic Assessment Unit." The number of BAUs a particular parcel represents, the "Equivalent Dwelling Unit" (EDU), is determined using the following formula:

$$\text{EDU} = \frac{(\text{parcel area in acres}) \times (\text{parcel runoff factor})}{\text{BAU}}$$

The parcel runoff factors are defined in Section 64.51.05 in the LAMC as established by the Los Angeles County Flood Control District.

[2] An important development in California was the litigation between the City of Salinas and the Howard Jarvis Taxpayers Association that was decided June 3, 2002. It blocked the imposition of a stormwater fee on owners of improved or undeveloped graded properties due to its status as a "property related" fee subject to Proposition 218 balloting. Unless the case is successfully appealed or reviewed by the California Supreme Court, it will serve as a significant roadblock to funding compliance through user fees. The City should consider revisiting this issue at some future date once legal precedents related to the Salinas case have been established in this matter.

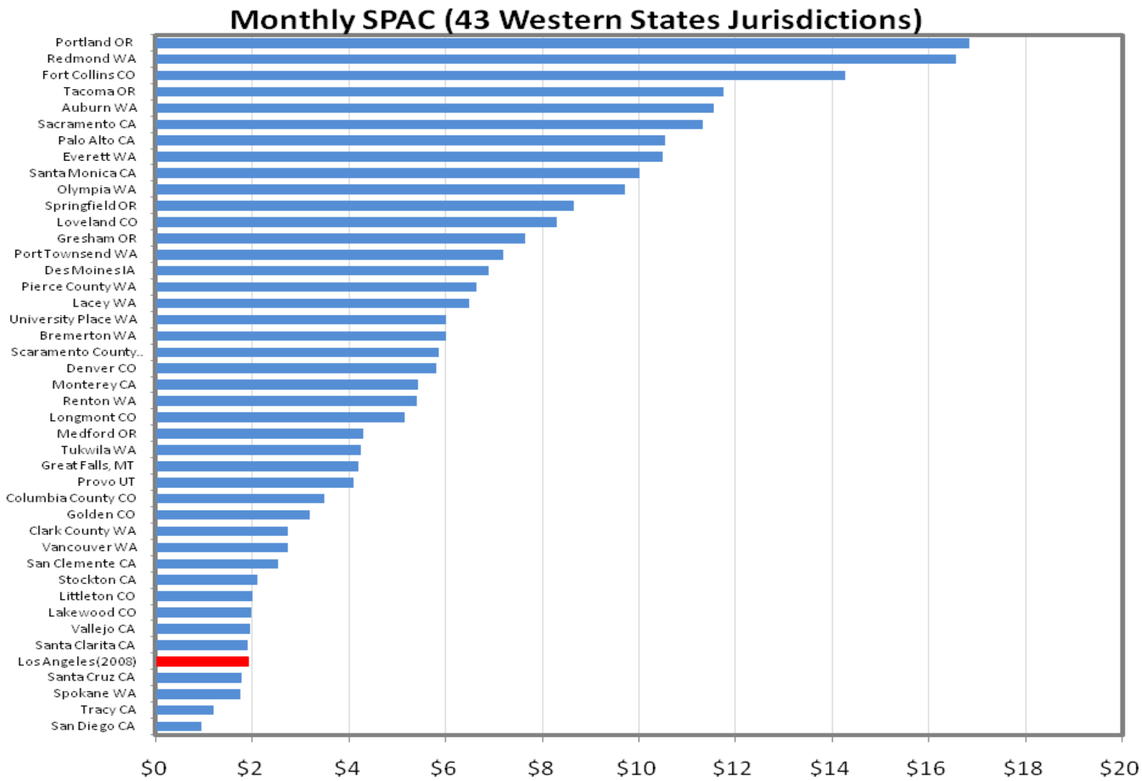


Figure 10-4
Comparison of Los Angeles Current Stormwater Fee with Other Western States City’s Fees
Figure based on 2007 Stormwater Utility Survey by Black & Veatch.
The current Los Angeles SPAC is represented by the red bar.

watercourses and waterbodies in response to regulatory requirements of the CWA. These obligation bonds are funded by the City’s General Fund from proceeds of ad valorem taxes levied on property subject to taxation over a period of approximately 20 years. The payment of the Proposition O bond is indicated by a line item on property tax bills so the amount can be readily identified by the taxpayer. Since the funds available from the Proposition O program have fully been allocated, no additional funding is available for implementation of the activities identified in the WQCMPUR.

Other Revenue Sources: Other revenue sources include interest payments on cash balances, developer plan review fees, grant reimbursements, reimbursements from other funds/agencies, fines and other minor revenue sources. Over the projection period, these revenue sources are expected to be relatively minor (about 10% in recent years, but expected to decrease as costs rise significantly) in comparison to SPAC generated-revenues and Proposition O bond proceeds.

10.5 Strategy for Future Funding

Without an increase in funds, there will be a delay in initiating new water quality programs, and possibly a delay in meeting water quality regulations. ***Figure 10-5*** illustrates the annual difference between expected revenues and expenses for the next five years. These estimates are based on 2007 dollars; actual costs in the future will be higher due to inflation and future increases in construction costs.

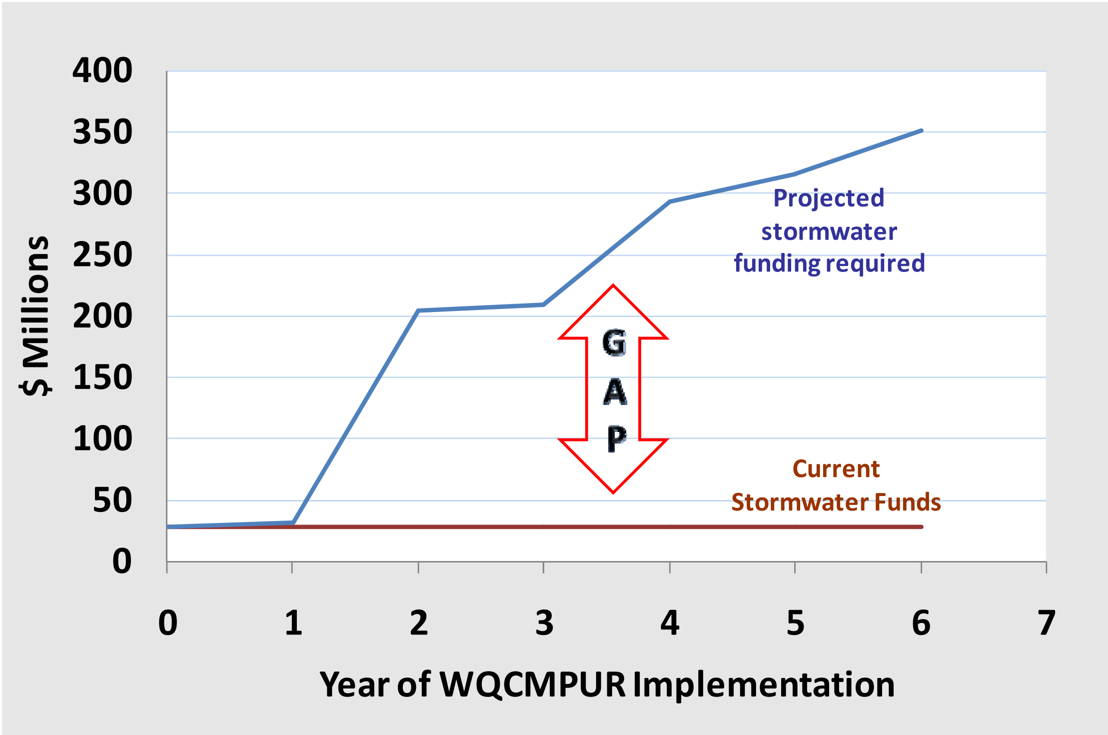


Figure 10-5
Predicted Annual Funding Gap for the Watershed Protection Program <u>without</u> an Increase in Funds - over a 5 year period of implementing programs defined in the WQCMPUR
Current SPAF funding and projected Watershed Protection Program funding needs are based on 2007 dollars. The projected funding requirements may increase or decrease after 5 years depending on the implementation rate of various water quality compliance projects.

This section discusses three options for future funding:

- **Option 1**: Increase of the SPAC;
- **Option 2**: Partnership with County of Los Angeles Flood Control Program; and
- **Option 3**: No additional funding for implementing the WQCMPUR.

Option 1, SPAC Increase: Based on the expected revenue shortfall illustrated in ***Figure 10-5***, a SPAC increase is a source of funds for two purposes: (a) to finance the capital costs of required stormwater projects; and (b) to cover on-going increases of O&M costs. If opting for this approach, the City could draft a 5-year SPAC increase schedule for voter or property owner approval (as required by Proposition 218), rather than attempt to gain approval for yearly rate increases. ***Table 10-4*** illustrates a possible SPAC adjustment schedule that would fund the estimated cost of $7-9 billion to implement the WQCMPUR through debt financing (note: calculations are based on 2007 dollars and have not been adjusted for yearly cost-of-living adjustment, COLA).

Table 10-4
Example of a SPAC Rate Adjustment and the Resulting Projected Revenue

	Current	Year 1	Year 2	Year 3	Year 4	Year 5
Monthly Rate/EDU(1)	□1.92	□3.93	□5.00	□6.08	□7.15	□8.25
Projected SPAF Revenue from SPAC	□31M(2)	□59M	□74M	□91M	□107M	□123M

(1) EDU: Equivalent Dwelling Unit.
(2) Includes □2.4M from permit fees and others.

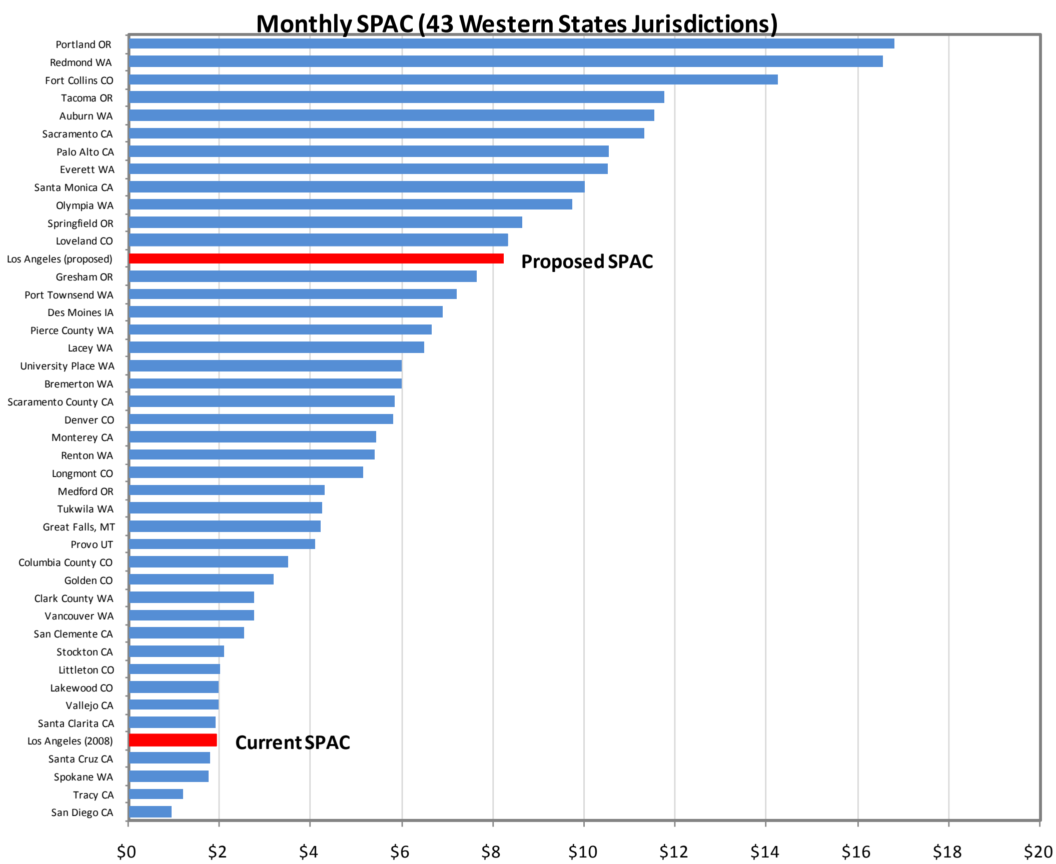


Figure 10-6
Comparison of Los Angeles Stormwater Fee with Other Western States Cities after Implementation of Possible SPAC Increase
This comparison uses current (2007) rates for other cities.

Even if the SPAC were increased to $8.25 by the end of 5 years, this rate would still be lower than the rates in many other cities in western states (***Figure 10-6).*** It is expected that a SPAC rate increase would require broad political support since Proposition 218 requires either a majority vote of property owners or two thirds approval of the voters in a general election.

Figure 10-7 illustrates how revenues from increasing the SPAC could be used to eliminate the funding gap between current revenues and projected future needs by using debt financing in a 7:1 ratio. A number of types of bond programs for debt financing are available to finance the implementation of the WQCMPUR including:

- General Obligation Bonds – Proposition O is an example;
- Stormwater Revenue Bonds; and
- State Revolving Fund Loans (SRF).

A discussion on specifics of these bonds can be found in ***Appendix 10-1.*** Debt financing is not unlimited and is constrained by unique situations depending on the source of financing. The issuance of multiple bonds would count against debt-coverage requirements (typically viewed as the assets to debt ratio). Debt-coverage

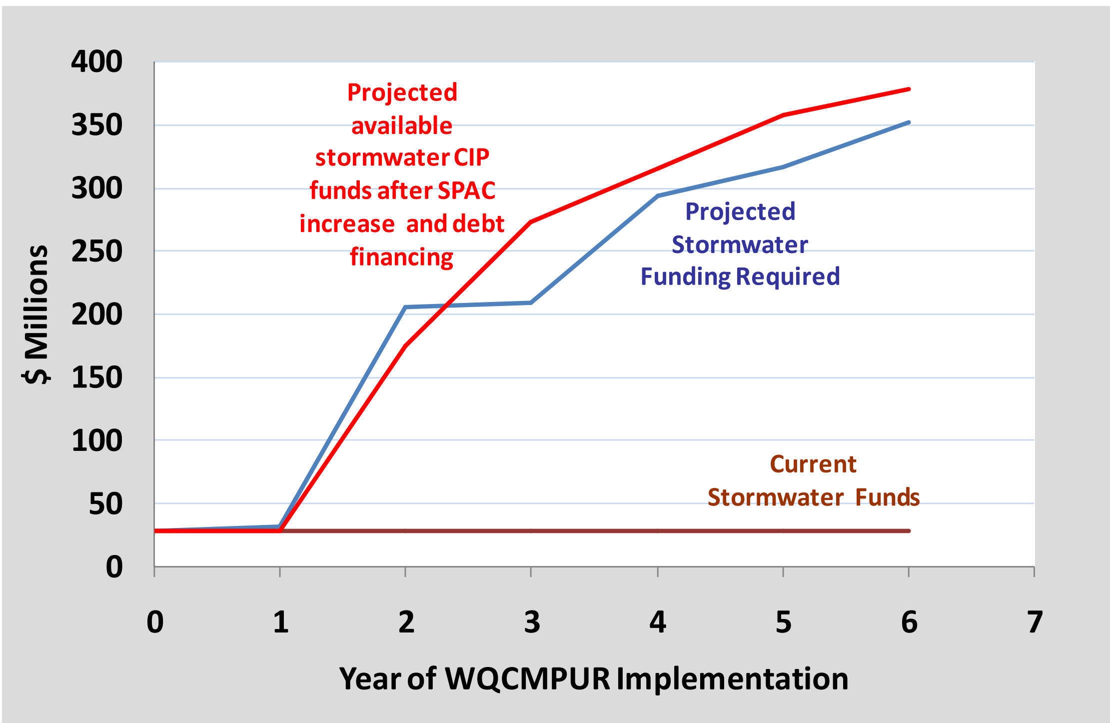


Figure 10-7
Comparison of Funding with Proposed SPAC Increase (Option 1) and Debt Financing with Projected Stormwater Funding Requirements over the first 5 Years of WQCMPUR Implementation

This chart assumes additional funds from a SPAC increase to fund stormwater programs will be distributed (1) to cover the projected O&M in ***Figure 10-3*** and (2) to cover debt financing of new CIP projects in a 7:1 ratio. Projected funding requirements are based upon 2007 dollars. It is assumed funds would be allocated in a graduated manner.

requirement ratios are required to meet specific credit ratings. There is the potential the SPAF could overextend itself if multiple bond issuances are sought that, in combination, decrease credit ratings and, subsequently, increase the interest payable on the bond.

Option 2, Partnership with Los Angeles County Flood Control Program: Currently, the County of Los Angeles collects fees from County property owners and uses these revenues for countywide projects that are narrowly limited by statute to support flood control programs. The City is working with the County to determine if expanding the scope of this program to address urban runoff water quality needs is viable as an additional funding source. It is believed that approval at the State level (probably with a County-sponsored Assembly Bill) will be necessary to change the allowable scope of the Flood Control Program. The City also intends to work with the County (and other cities within the County) to determine the amount of increased fees and how the funds would be administered, since any fees generated would be for programs across the County. After (1) the necessary State approval/modifications of the statute limitations and (2) determination of county-wide revenue needs, the County (and City) expect to seek approval by property owners (+50 %), probably sometime in 2010. This approach also aligns with the fact that a given impacted watershed will include many responsible parties and the cost for implementing water quality compliance projects will include multiple jurisdictions. At this point, it is not clear whether a single fee increase or a graduated fee increase could be sought. This will have a major impact on the rate of implementing water quality improvement projects.

Option 3, No Additional Funding: Without additional funding, many water quality improvements recommended by the WQCMPUR cannot be implemented. This will result in non-compliance with emerging water quality regulations, potentially subjecting the City of Los Angeles to penalties and lawsuits.

Other Funding Sources: WPD actively seeks and will continue to seek supplemental funding from federal, state and local grants and loans. Grants have previously been awarded from the California Integrated Waste Management Board, the California Coastal Commission, the Governor's Clean Beach Initiative, the Federal Transportation Equity Act for the 21st Century (TEA-21) and State Propositions A, 12, 13, 40, 50, 84 and 1E (***Appendix 10-2***). However, monies from these types of sources are limited and are distributed among numerous public and private agencies following a competitive award process. On average, the City has been awarded approximately $2 - $3 million annually in grant funds. State funding is expected to increase slightly over the next few years with the recently passed State Bond Propositions 1E (2006, for Disaster Preparedness and Flood Prevention) and 84 (2006, for Water Quality, Safety and Supply, Flood Control, Natural Resources Protection, and Park Improvements). Most grants require some percentage of matching funds, so while grants can extend funding, they often require upfront funding.

Other funding sources include additional user fees (for refuse and excess water), federal grants, subsidies and incentive programs, and State Revolving Fund loans. These alternatives will be pursued as appropriate. However, none of these funding sources are expected to provide significant funds compared to projected needs.

10.6 WQCMPUR Benefits

The discussion up to this point has focused upon estimates of the direct costs to fund future water quality compliance projects and the funding sources that need to be developed. While these costs may be substantial, they should be viewed against the potential benefits of implementing the WQCMPUR. The City and the surrounding region will benefit with fewer beach closures, cleaner communities, healthier ecosystems, lowered health risks, improved recreational opportunities and lowered demand for potable water. Utilizing an existing study prepared in 2004 for the LARWQCB (***Ref. 10-4;*** Appendix H), a present value was estimated for the six following potential benefits:

- Aesthetic value of a clean ocean – the value or benefits of a clean ocean after removal of all ocean impairments;
- Ecosystem services – value of lost near-shore marine ecological services associated with impairments that could be potentially returned if urban runoff quality control improvements are implemented;
- Additional water supply - value of water that could potentially be infiltrated with stormwater quality control improvements;
- Flood control – total annual flood insurance premiums in the region that would be potentially no longer required with stormwater quality control improvements;
- Property value increase – high range: total increases in property values related to increases in green space associated with stormwater quality control improvements; low range: esthetic benefit of trash control associated with stormwater quality control improvements; and
- Avoided dredging costs – sediment removal costs in regional harbors that could potentially be eliminated with stormwater quality control improvements.

The values of these benefits are certainly subjective, but they are not intangible. Utilizing the data in the study and applying updated values a high and low range of costs were developed for each factor. Then the factors were summed and compared to the overall present value cost of the WQCMPUR as illustrated in ***Figure 10-8***. Low and high range benefit factors are approximately 3.7 times greater and 13.8 times greater, respectively, than the estimated WQCMPUR cost. Obviously missing from the list of benefits are those that could be attributed to avoided health costs that, if it were possible to include, would skew the cost-benefit comparison even more in favor of the activities recommended in the WQCMPUR.[3] Another benefit not included in the figure is the avoided costs of legal actions that might happen if water quality improvements are not implemented

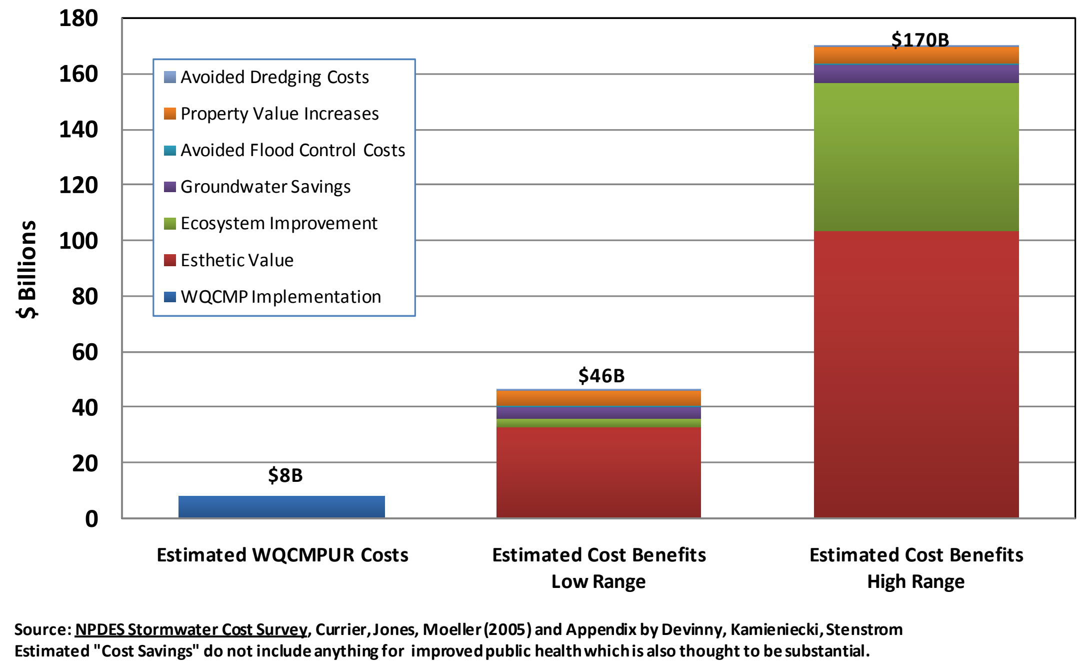


Figure 10-8
Comparison of WQCMPUR Estimated Costs with Cost Benefits Expected (2007 Basis)

10.7 Recommendations

Proposition O has provided a temporary financial reprieve that has allowed for the implementation of a number of large-scale projects. These projects will have the most impact on compliance with the dry-weather bacteria and trash TMDLs. The financial plan for the WQCMPUR has identified the gap between proposed planning level CIP and O&M costs and revenues for the next 20 years. The shortfall in revenues will require the development of additional revenue sources and incentives to fund this implementation strategy. Accordingly, it is recommended that the City evaluates an increase of the SPAC and/or additional resources from partnering with the Los Angeles County Flood Control Program as sustainable funding sources for the implementation of the WQCMPUR.

---

[3] In 2006, the LARWQCB included information in a Fact Sheet, part of the LA County's MS4 permit renewal process, that indicated: (1) illness associated with swimming in marine waters were estimated between 627,800 and 1,479,200 excess gastrointestinal cases annually in Los Angeles County and Orange County beaches as a result of enterococci contaminated waters, and (2) the corresponding economic loss ranged from $21 million to $51 million annually.

References

10-1. Stanley & Holman Associates (1998). Financial and Economic Impacts of Storm Water Treatment Los Angeles County NPDES Permit Area.

10-2. Brian K. Currier, Joseph M. Jones, Glenn L. Moeller (2005) "NPDES Stormwater Cost Survey." Prepared for California Water Resources Control Board, Office of Water Programs. (Report includes Alternative Approaches to Stormwater Quality Control (2004) by Joseph S. Devinny, Sheldon Kamieniecki and Michael Stenstrom as Appendix H.

10-3. John A Kuprenas, Peter Gordon, James E. Moore, Harry W. Richards, and Jin-Jen Lee (June 2003). "Analysis Methodology for Stormwater Treatment Costs." 4th Joint Annual ISPA / SCEA Conference.

10-4. ASCE (2005). "2005 Report Card for Los Angeles County Infrastructure."

10-5. James Moore, Peter Gordon, Harry W. Richardson, John Kuprenas and Jin-Jen Lee (2003). "An Economic Impact Evaluation of Proposed Storm Water Treatment for Los Angeles County." AWRA's 2003 annual Water Resources Conference.

10-6. Caltrans Water Quality Newsflash (March 14, 2005). Number 05-11. http://www.dot.ca.gov/hq/env/stormwater/publicat/newsflash/

10-7. EPA and California Regional Water Quality Control Board Los Angeles Region (2005). Staff Report for "Total Maximum Daily Load for Metals – Los Angeles River and Tributaries."

10-8. EPA and California Regional Water Quality Control Board Los Angeles Region (2004). Staff Report for "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland."

10-9. EPA and California Regional Water Quality Control Board Los Angeles Region (2007). Staff Report for "Trash Total Maximum Daily Loads for the Los Angeles River Watershed."

10-10. EPA and California Regional Water Quality Control Board Los Angeles Region (2007). Staff Report for "Trash Total Maximum Daily Load for the Machado Lake in the Dominguez Channel Watershed."

10-11. EPA and California Regional Water Quality Control Board Los Angeles Region (2005). Staff Report for "Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor."

Appendix 1-1
Council Motion CF 07-0663

The following is the text of City Council Motion CF 07-0663 from the Energy and the Environment Committee and presented by Councilmen Bill Rosendahl (CD11) and Ed Reyes (CD01). The motion was signed on March 2, 2007.

TEXT OF COUNCIL MOTION CF 07-0663 (March 2, 2007)

Pollution from urban runoff during dry and wet weather harms public health and the environment. Additionally, the City of Los Angeles faces legal mandates to meet water quality standards and deadlines to reduce pollution from urban runoff under the Clean Water Act (CW A). These CWA mandates are included in the Municipal Stormwater Permit, as well as existing and upcoming Total Maximum Daily Loads (TMDL) regulations.

A Water Quality Compliance Master Plan (Master Plan) is needed to provide strategic direction essential for planning, budgeting, and funding efforts to reduce pollution from urban runoff. This plan should guide the City's efforts to meet its CWA mandates. The need for this plan is urgent, and the City needs to show leadership immediately.

The City has several long-range planning documents that can help in the development of strategies to resolve our urban runoff problems. These include the Integrated Resources Plan, the Integrated Regional Water Management Plan, the Draft Los Angeles River Revitalization Master Plan, and other similar watershed management plans.

The Bureau of Sanitation has been tasked with managing the City's Watershed Protection Program and in that role is responsible for assuring the City is in compliance with all urban runoff regulations and mandates.

I THEREFORE MOVE that the Bureau of Sanitation, working with the Bureau of Engineering, City Administrative Officer and the Chief Legislative Analyst, be directed to create a Water Quality Compliance Master Plan describing the City's strategy to achieve Clean Water Act standards.

I FURTHER MOVE that an initial written report be presented within 30 days on how the City will create the Master Plan and specifically address how the City will incorporate public input with the final Master Plan.

The final Master Plan should incorporate the following principals:

Identify all pollutants of concern in the City by type and location, including watershed or water body;

Prioritize polluted areas within the City and create a compliance timetable;

Identify existing efforts to reduce pollutants of concern and comply with all state and federal regulations;

TEXT OF COUNCIL MOTION CF 07-0663 (Page 2 of 2)

- Identify strategies -- such as on-site retention/infiltration, structural best management practices, regional multi-use benefit projects (inducing the identification of potential sites for such projects), and non-structural educational and regulatory measures (including ordnance changes to encourage on-site infiltration) - for the City to meet Clean Water Act standards by pollutant and by water body or watershed;

- Provide a technical nexus between the strategies and water quality standards attainment and demonstrate that strategy implementation will result in standards compliance;

- Identify water quality data gaps including those that need to be filled in order to determine if the City is in full compliance with water quality requirements in the Los Angeles County stormwater permit and applicable TMDLs; and

- Identify estimated costs and sources of financial support including, but not limited to, state and local bonds, stormwater pollution abatement funds, County flood control fees, and sewer service charges.

I FURTHER MOVE that the proposed Master Plan should integrate existing efforts already underway such as the Integrated Resources Plan, Integrated Regional Water Management Plan, the Draft Los Angeles River Revitalization Master Plan, and other relevant watershed management plans.

I FURTHER MOVE that the proposed Master Plan be developed in partnership with stakeholders from the public, environment groups, and regulators including the Los Angeles Regional Water Quality Control Board and local municipalities, and that public workshops be held to seek and gather optimal input.

I FURTHER MOVE that the proposed Master Plan be finalized within six months of the initial report due within 30 days.

Appendix 2-1
Los Angeles River Watershed Fact Sheet Summary

Watershed Area	834 square miles; 30 miles of river and 289 square miles of watershed lie within the City.
Location	San Fernando Valley, Downtown Los Angeles, and (8) tributaries which include; Bell Creek, Aliso Canyon Creek, Bull Creek, Tujunga Wash, Verdugo Wash, Arroyo Seco, Rio Hondo and Compton Creek.
Land Use	Approximately 324 square miles of the watershed are covered by forest or open space land including the area near the headwaters, which originate in the Santa Monica, Santa Susana, and San Gabriel Mountains. The remaining 510 square miles, and approximately 231 square miles of the City portion are heavily developed residential, commercial and industrial areas that are bordered by rail yards, freeways, major commercial areas, refineries and petroleum products storage facilities. Also included in part of the watershed are a number of lakes that are heavily used for recreational purposes.
Hydrology Tidal Influence	Virtually the entire main channel of the river has been channelized and paved except for the tidal prism where soft bottom persists with some remaining wetlands habitat and in a stretch of the river near downtown Los Angeles where a high water table precludes use of concrete. Many tributaries originate in either the Santa Monica or San Gabriel Mountains where they have year-round flow due to springs and they support high quality habitat. The Los Angeles watershed has several dams that control flows in some areas of the watershed, including the Pacoima Dam, the Rio Hondo, and the area above Big Tujunga Wash.
Cities and Agencies	The watershed is broken up into 6 jurisdictional groups (for metals). The City of Los Angeles participates in all 6 of the groups. Along with the City of Los Angeles, 42 other cities and 8 different agencies are responsible for the watershed.
Dry Weather Flow	Year-round flow in the river is maintained by urban and agricultural run-off, and discharges of treated recycled water. The average precipitation per year is 14 - 20 inches.
Beneficial Uses Categories	Aliso Canyon Wash, Dry Canyon Creek, McCoy Canyon Creek, Tujunga Wash, Burbank Western Channel, Rio Hondo (Reach 1): MUN, GWR, REC1, REC2, WILD, WARM. Compton Creek and Monrovia Canyon Creek: All of the above listed with the addition of WET. Los Angeles River (Reach 4): All of the above listed with the addition of WET and IND, Los Angeles River (Reach 1): All of the above listed with the addition of SHELL, RARE, MIGR, SPWN, MAR, IND, PROC.
Water Quality Impairments	Trash, copper, lead (sediment and/or water), cadmium, mercury, zinc (sediment and/or water), chromium, coliform/fecal bacteria, PCBs (tissue or sediment), DDT (tissue or sediment), Chlordane (tissue or sediment). PAHs: Benzo(a)pyrene, Benzo(a)anthracene, Chrysene (C1-C4), Phenanthrene, Pyrene, 2-Methylnaphthalene, Dibenzo[a,h]anthracene. Benthic Community Effects, cyanide, Oil (sediment), Mercury (sediment), Sediment Toxicity, Toxaphene (tissue), Dieldrin, Diazinon, 1,1-Dichloroethene (1,1-DCE or Vinylidene chloride), tetrachloroethylene (PCE), trichloroethylene (TCE), Nitrate, Nitrogen.
Watershed Management Plans	Los Angeles River Master Plan, Los Angeles County, 1994 Los Angeles River Revitalization Master Plan, City of Los Angeles, April 2007 Compton Creek Watershed Management Plan Rio Honda Watershed Management Plan
Pollution Sources (known and potential)	The majority of the LA River Watershed is considered impaired due to a variety of point and non-point sources. Some of these constituents are of concern throughout the length of the river while others are of concern only in certain reaches. Impairment may be due to excessive water column or sediment levels of pollutants, or bioaccumulation of pollutants.

References

1. Los Angeles Regional Water Quality Control Board (2006). Clean Water Act 303 (d) list.
2. Los Angeles Regional Water Quality Control Board (1994). Water quality control plan Los Angeles Region (4).
3. City of Los Angeles (2006). Integrated Resources Program (IRP), Implementation Strategy.

Appendix 2-2
Santa Monica Bay Jurisdictions 2 & 3 Watershed Fact Sheet Summary

Watershed Area	Approximately 54 square miles for jurisdictions 2/3 (414 square miles for the entire watershed). Watershed jurisdictions are shown in ***Figure 1*** of ***Appendix 2-2***.
Location	The area of land that drains naturally to the Santa Monica Bay is comprised of terrestrial environment bordering the coast. The watershed is bordered on the north by the Santa Monica Mountains, from the Ventura-Los Angeles County line to Griffith Park, extending south and west across the Los Angeles coastal plain to include the area east of Ballona Creek and north of Baldwin Hills. South of Ballona Creek, a narrow coastal strip between Playa del Rey and the Palos Verdes Peninsula forms the southern boundary of the watershed. There are 28 separate sub-watersheds within the larger Santa Monica Bay watershed. The two largest are Ballona Creek (130 square miles) and Malibu Creek (110 square miles). Ballona Creek is within the watershed limits but is managed separately. Marina del Rey, approximately 2.9 square miles, is monitored by a separate TMDL but is geographically within the Santa Monica Bay watershed. The remaining watershed is broken into 7 jurisdictional areas for managing water quality with respect to bacteria. Jurisdiction 2 encompasses the Castle Rock, Dockweiler, Venice Beach, Pulga Canyon, Santa Monica Canyon, and Santa Ynez sub-watersheds . Jurisdiction 3 covers a small section from Santa Monica Canyon and north of the Santa Monica Freeway at the ocean to north of Marina del Rey.
Land Use	The land use categories that dominate in Jurisdictions 2 and 3 are as follows: vacant (49□), high density single family (18□), regular/mixed transportation (7□), low density single family/ rural residential (5□), multiple family residential/ trailer parks (5□), heavy industrial (3□), retail/commercial (3□), mixed residential (2□), education (1□), light industrial (1□), and general office (1□).
Hydrology □ Tidal Influence	The Santa Monica Bay and its watershed are comprised of unique and interrelated habitats. Among the various habitats found in and around the Bay are: benthic (ocean bottom), pelagic (water column), reefs, sandy beaches, rocky shores/tide pools, jetties and harbors, lagoons, wetlands, rivers and streams, sand dunes and bluffs, coastal scrub/chaparral, grassland, and woodland.
Cities and Agencies	Seven primary jurisdictions are identified within the Santa Monica Bay watershed by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. Each jurisdiction has a group of associated sub-watersheds and beach monitoring locations. The City of Los Angeles, City of Santa Monica, County of Los Angeles, Caltrans are among agencies that participate in the most jurisdictional groups.
Dry Weather Flow	Malibu creek and Ballona creek drain to the Bay directly. The rest of sub watersheds discharges to the Bay either through local storm drain systems, or to POTW through low flow diversions in dry weather. Based on WPD runoff estimates, the dry weather runoff is on the order of 10 mgd.
Beneficial Uses Categories	Almost every beneficial use defined in the Basin Plan is identified in water bodies somewhere in the watershed.
Water Quality Impairments	Coliform bacteria, trash, lead, cadmium, copper, silver, zinc, toxicity, benthic community effects, low D.O, organic enrichment, fish consumption advisory, sediment toxicity, ChemA□, PAHs (sediment).
Watershed Management Plans	City of Santa Monica : Watershed Management Plan, 2006 LA RWQCB : The Santa Monica Bay Watershed Management Area, 2004 The Leadership Committee of the Greater Los Angeles County Integrated Regional Water Management Plan: Integrated Regional Water Management Plan, December 2006

Appendix 2-2
Santa Monica Bay Jurisdictions 2 & 3 Watershed Fact Sheet Summary

Pollution Sources (known and potential)	The runoff is a major source of pollutants to the Bay. The quality of runoff is affected by many factors such as hydrology, geology, land use, season and sequence and duration of hydrologic events. Impervious surfaces not only increase the volume of stormwater runoff but also deteriorate water quality by collecting and transporting pollutants to the Bay. Aerial deposition has been the focus in recent years. Littering is a serous problem that has grown proportionally with population. The Hyperion Treatment Plant, south of Marina del Rey, discharges directly to the Bay.
General	Water quality is generally better in the headwater and upper portion of the watershed then is generally degraded by urban and stormwater runoff closer to the Pacific Ocean. Existing and potential beneficial use impairment problems in the watershed fall into two major categories: human health risk, and natural habitat (wildlife) degradation. The former are issues primarily associated with recreational uses of the Santa Monica Bay. The latter are issues associated with terrestrial, aquatic and marine environments. Pollutant loadings that originate from human activities are common causes of both human health risks and habitat degradation.
Special Status Species	Rare, sensitive, threatened or endangered species: 1) Birds: California brown pelican, California least tern and Belding's savannah sparrow. 2) Fish: the Steelhead trout and Tidewater goby.

References

1. Los Angeles Regional water Quality Control Board (2004). Watershed Management Initiative Chapter, 2.10, Santa Monica Bay Watershed Management Area.
2. Santa Monica Bay Restoration Commission (2004). State of the Bay.
3. Los Angeles Regional Water Quality Control Board (2002). Santa Monica Bay Beaches Wet Weather Bacteria TMDL; Staff Report.
4. Los Angeles Regional Water Quality Control Board (2002). Santa Monica Bay Beaches Dry Weather Bacteria TMDL; Staff Report.

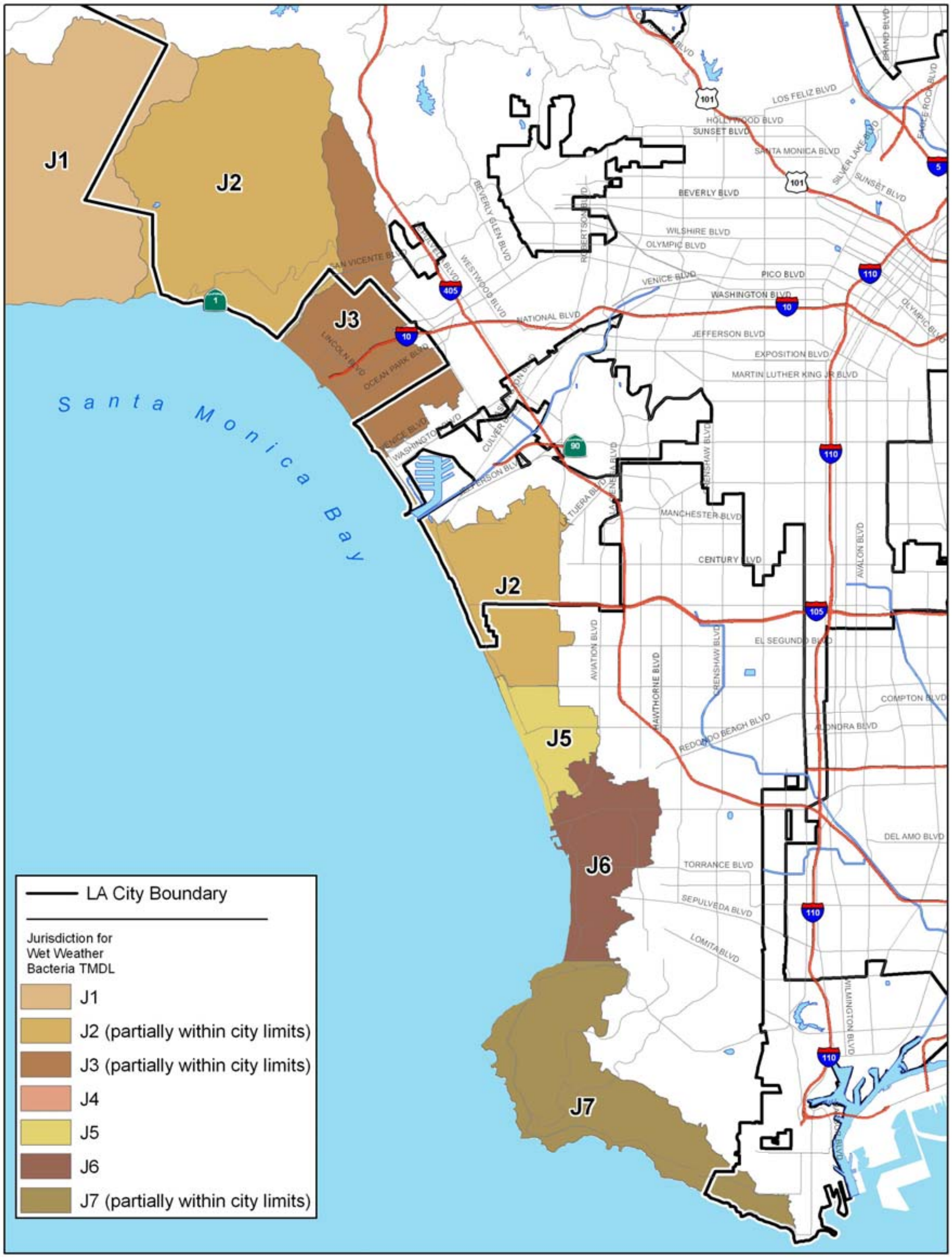


Figure 1
Santa Monica Bay Watershed Jurisdictions
Shaded areas are parts of the Santa Monica Bay Watershed that has been divided into "jurisdictions" for the purpose of managing bacteria during "wet weather." Portions of Los Angeles City intersect with Jurisdiction 2, Jurisdiction 3 and (to a very small extent) Jurisdiction 7. Jurisdiction 4 is north and west of the coverage area of this figure.

Appendix 2-3
Ballona Creek Watershed Fact Sheet Summary

Watershed Area	130 square miles. (Ballona Creek is within the Santa Monica Bay Watershed.)
Location	Western Los Angeles
Land Use	The land use categories that best represent Ballona Creek are as follows: high density single family (33□), vacant (14□), multiple family residential/trailer parks (14□), mixed residential (9□), retail/ commercial (8□), low density single family/ rural residential (3□), education (3□), light industrial (3□), open space/recreation (2□), general office (2□), institutional (2□), regular/mixed transportation (2□), golf courses (1□), and natural resources extraction (1□) .
Hydrology □ Tidal Influence	There is significant tidal influence in the unlined Ballona Creek Estuary, but little or none in the lined portion upstream of the estuary.
Cities and Agencies	City of Los Angeles, Culver City, Los Angeles County
Dry Weather Flow	Benedict Canyon Channel, Sepulveda Channel and Centinela Creek all intersect with the main channel of Ballona Creek at different points along its path. There are also discharges to the creek through local storm drain networks. Dry weather targets in the creek apply to days when the flow is less than 40 cfs.
Beneficial Uses Categories	Potential and existing beneficial uses for the Ballona Creek waterbodies include: municipal (MUN), navigation (NAV), contact recreation (REC-1), non-contact recreation (REC-2), commercial fishing (COMM), estuary habitat (EST), marine habitat (MAR), wildlife habitat (WILD), rare, threatened, or endangered species (RARE), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), shellfish harvesting (SHELL), wetland habitat (WET).
Water Quality Impairments	Bacteria, trash, metals, cyanide, shellfish harvesting advisory, toxicity, exotic vegetation, habitat alterations, hydromodification, reduced tidal flushing.
Watershed Management Plans	A Comprehensive Monitoring Plan has been developed for Ballona Creek. Additionally, the City□s Integrated Resources Plan describes some management of the runoff which feeds Ballona Creek.
Pollution Sources (known and potential)	Dry weather and storm water runoff contain a number of toxics from the surrounding urban landscape.

References

1. Los Angeles Regional Water Quality Control Board (2006). Clean Water Act 303(d) list.
2. Los Angeles Regional Water Quality Control Board (1994). Water quality control plan Los Angeles Region (4).
3. City of Los Angeles (2006). Integrated Resources Program (IRP); Implementation Strategy.

Appendix 2-4
Dominguez Channel Watershed Fact Sheet Summary

Watershed Area	110 square miles
Location	South Los Angeles County
Land Use	96% of the Dominguez Channel watershed area is developed: the primary land uses are transportation, commercial, industrial and residential.
Hydrology/ Tidal Influence	The Dominguez Channel (DC) is lined above Vermont Avenue, where it has minimal flow. The DC Estuary begins below Vermont and is unlined. The DC Estuary has fresh water flow from upstream and has salt water from the tide.
Cities and Agencies	Los Angeles, Torrance, Carson, Lomita, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, Gardena, Caltrans, Los Angeles County
Dry Weather Flow	Year round flow is maintained from dry weather urban run off.
Beneficial Use Categories	**DC (above Vermont):** Contact and Non-contact water recreation (REC-1, REC-2), preservation of rare and endangered species (RARE). **DC (estuary, below Vermont):** MUN, IND, REC-1, REC-2, RARE, IND, NAV, COMM, MAR, EST, WILD, MIGR, SPWN. **Machado Lake:** MUN, REC-1 REC-2, WARM, WILD, RARE. **Long Beach/LA Harbor:** IND, NAV, REC-1, REC-2, MAR, SPWN, SHELL.
Water Quality Impairments	Algae, ammonia, ChemA (tissue), eutrophic (conditions), odor, trash, beach closures chromium (sediment), lead (tissue and sediment), zinc (sediment), cadmium (sediment), copper (sediment), mercury (sediment), coliform/indicator bacteria, sediment toxicity, benthic community effects. PAHs (sediment): Benzo(a)pyrene, Benzo(a)anthracene, chrysene (C1, C4), phenanthrene, dibenzo(a,h)anthracene, pyrene. Chlordane (tissue and sediment), PCBs (tissue and sediment), DDT(tissue & sediment), aldrin (tissue), dieldrin (tissue), Toxaphene (tissue).
Watershed Management Plans	The Dominguez Channel Watershed Action Committee has been run by LA County since 2000. It includes a number of agency and environmental stakeholders, and holds meetings that are attended by staff from the Regional Board. This group meets quarterly. The US EPA is conducting stakeholder meetings both for technical stakeholders and an advisory committee on the upcoming Toxics TMDL for DC including Los Angeles and Long Beach Harbors.
Pollution Sources (known and potential)	Historic deposits of DDT and PCBs in sediment, discharges from refineries, spills from ships and industry, leaching of contaminated groundwater.

References

1. Los Angeles Regional Water Quality Control Board (2006). Clean Water Act 303(d) list.
2. City of Los Angeles (2006), Integrated Resources Program (IRP); Implementation Strategy.

Appendix 2-5
Example Page from the 303(d) List for Region 4 (Page 14 of 50 shown)

2006 CWA SECTION 303(d) LIST OF WATER QUALITY LIMITED SEGMENTS REQUIRING TMDLS

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

USEPA APPROVAL DATE: JUNE 28, 2007

REGION	TYPE	NAME	CALWATER WATERSHED	POLLUTANT/STRESSOR	POTENTIAL SOURCES	ESTIMATED SIZE AFFECTED	PROPOSED TMDL COMPLETION
4	R	Dominguez Channel (lined portion above Vermont Ave)	40351000				
				Ammonia	Nonpoint/Point Source	6.7 Miles	2019
				Copper	Nonpoint/Point Source	6.7 Miles	2019
				Dieldrin (tissue)	Nonpoint/Point Source	6.7 Miles	2019
				Indicator bacteria	Nonpoint/Point Source	6.7 Miles	2007
				Lead (tissue)	Nonpoint/Point Source	6.7 Miles	2019
				Sediment Toxicity	Source Unknown	6.7 Miles	2019
				Zinc (sediment)	Nonpoint/Point Source	6.7 Miles	2019
4	E	Dominguez Channel Estuary (unlined portion below Vermont Ave)	40512000				
				Ammonia	Nonpoint/Point Source	140 Acres	2019
				Benthic Community Effects	Nonpoint/Point Source	140 Acres	2019
				Benzo(a)pyrene (PAHs)	Source Unknown	140 Acres	2019
				Benzo[a]anthracene	Source Unknown	140 Acres	2019

From: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r4_06_303d_reqtmdls.pdf

Appendix 3-1
Water Quality Numeric Targets

Table 1
Water Quality Numeric Targets for Trash

Waterbody	Target(1)
Los Angeles River	Zero limit for trash particles greater than 5 mm
Ballona Creek	Zero limit for trash particles greater than 5 mm
Machado Lake	Zero limit for trash particles greater than 5 mm

(1) Targets are for storm events up to a 1-year 1-hour storm

Table 2
Water Quality Numeric Targets for Bacteria

Waterbody	Beneficial use	Sample(3)	Target (number of bacteria per 100 mL)			
			Total coliform(4)	Fecal coliform(5)	Enterococcus	E. coli
Santa Monica Bay Watershed						
Santa Monica Bay Beaches	REC-1 Marine water	Single sample	10,000	400	104	
		Geometric mean	1,000	200	35	
Ballona Creek Watershed						
Ballona Creek Reach 1	REC-2 Fresh Water	Single sample		4,000		
		Geometric mean		2,000		
Ballona Creek Reach 2	LREC-1 Fresh Water	Single sample				576
		Geometric mean		200		126
Sepulveda Channel	REC-1 Fresh Water	Single sample		400		235
		Geometric mean		200		126
Ballona Creek Estuary	REC-1 Marine Water	Single sample	10,000	400	104	
		Geometric mean	1,000	200	35	
Marina del Rey Watershed						
Marina del Rey Harbor(1)	REC-1 Marine water	Single sample	10,000	400	104	
		Geometric mean	1,000	200	35	
Dominguez Channel Watershed						
Los Angeles Harbor(2)	REC-1 Marine water	Single sample	10,000	400	104	
		Geometric mean	1,000	200	35	

(1) Back basins only.
(2) Inner Cabrillo Beach and Main Ship Channel only.
(3) Single sample standards must be met in every sample that is taken from a water although TMDLs sometimes allow for a certain number of exceedance days in a year. The geometric mean is calculated as the 30-day rolling average. Standards for this geometric mean are always lower than the standards for single samples.
(4) If the fecal to total coliform ratio is greater than 0.1, the total coliform standard becomes 1,000 per 100 mL.
(5) Fecal coliforms are often measured as E. coli, assuming a 1:1 ratio between the two.

Table 3
Water Quality Numeric Targets for Metals

Waterbody	Weather	Target (µg/L)				
		Cadmium	**Copper**	**Lead**	**Selenium**	**Zinc**
LA River Watershed						
Reach 5, 6 and Bell Creek	Dry		30	19		388
	Wet	3.1	17	62	5	159
Reach 4	Dry		26	10		212
	Wet	3.1	17	62	5	159
Reach 3 above LAG	Dry		23	12		244
	Wet	3.1	27	62	5	159
Reach 3 below LAG	Dry		26	12		244
	Wet	3.1	17	62	5	159
Burbank Western (above WRP)	Dry		26	14		213
	Wet	3.1	17	62	5	159
Burbank Western (below WRP)	Dry		19	9.1		131
	Wet	3.1	17	62	5	159
Reach 2 and Arroyo Seco	Dry		22	11		235
	Wet	3.1	17	62	5	159
Reach 1	Dry		23	12		233
	Wet	3.1	17	62	5	159
Compton Creek	Dry		19	8.9		167
	Wet	3.1	17	62	5	159
Rio Hondo	Dry		13	5		131
	Wet	3.1	17	62	5	159
Ballona Creek Watershed						
Ballona Creek Reach 1 and 2	Dry	5.83	24	13	5	304
	Wet	3.36	18	59	5	119
Sepulveda Channel	Dry	5.83	24	13	5	304
	Wet	3.36	18	59	5	119

Table 4
Water Quality Numeric Targets for Toxic Pollutants in Sediments

Waterbody	Target for Metals (mg/kg)				
	Cadmium	**Copper**	**Lead**	**Silver**	**Zinc**
Ballona Creek Estuary	1.2	34	46.7	1	150
Marina Del Rey	-	34	46.7	-	150
	Target for Organics (mg/kg)				
	Chlordane	**DDT**	**PCB**	**Total PAH**	
Ballona Creek Estuary	0.5	1.58	22.7	4,022	
Marina Del Rey[1]	0.5	-	22.7	-	

(1) Back Basins only.

Table 5
Water Quality Standards for Nitrogen Compounds from Water Reclamation Plants

Waterbody	Target (Nitrogen , mg/L)			
	Ammonia as nitrogen	**Nitrate as nitrogen**	**Nitrite as nitrogen**	**Nitrate plus Nitrite**
LA River Watershed[1]				
POTW - D.C Tillman	4.7	8	1	8
POTW - LA-Glendale	8.7	8	1	8
POTW - Burbank	10.1	8	1	8

(1) Water quality standards for nutrients in Los Angeles River need only be met at the effluent discharges of the publicly owned treatment plants.

Appendix 3-2
Sources of Water Quality Data

Program	Monitoring Agency
NPDES Monitoring Programs	
MS4 NPDES Permit (Storm water)	LA County (Public Works), City of Los Angeles (BOS)
Hyperion NPDES Permit (POTW)	City of Los Angeles (BOS)
Terminal Island NPDES Permit (POTW)	City of Los Angeles (BOS)
D.C. Tillman NPDES Permit (POTW)	City of Los Angeles (BOS)
LA-Glendale NPDES Permit (POTW)	City of Los Angeles (BOS)
Burbank Treatment Plant NPDES Permit (POTW)	City of Burbank
Tapia Water Reclamation Facility NPDES Permit (POTW)	Las Virgenes Municipal Water District
DWP/Scattergood NPDES Permit	City of Los Angeles (DWP)
DWP/Harbor NPDES Permit (Los Angeles Harbor)	City of Los Angeles (DWP)
DWP Valley Generating Station	City of Los Angeles (DWP)
Southern California Edison NPDES permit	Southern California Edison
Los Angeles World Airports General NPDES Storm Water Permit	City of Los Angeles (LAWA, BOS)
TMDL Monitoring Programs (some programs are in planning phase)	
Santa Monica Bay Beaches Bacteria TMDL	City of Los Angeles (BOS), LA County (DPH)
Marina del Rey Harbor Bacteria TMDL	City of Los Angeles (BOS)
Marina del Rey Harbor Toxics TMDL	LA County (Public Works)
LA Harbor/Cabrillo Beach Bacteria TMDL	City of Los Angeles (BOS)
Ballona Creek/Estuary Metals & Toxics TMDL	City of Los Angeles (BOS)
Ballona Creek Bacteria TMDL	City of Los Angeles (BOS)
Ballona Creek TMDL Special Studies (Particle Analysis, TIE)	City of Los Angeles (BOS), SCCWRP
LA River Metals TMDL	City of Los Angeles (BOS), LA County (DPW)
LA River Bacteria TMDL	City of Los Angeles (BOS), LA County (DPW)
LA River Nitrogen Compounds TMDL	City of Los Angeles (BOS)
Special studies related to TMDLs	
Marina del Rey Bacteria Source ID study	LA County (Public Works); Weston
Ballona Creek TMDL Special Studies (TIE)	City of Los Angeles (BOS), SCCWRP
Los Angeles River Water Effects Ratio (Copper)	City of Los Angeles (BOS), Larry Walker & Associates
Los Angeles River Water Effects Ratio (Ammonia)	City of Los Angeles (BOS), Larry Walker & Associates
Los Angeles River Bacteria Source Identification	City of Los Angeles (BOS), Larry Walker & Associates
Los Angeles River Tier II Bacteria Source Assessment	City of Los Angeles (BOS), Larry Walker & Associates

Miscellaneous Monitoring Programs	
Status & Trends Monitoring Program (various waters)	City of Los Angeles (BOS)
WPD Enforcement: Spill Sampling & Illicit Discharges	City of Los Angeles (BOS)
Augustus F. Hawkins Constructed Wetlands	City of Los Angeles (BOS)
Marquez Low Flow Diversion Monitoring (Bacteria)	City of Los Angeles (BOS)
Ballona Lagoon Water Quality Monitoring	City of Los Angeles (BOS)
Ballona Creek Pollutagraph (Special Study)	LA County (Public Works); Weston
Los Angeles River Watershed-wide Monitoring Program	City of Los Angeles (BOS); Burbank
Bight '03 (and future projects)	SCCWRP
Bacteria Source Identification, Escondido Canyon	LA County (Public Works); SCCWRP
Aerial Deposition	SCCWRP
Los Angeles River "Snapshot" monitoring	SCCWRP
Urban Lakes Monitoring	City of Los Angeles (Department of Recreation & Parks)
Others	Heal the Bay, Santa Monica Bay Keeper, Others

Appendix 3-3
Monitoring Locations

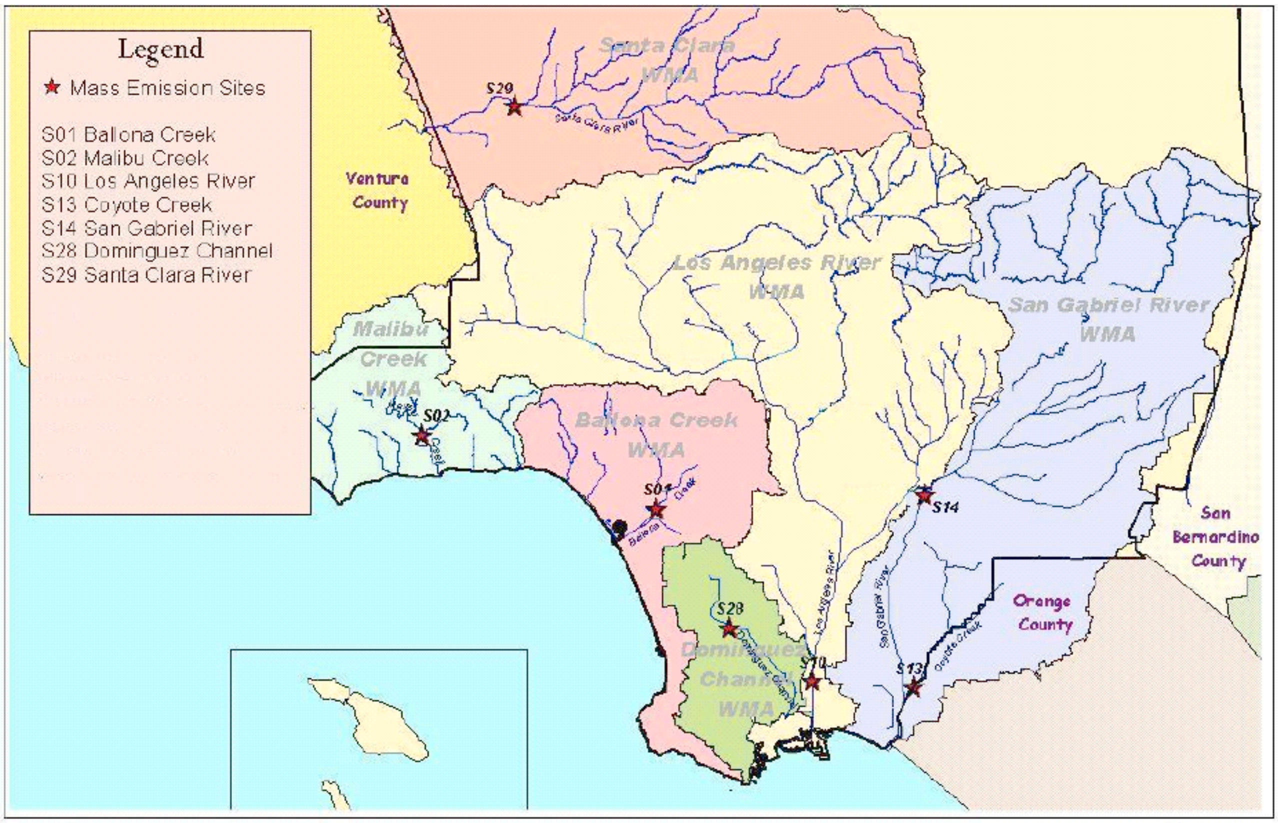


Figure 1
MS4 NPDES Permit Mass Emission Sampling Sites
Monitoring by Los County Department of Public Works, ***Ref. 1.***

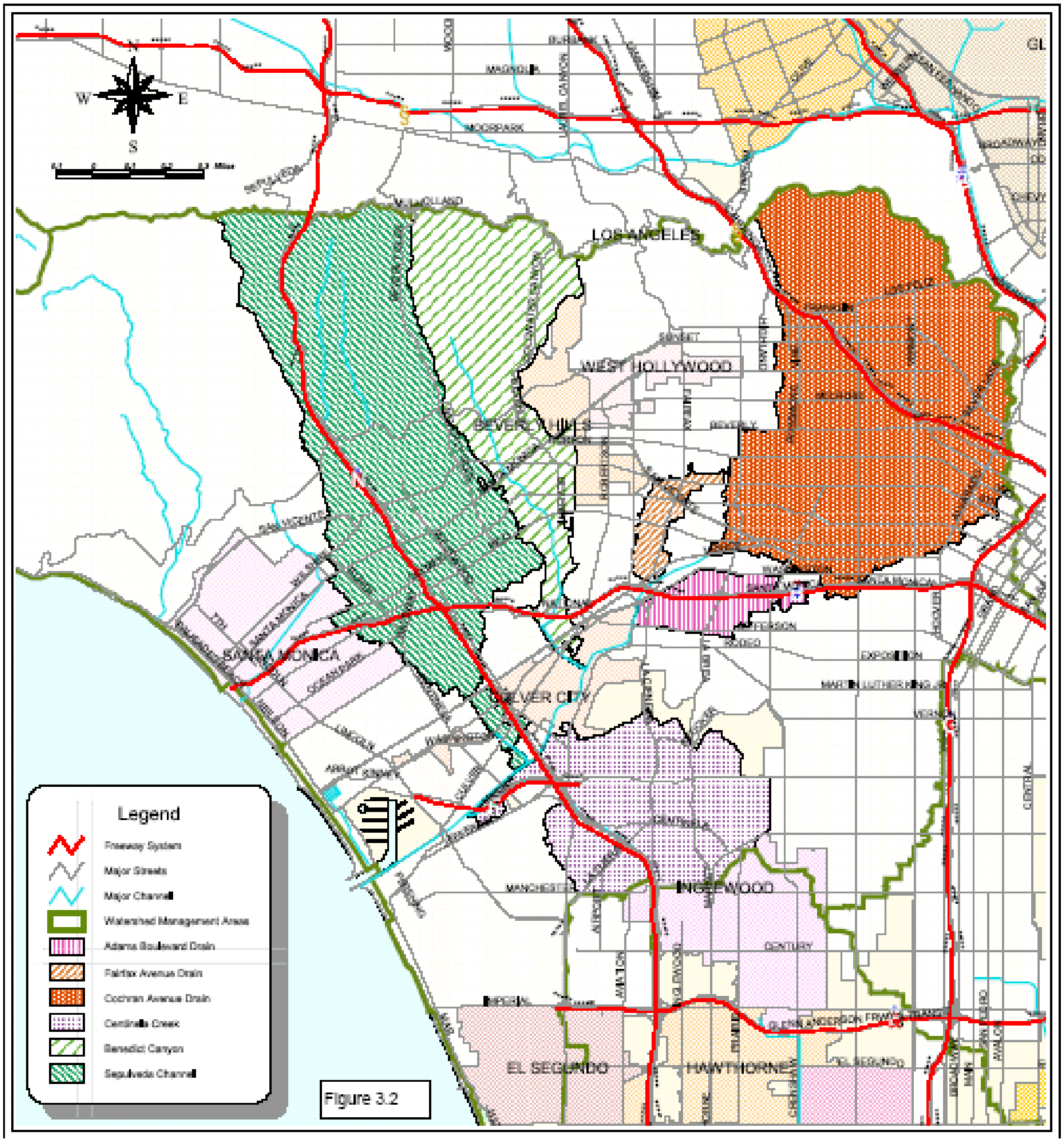


Figure 2
MS4 NPDES Permit Tributary Sampling Sites
Monitoring by Los Angeles County Department of Public Works, ***Ref. 1***. Tributary monitoring in Ballona Creek was over 2005-06.

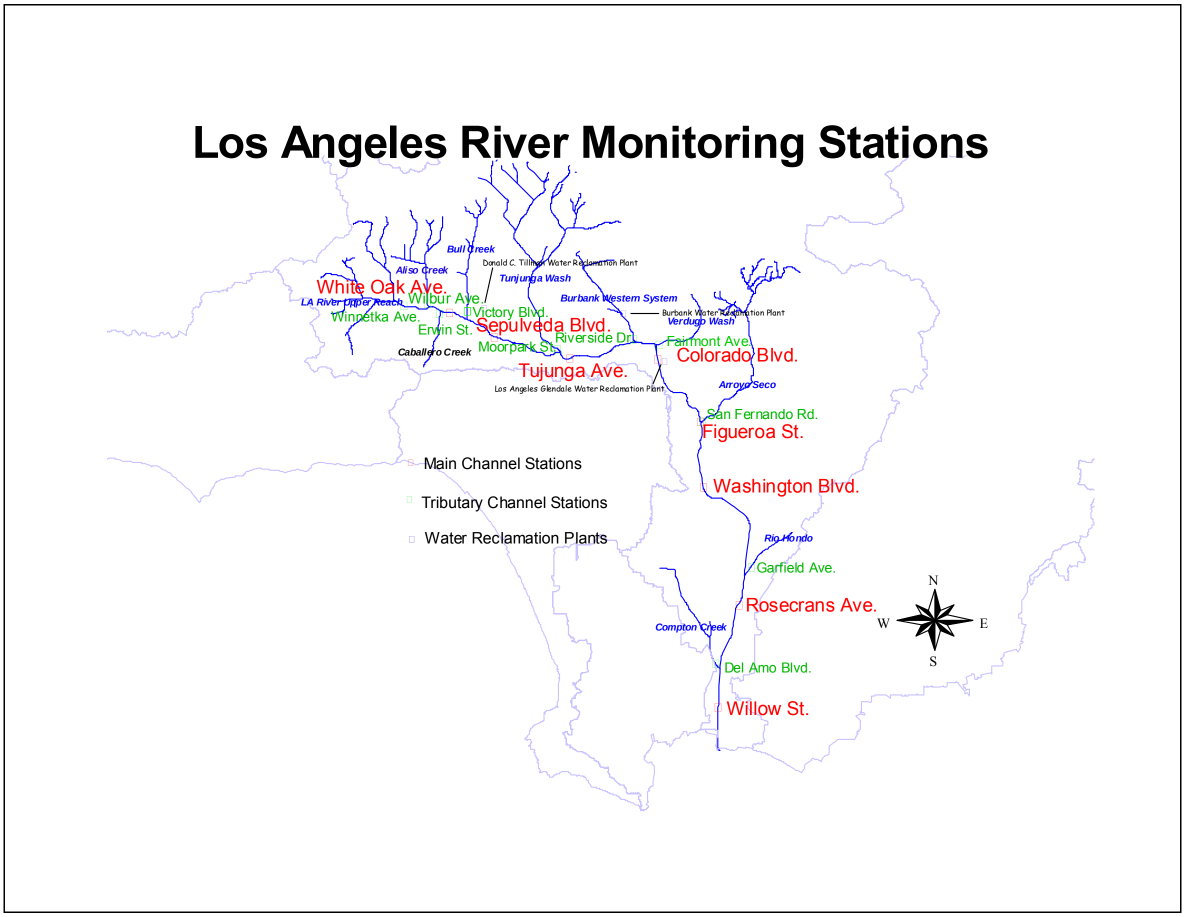


Figure 3
Status & Trends Monitoring Locations in Los Angeles River Watershed

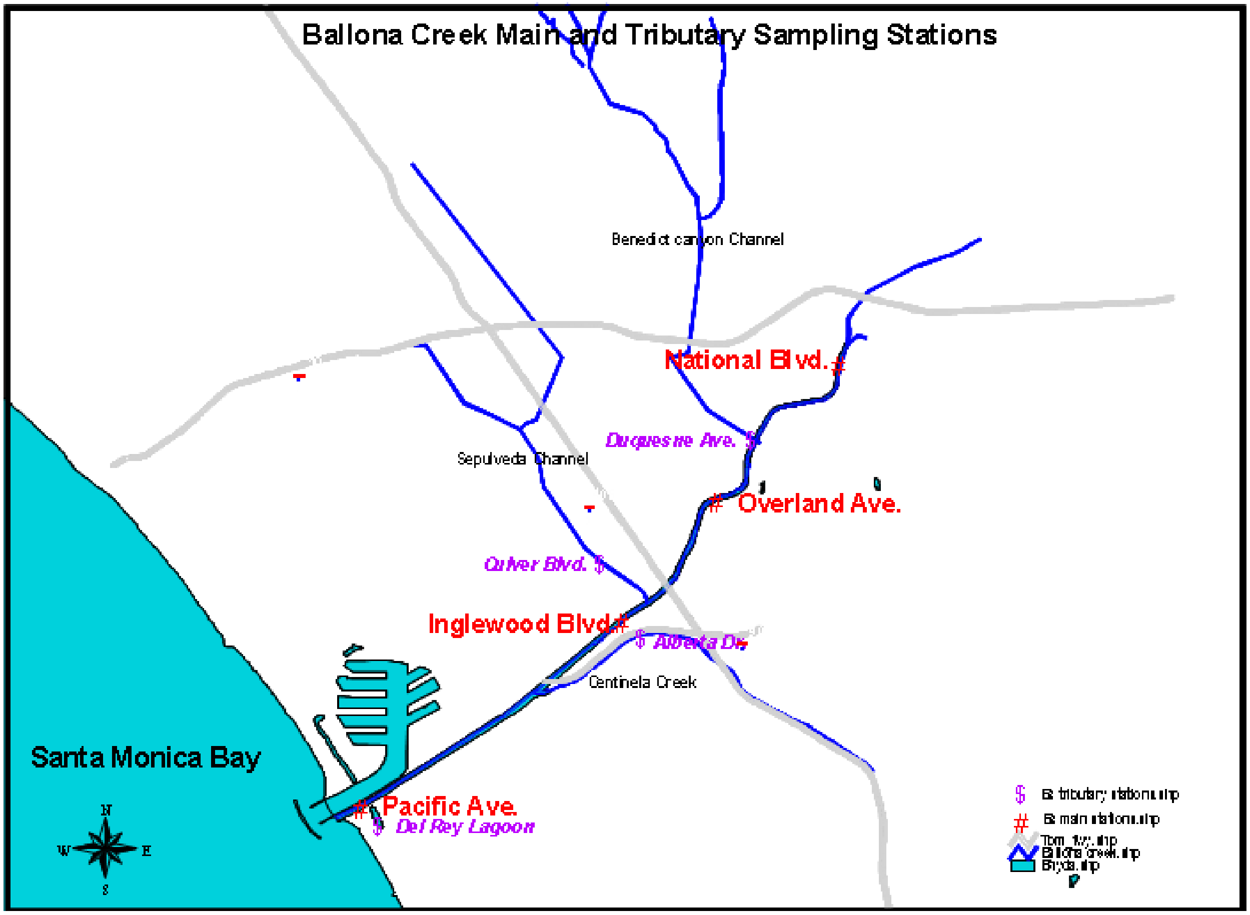


Figure 4
Status & Trends Monitoring Locations in Ballona Creek Watershed

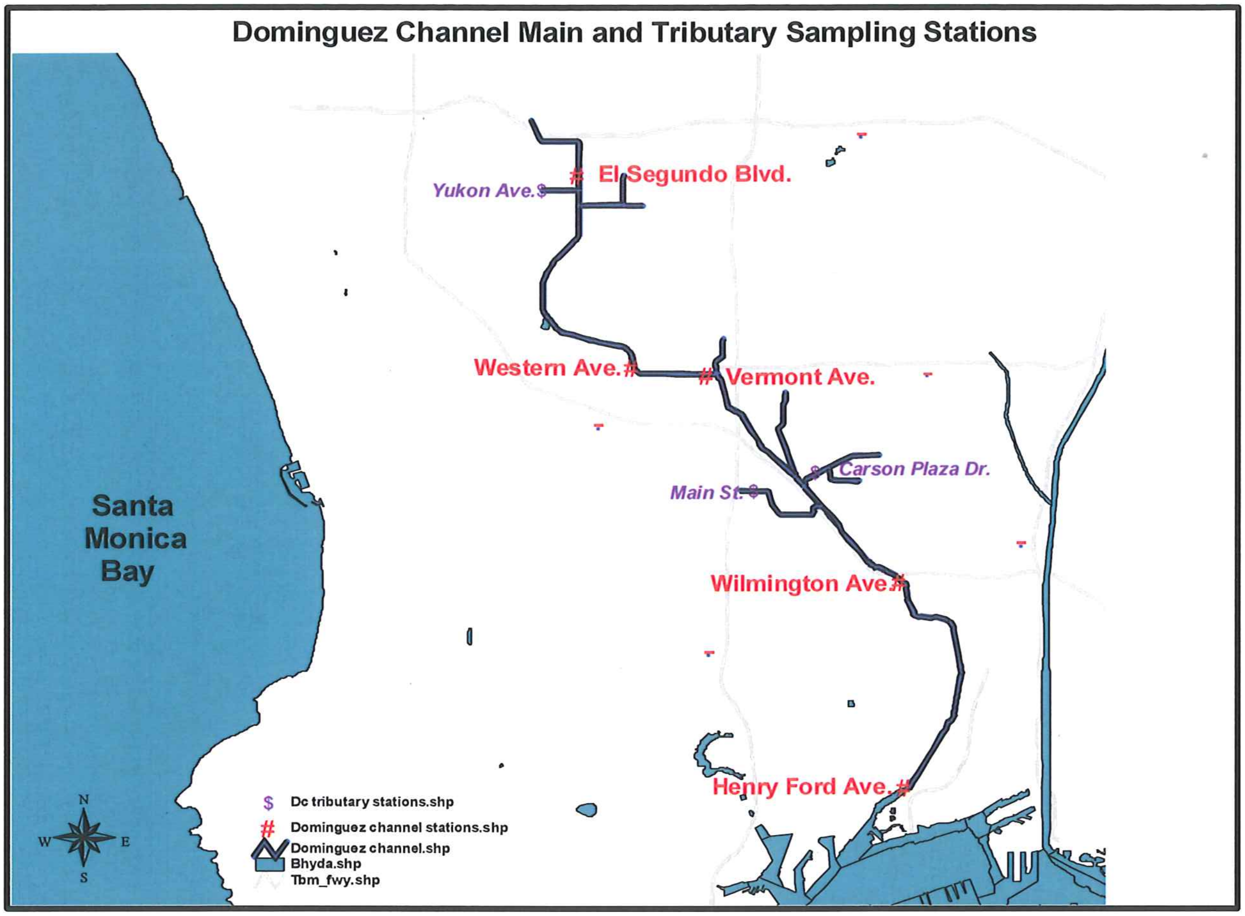


Figure 5
Status & Trends Monitoring Locations in Dominguez Channel Watershed

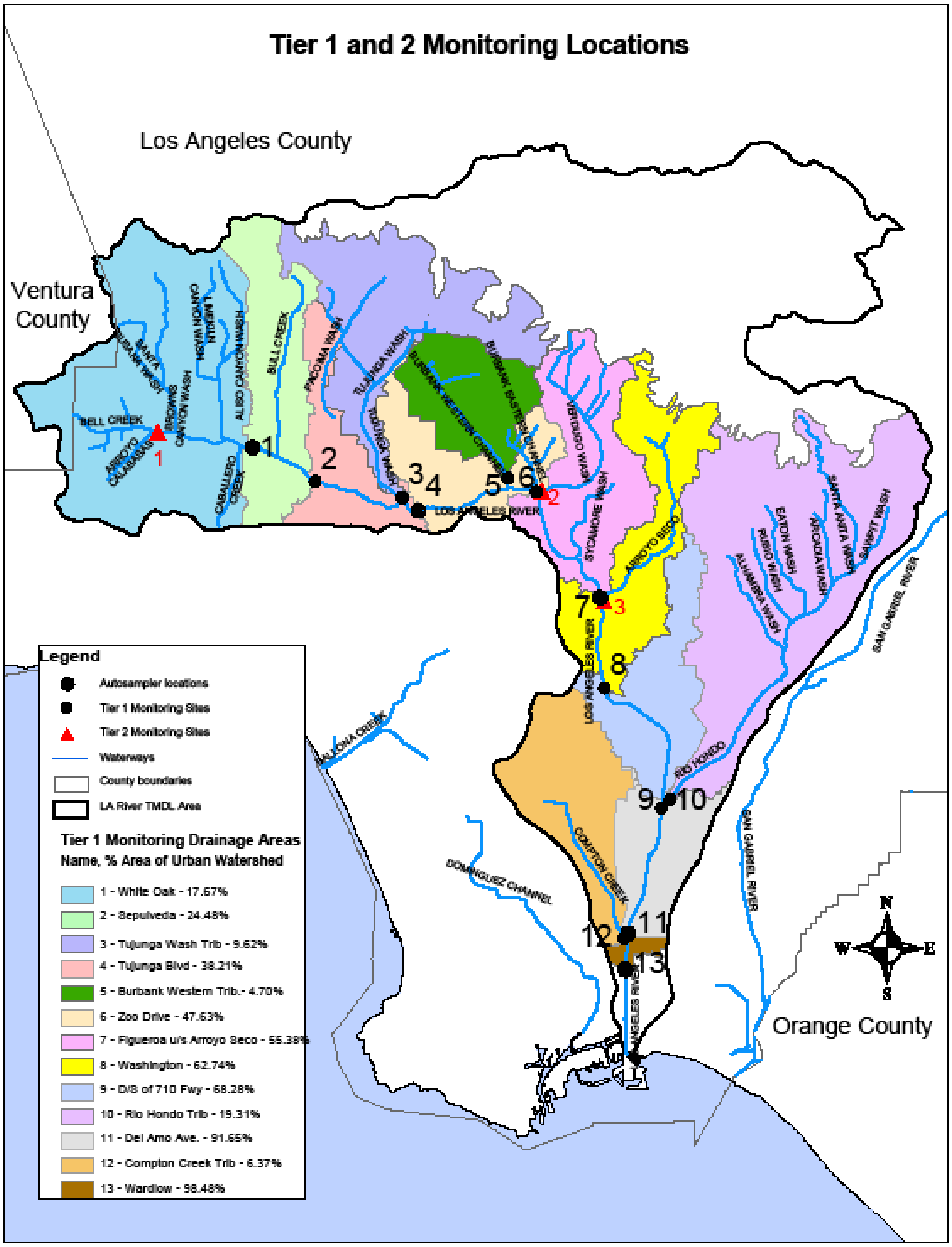


Figure 6
Proposed Monitoring Locations for Los Angeles River Metals TMDL

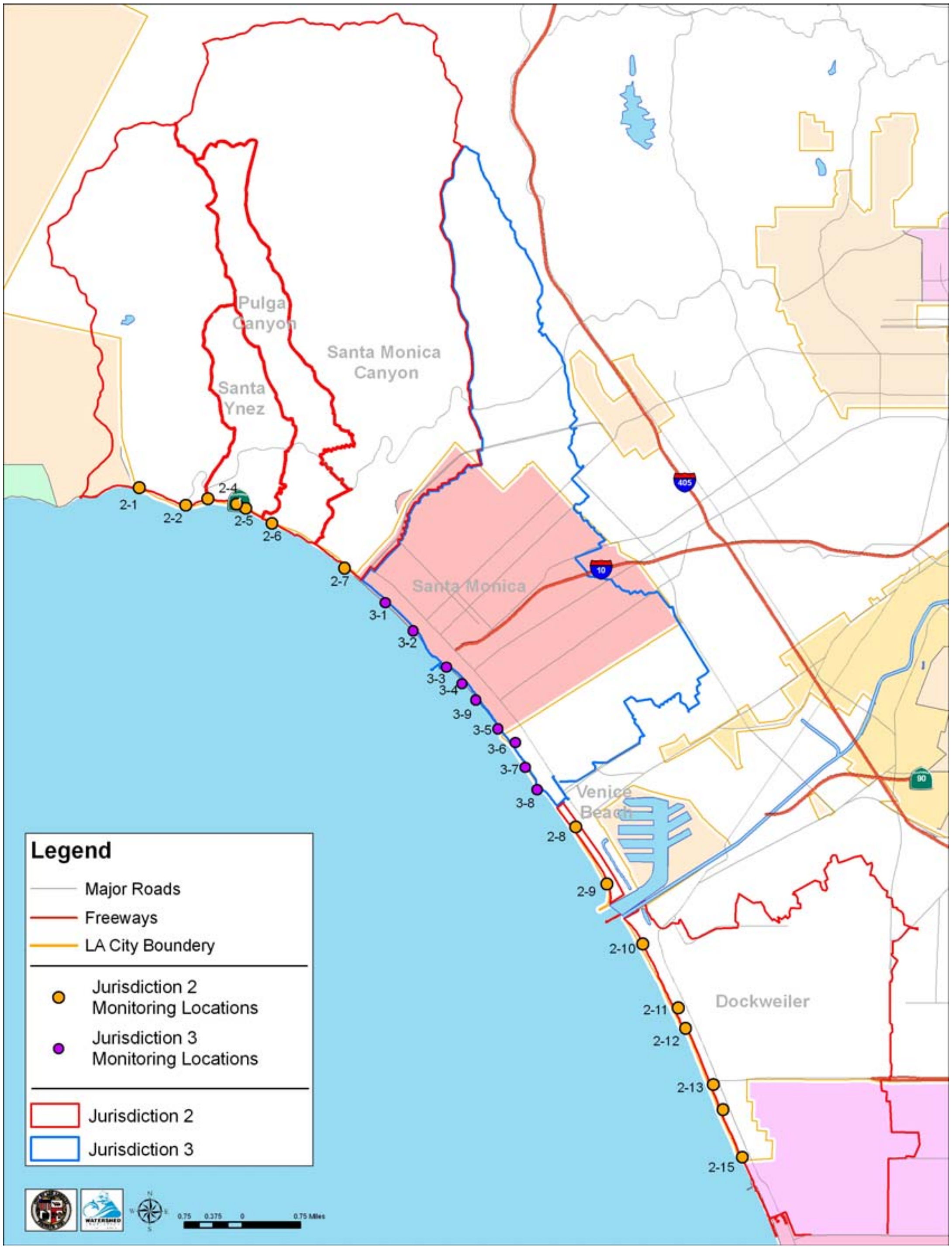


Figure 7
Monitoring Locations for Santa Monica Bay Beaches Bacteria TMDLs (Jurisdictions 2 and 3)

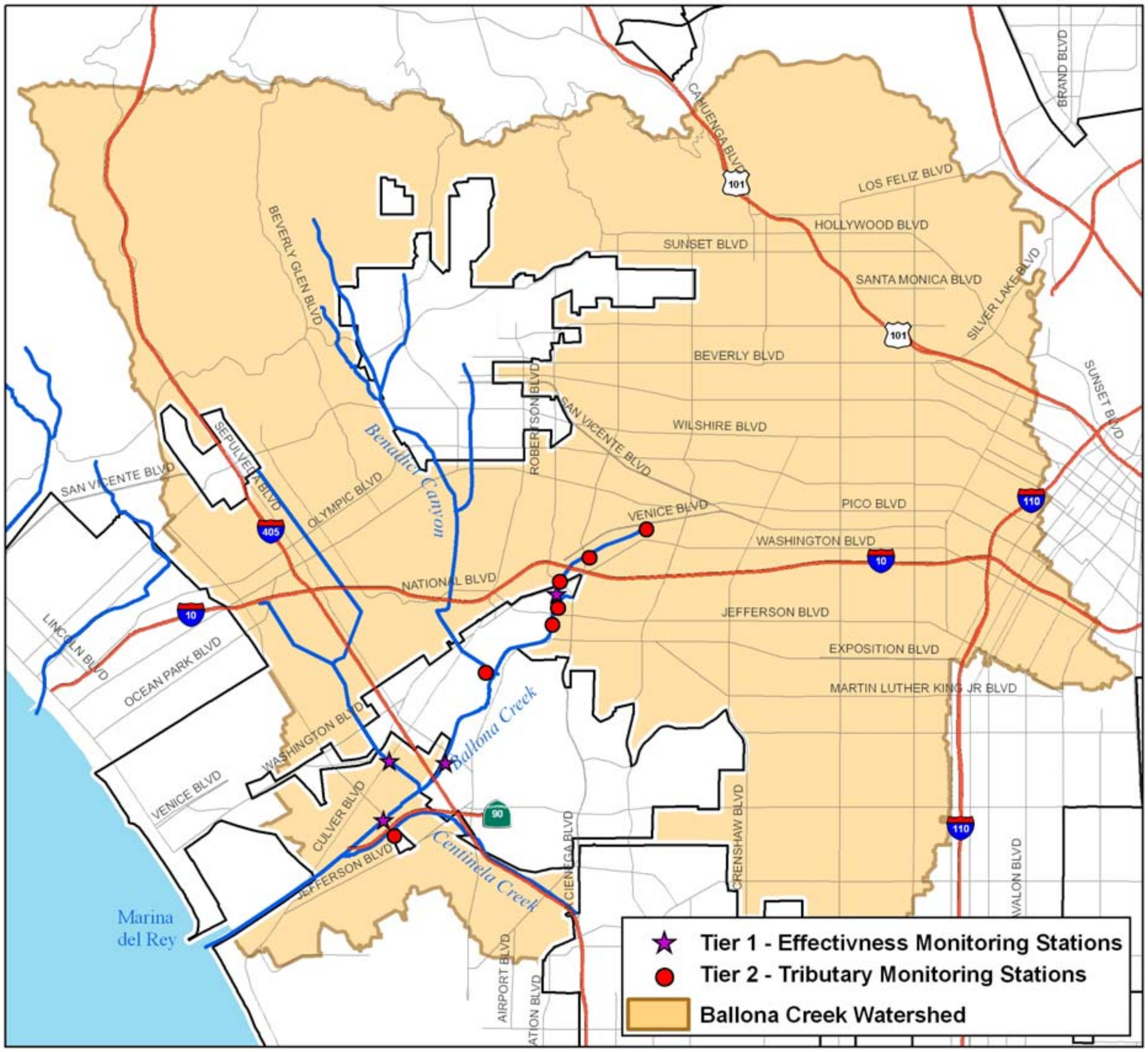


Figure 8
Proposed Monitoring Locations for Ballona Creek Metals TMDL

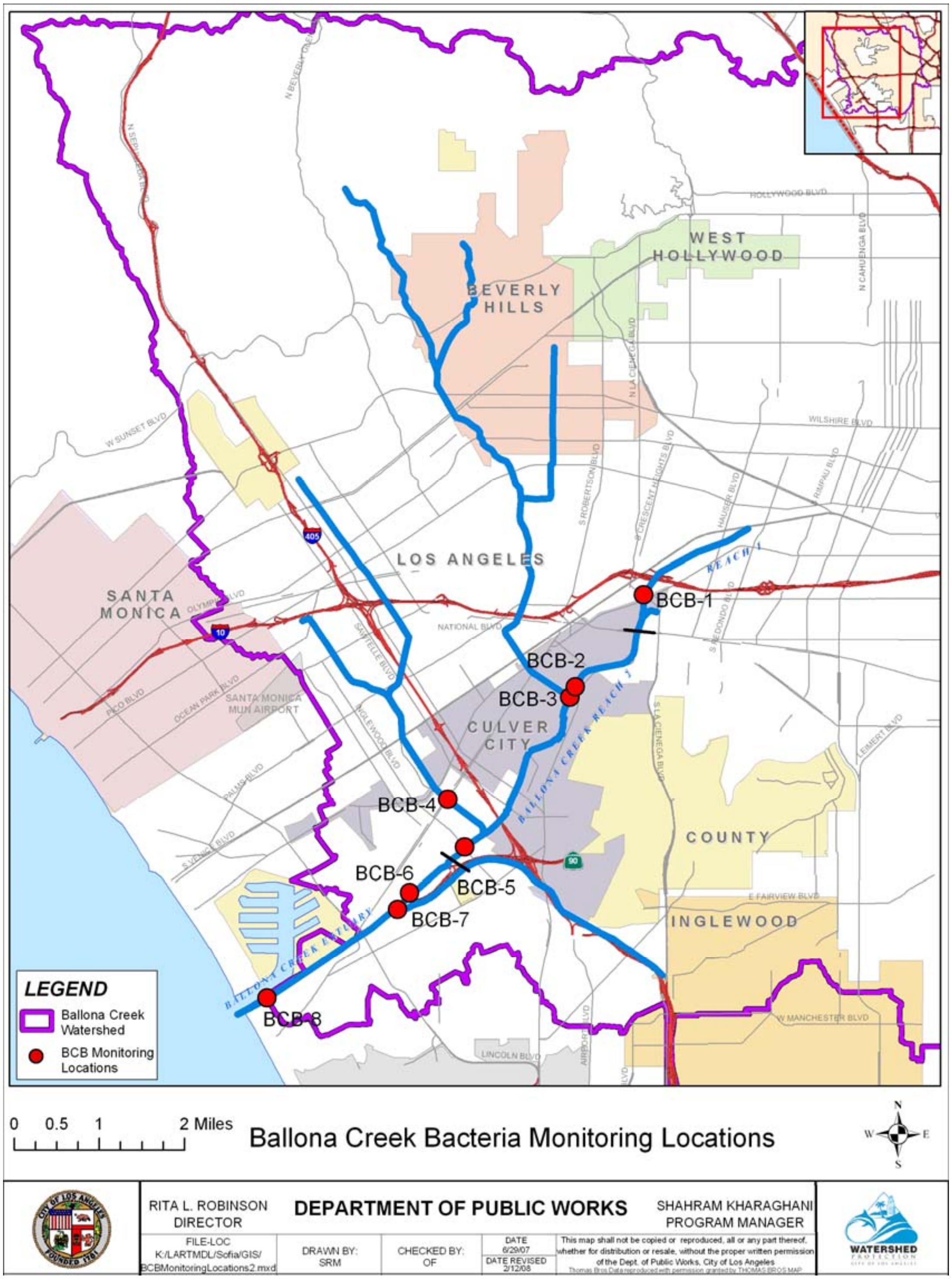


Figure 9
Proposed Monitoring Locations for Ballona Creek Bacteria TMDL

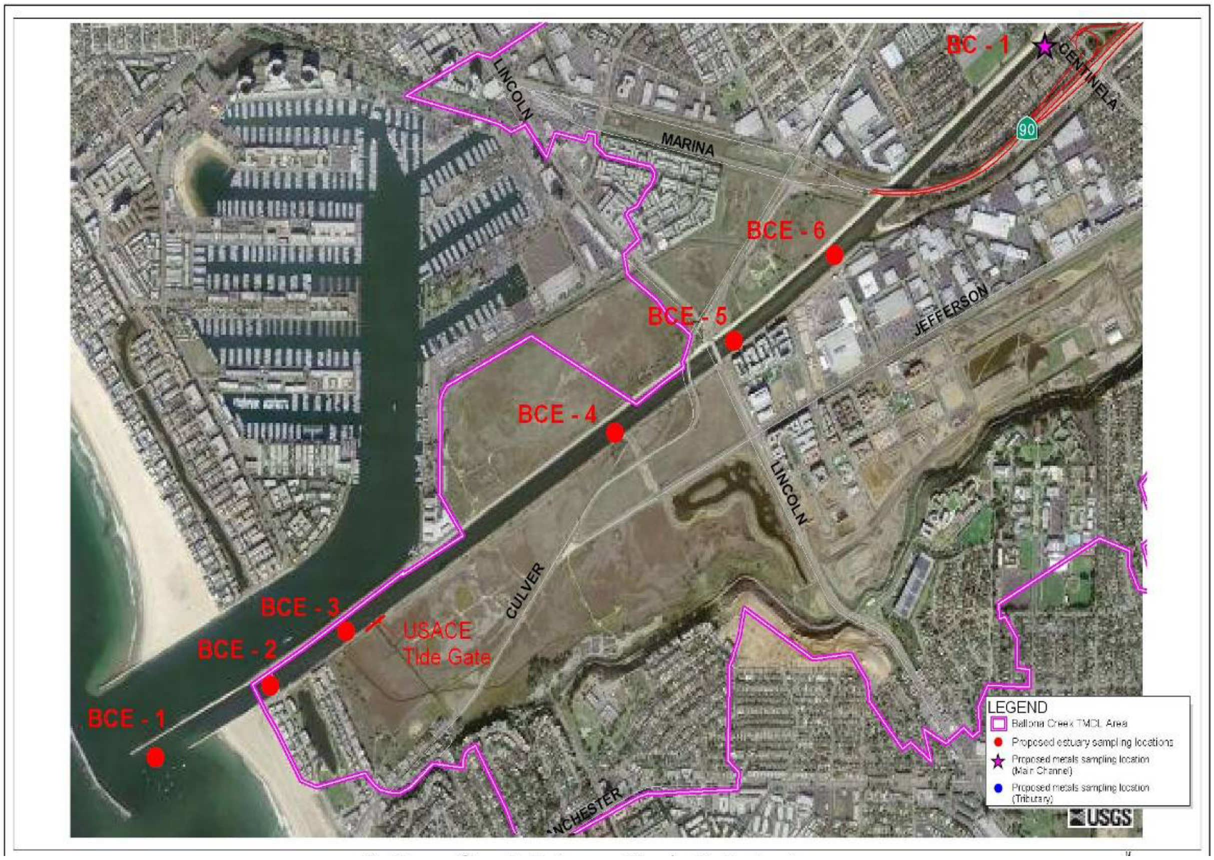


Figure 10
Proposed Monitoring Locations for Ballona Creek Estuary Toxic Pollutants TMDL

Figure 11
Monitoring Locations for Marina del Rey Harbor Mother's Beach and Back Basins Bacteria TMDL

Figure 12
Proposed Monitoring Locations for Marina del Rey Toxic Pollutants TMDL

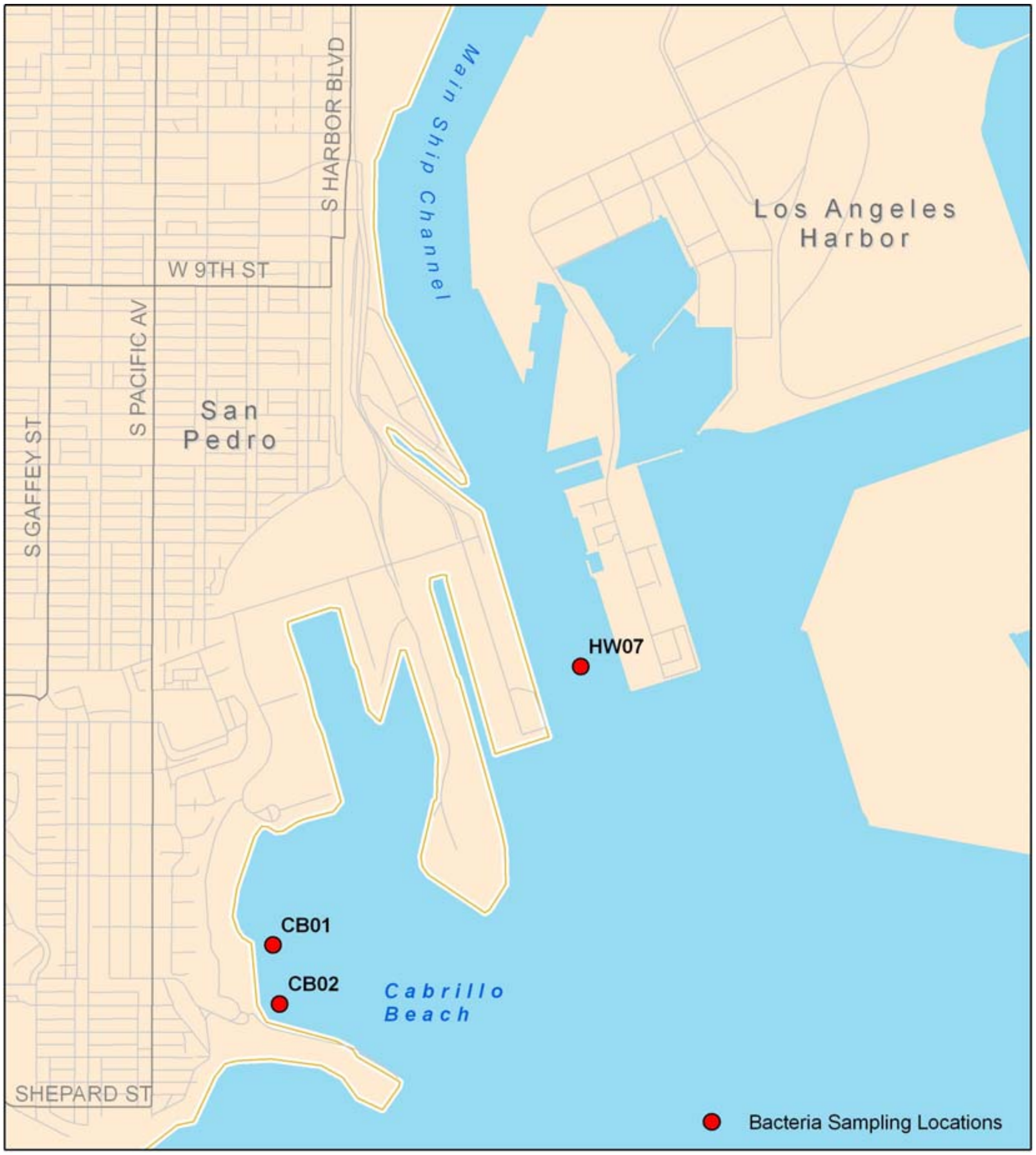


Figure 13
Monitoring Locations for Los Angeles Harbor Main Ship Channel and Inner Cabrillo Beach Bacteria TMDL

References

1. County of Los Angeles Department of Public Works (2007). Los Angeles County 2006-07 Stormwater Monitoring period (www.ladpw.org/WMD/npdes/2006-07tc.cfm).

Appendix 4-1
Pollutant Sources and Effects on Health and Environment

Pollutant	General Sources in Environment[1]	Runoff Sources	Health & Environmental Effects
Metals & Inorganic Chemicals			
Zinc	Coatings to prevent rust; dry cell batteries; alloys like brass, and bronze; widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments; historical uses.	Automobile tire wear; wear of galvanized metals; zinc galvanized rooftops; brake pad wear; building siding and roof.	Toxic to aquatic organisms
Copper	Brake pad wear, wire, plumbing pipes, and sheet metal; brass and bronze pipes and faucets; compounds used in agriculture to treat plant diseases, water treatment; preservatives for wood, leather, and fabrics.	Brake pad wear; architectural applications; pesticides applications; vehicle fluid leaks and dumping; industrial copper use; aerial deposition (fossil fuel combustion, industrial facilities, wildfires); soil erosion; building siding.	High acute and high chronic toxicity to aquatic organisms and marine fishes, bio- concentrate in certain aquatic species.
Lead	Automobile exhaust, release from soils, fossil fuels, mining, and manufacturing; production of metal products (solder and pipes), and devices to shield X-rays; (Lead from gasoline, paint and other historical uses has been dramatically reduced in recent years).	Aerial deposition (fossil fuel combustion, industrial facilities); construction material wear; soil erosion; building siding; lead-based paints.	Acute: variety of adverse health effects in humans interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children. Chronic: Cerebro-vascular and kidney disease in humans
Selenium	Electronics industry, nutritional supplement and glass industry; as a component of pigments in plastics, paints, enamels, inks, and rubber; preparation of pharmaceuticals, nutritional feed additive for poultry and livestock; pesticide formulations; rubber production; ingredient in fungicides; diagnostic medicine.	Natural sources such as marine shales.	Short Term: Hair and fingernail changes; damage to the peripheral nervous system; fatigue and irritability. Long-term: Damage to kidney and liver tissue, and the nervous and circulatory systems.
Cadmium	Mineral fertilizers; production of pigments, metal coatings, and plastics; enters the air from mining, industry, and historical uses.	Fertilizer application; insecticide application; tire wear; wear of coated surfaces; aerial deposition.	Bioaccumulation in aquatic ecosystems and food chain, persist in the environment, chronic exposure can lead to kidney disease.
Silver	Jewelry, silverware, electronic equipment, and dental fillings; used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent used in lozenges and chewing gum to help people quit smoking; textile plant	Effluent from photographic processing industry; aerial deposition; natural sources.	Extremely toxic to aquatic plants and animals

Pollutant	General Sources in Environment[1]	Runoff Sources	Health & Environmental Effects
Pesticides			
Chlordane	Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.	Historical soil/sediment contamination; their current presence in runoff is related to the release of these chemicals from sediments	Effects on the central nervous system. High acute toxicity to aquatic organisms such as fishes, crustaceans, and amphibians. Bioaccumulation in aquatic ecosystems and food chain, persist in the environment
DDT	Its use in the U.S. was banned in 1972 because of damage to wildlife.	Legacy sediments.	Probable human carcinogens. Nervous system effects in humans and animals.
Dieldrin	EPA banned all uses of dieldrin in 1987.	Legacy sediments.	Probable human carcinogens. Nervous system effects in humans and animals.
PAHs and Other Organic Compounds			
Includes: Benzo(A)Pyrene Chrysene Phenanthrene Pyrene	Incomplete burning of oil and gas, or other organic substances like tobacco or charbroiled meat; found in coal tar, crude oil, creosote, and roofing tar; used in medicines or to make dyes, plastics, and pesticides; In Southern California, predominantly from mobile sources (cars, trucks, and trains)	Combusted of fossil fuels; vehicle motor oil; aerial deposition and subsequent wash-off of combustion by-products.[2]	Probable human carcinogens. Toxic to aquatic life at low concentrations.
1,1 DCE/ Vinyldene Chloride	Production of vinyl chloride	Runoff from chemically impacted soils; solvents	Probable human carcinogens. Toxic to aquatic life at low concentrations.
PCBs	Water supply contaminated by transformer oils in which PCBs were originally used as a heat-exchange medium; The use of these compounds has been banned. (There are still numerous transformers in existence that contain PCBs)	Historical soil/sediment contamination; old, leaking equipment; their current presence in runoff is related to the release of these chemicals from sediments	Bioaccumulation in the food chain, persist in the environment, chronic exposure can lead to liver damage and congenital defects, found to be carcinogenic in laboratory animals.
Nutrients			
Nitrite/Nitrate, Ammonia and Phosphates	Fertilizers; lawn clippings; car exhaust ; animal wastes; detergents	Commercial fertilizers; detergents, domestic pet/wildlife/human waste; nitrogen in precipitation.	Promotes toxic and non-toxic algal blooms which reduces the amount of light and dissolved oxygen

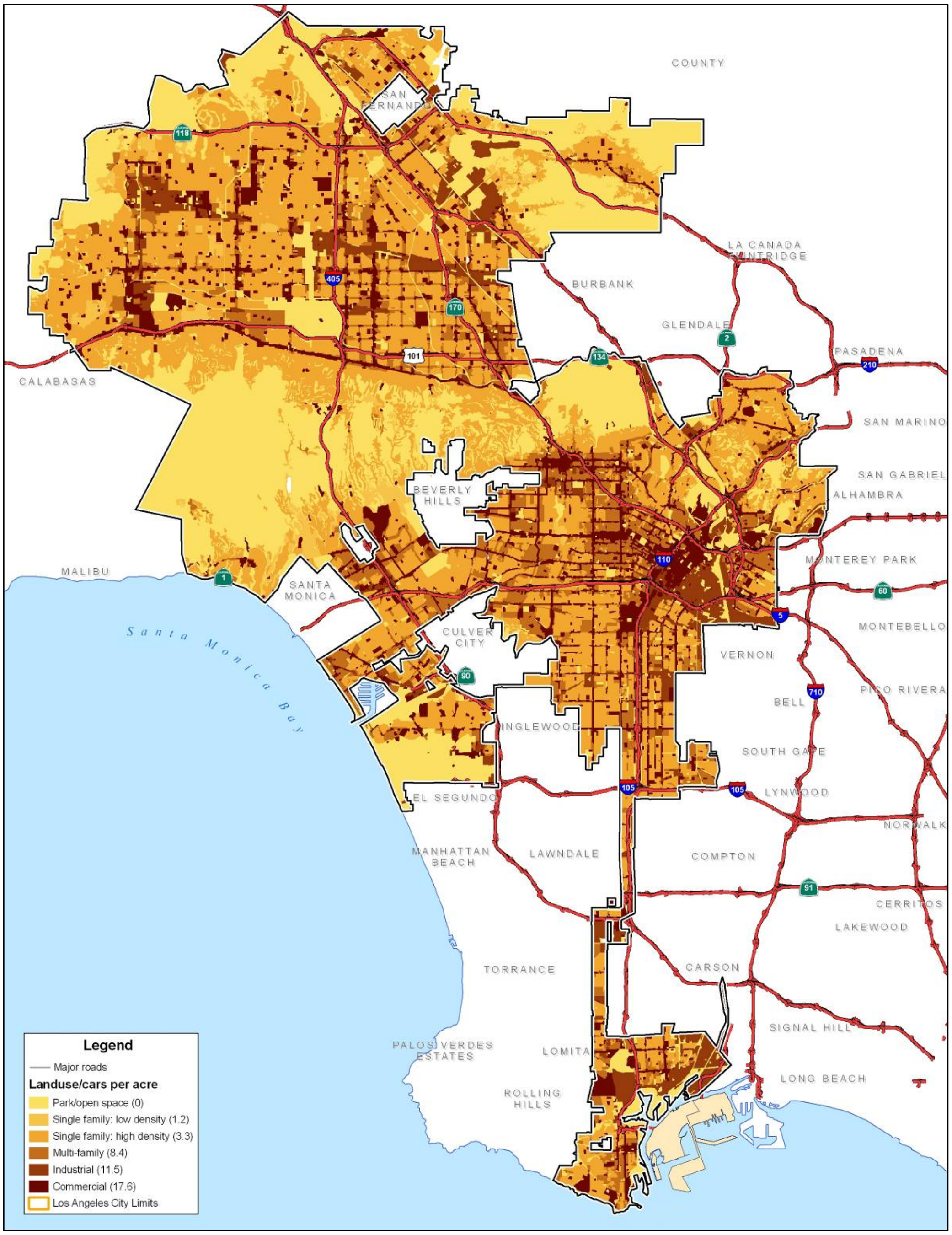
Pollutant	General Sources in Environment[1]	Runoff Sources	Health & Environmental Effects
Pathogens			
Indicator Bacteria & Enteric Viruses	Domestic pet/wildlife/human wastes deposited, stored or applied to the land; application of fertilizers, algaecides and fungicides.	Improper management of wastes, fertilizers, algaecides and fungicides; failed septic systems; boat discharges.	Public health concerns.
Trash			
Trash	Human littering of unwanted material such as plastics, paper, grass, and aluminum cans, etc.	Human littering of unwanted material such as plastics, paper, grass, and aluminum cans, etc.	Contributes all sort of pollutants to the receiving waterbodies. Aesthetically not pleasant. Environmental and public health concerns.

(1) ***Ref. 1***.
(2) ***Ref. 2***.

References

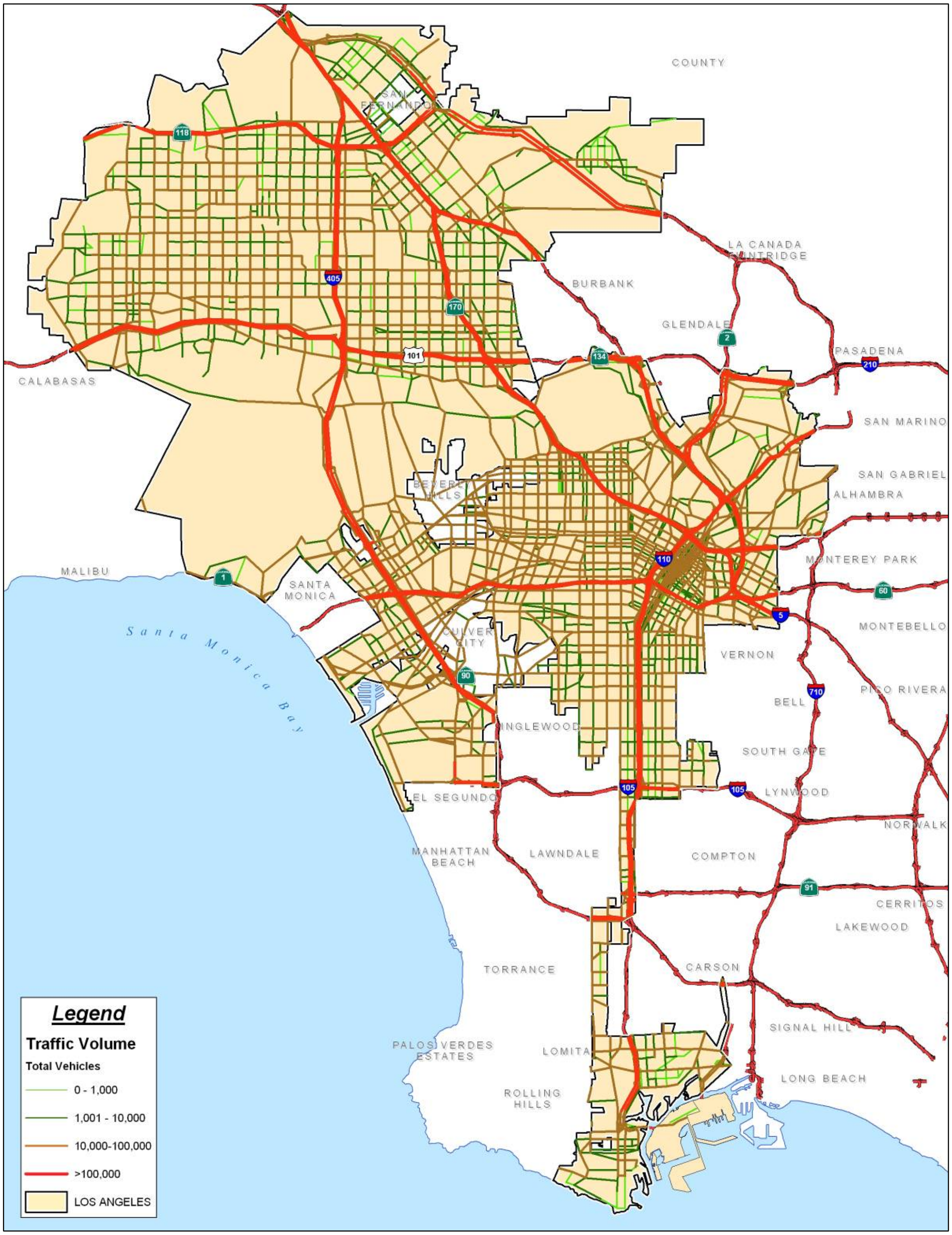
1. Watershed Protection Division (2007). Priority Pollutants and their Sources in the Environment. Los Angeles, CA (internal report).
2. Stein, E.D., Tiefenthaler, L.L., Schiff, K.C. (2007). Sources, Patterns and Mechanisms of Storm Water Pollutant Loading from Watersheds And Land Uses of the Greater Los Angeles Area; SCCWRP Report.

Appendix 4-2
Spatial Pollution Distribution Maps



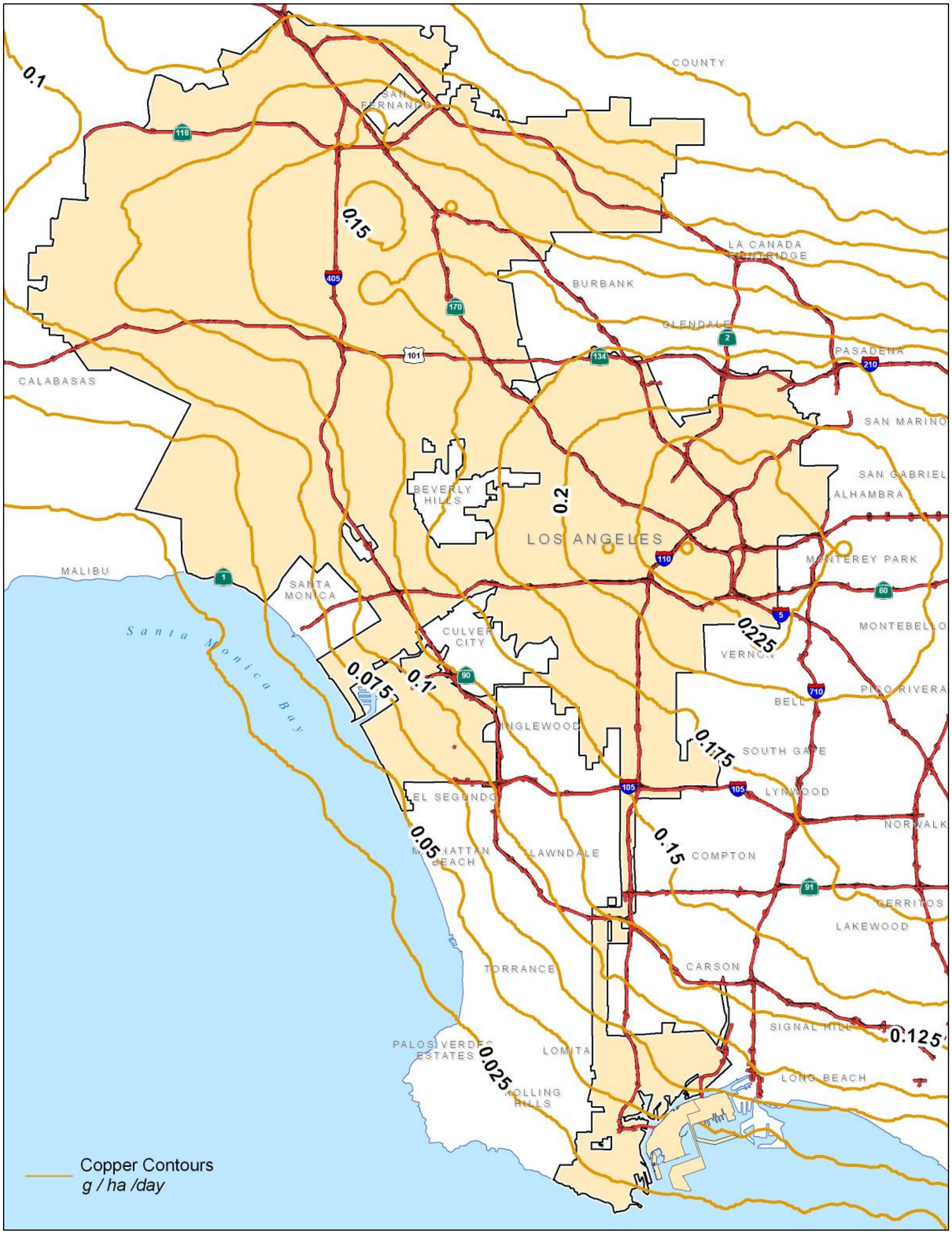
Map 1 Vehicle Density for Each Land Use

The traffic information was based on the transportation data gathered by the Southern California Association of Governments (SCAG) illustrates locations in Los Angeles with relatively high use traffic patterns.



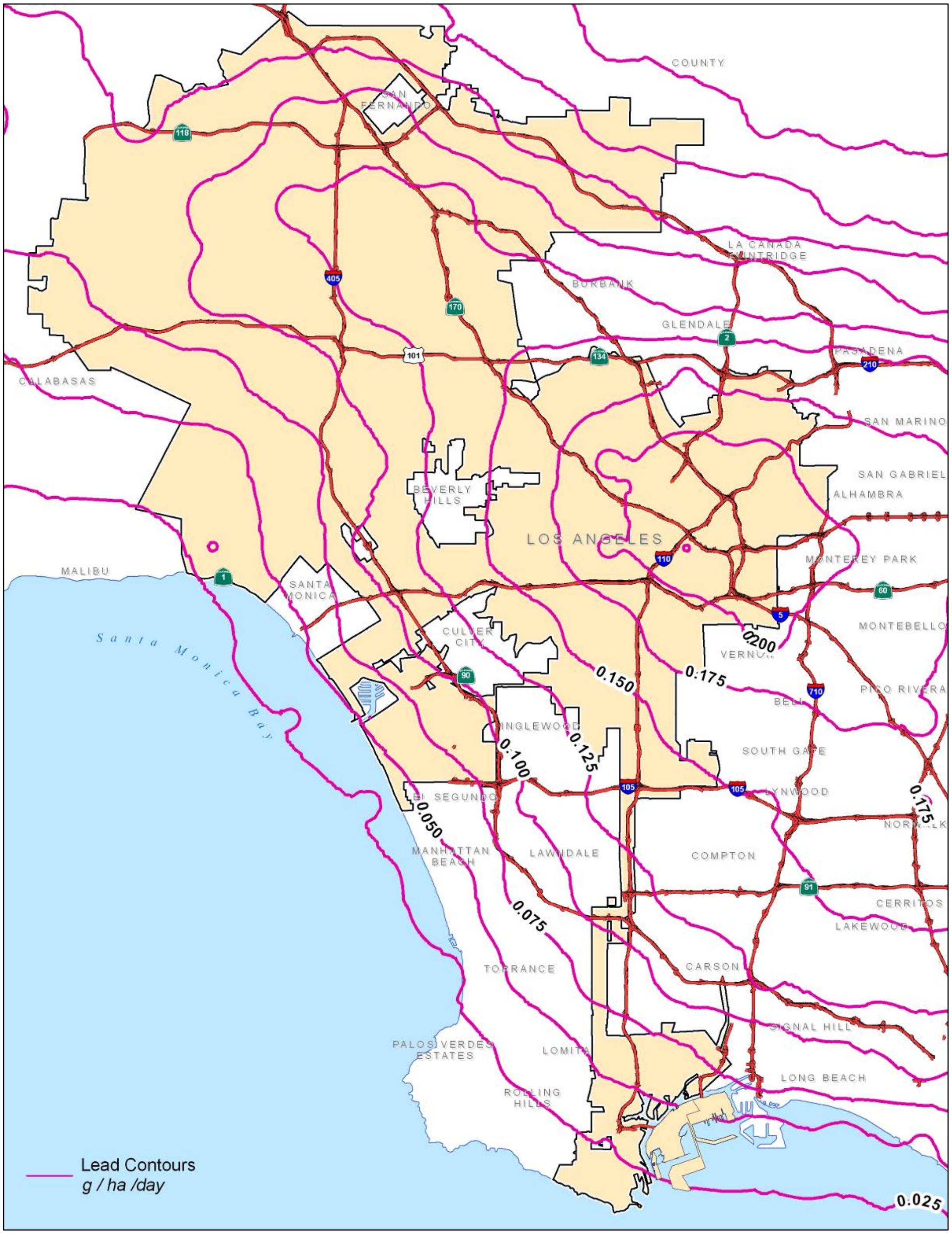
Map 2 Average Daily Traffic Count

The traffic information was based on the transportation data gathered by the Southern California Association of Governments (SCAG).



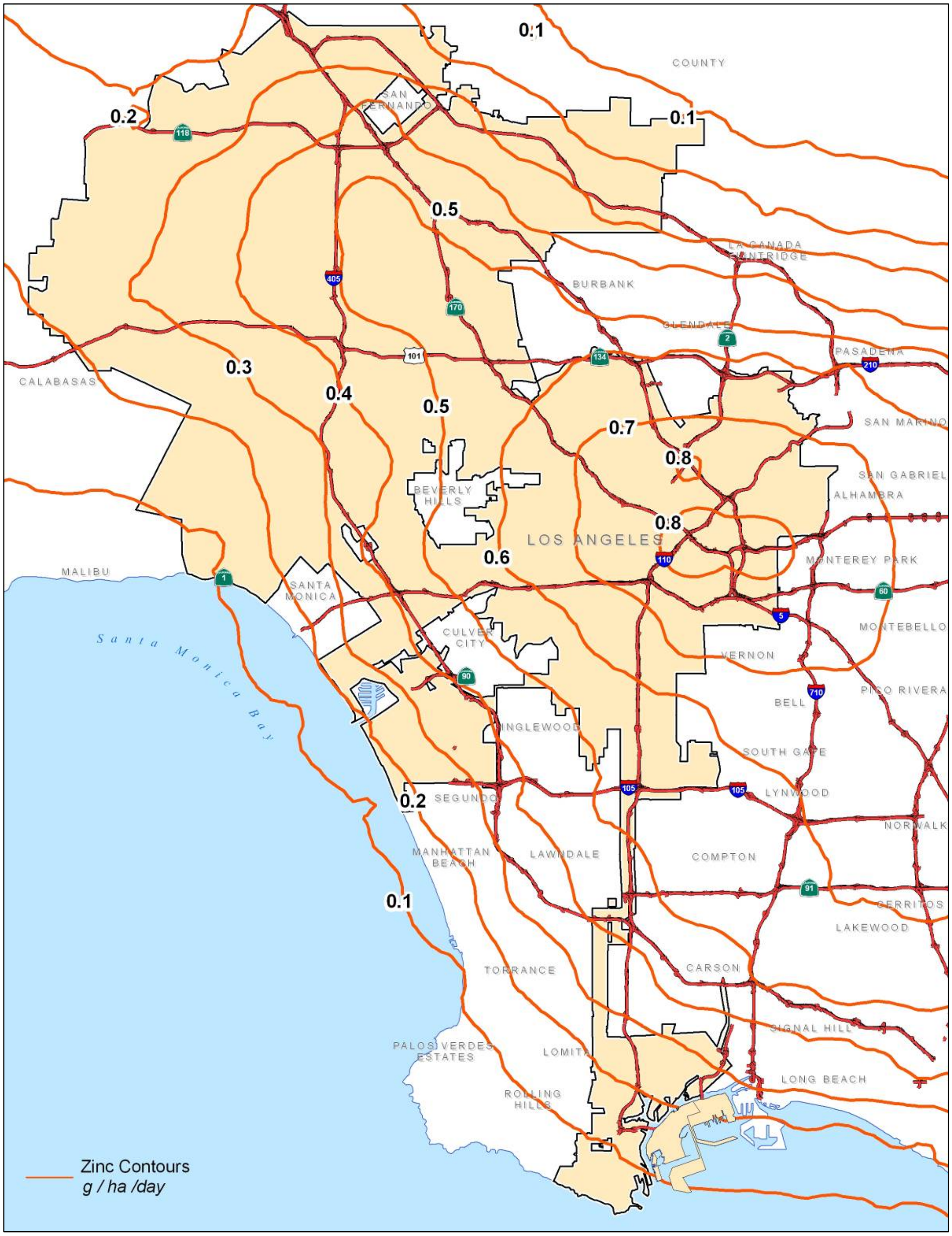
Map 3 Copper Atmospheric Deposition

The atmospheric deposition contours were developed by UCLA based on information generated by South Coast Air Quality Management District (***Ref. 1***). The map indicates that the highest deposition of copper occurs near Downtown Los Angeles.



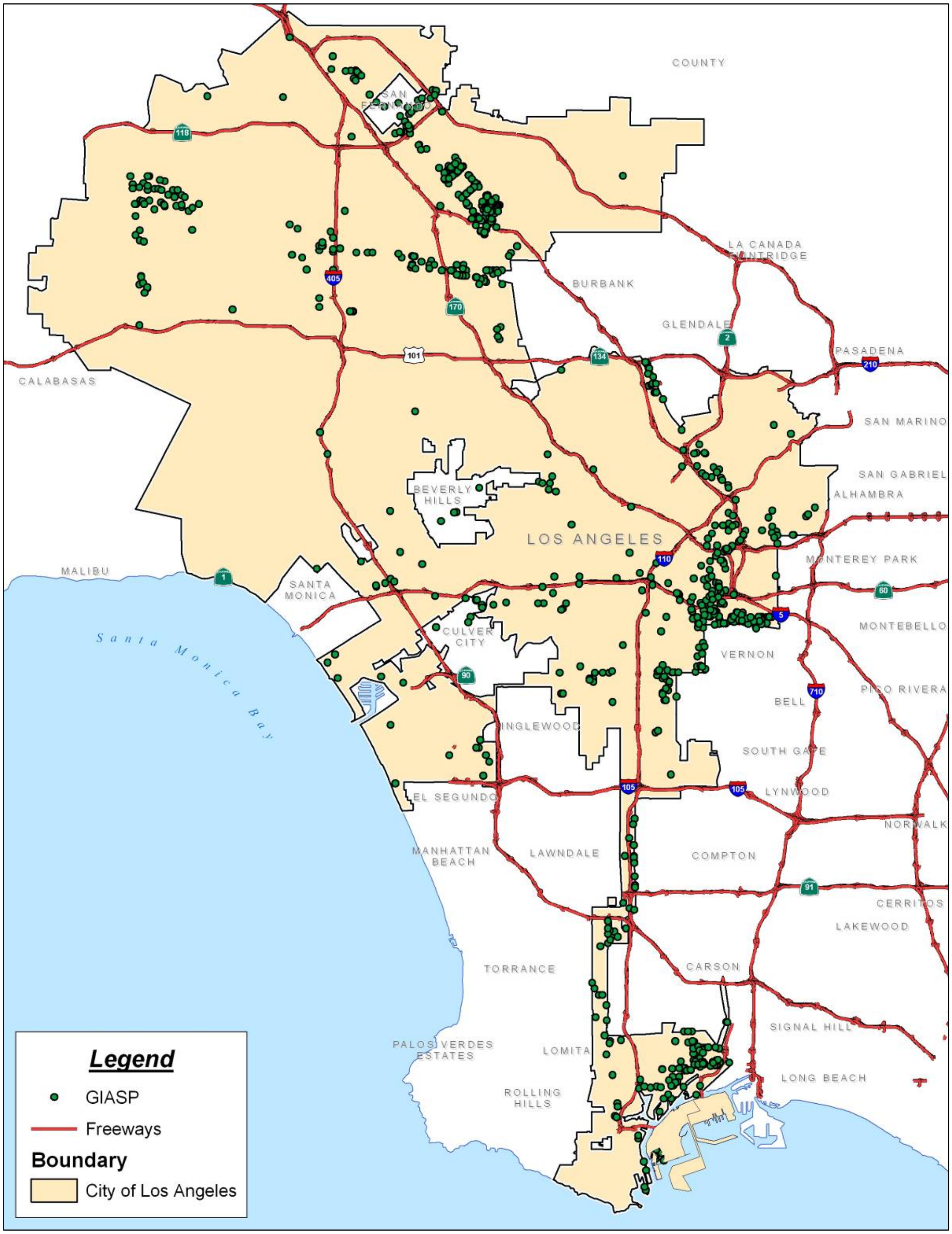
Map 4 Lead Atmospheric Deposition

The atmospheric deposition contours were developed by UCLA based on information generated by South Coast Air Quality Management District (***Ref. 1***). The map indicates that the highest deposition of lead occurs near Downtown Los Angeles.



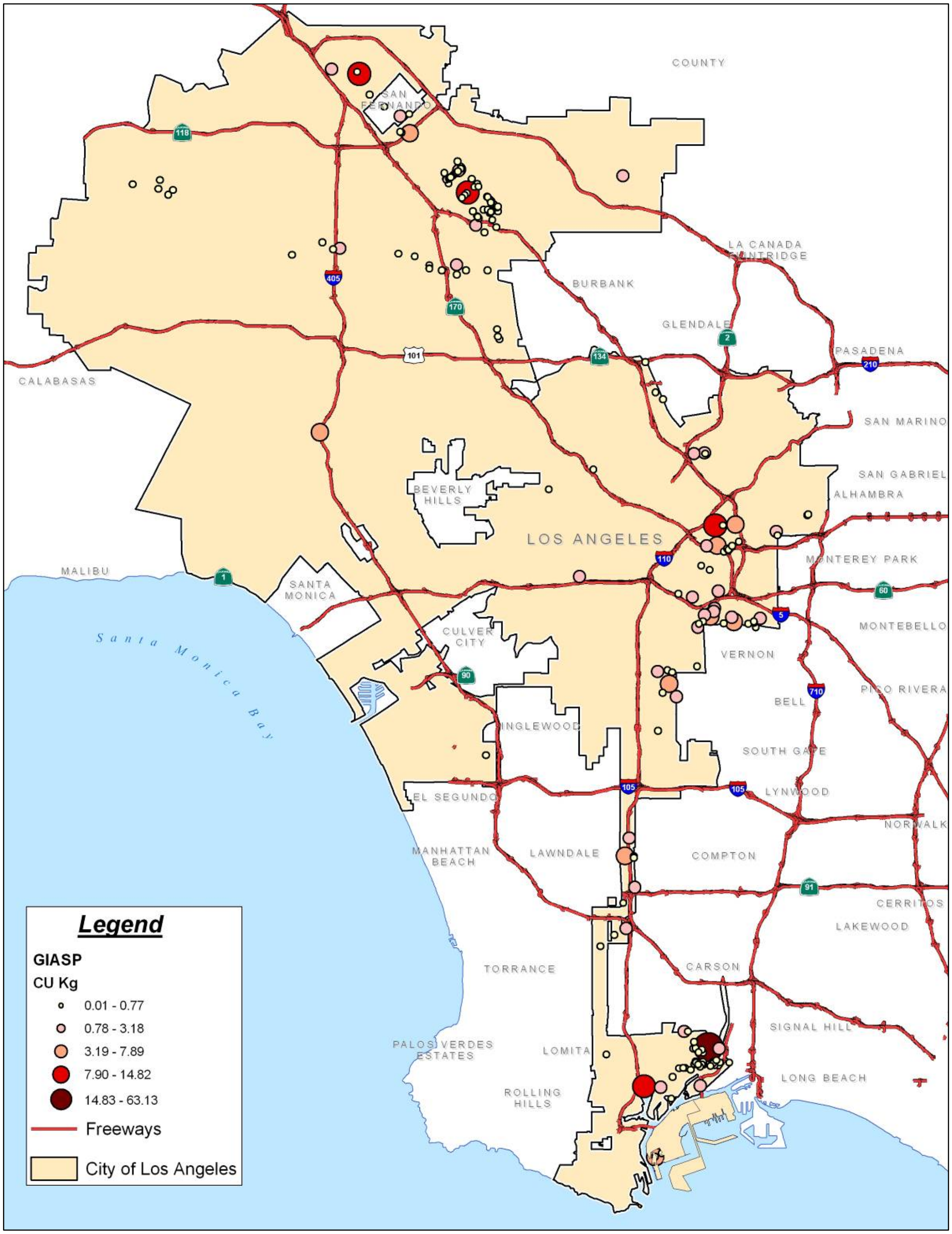
Map 5 Zinc Atmospheric Deposition

The atmospheric deposition contours were developed by UCLA based on information generated by South Coast Air Quality Management District (***Ref. 1***). The map indicates that the highest deposition of zinc occurs near Downtown Los Angeles.



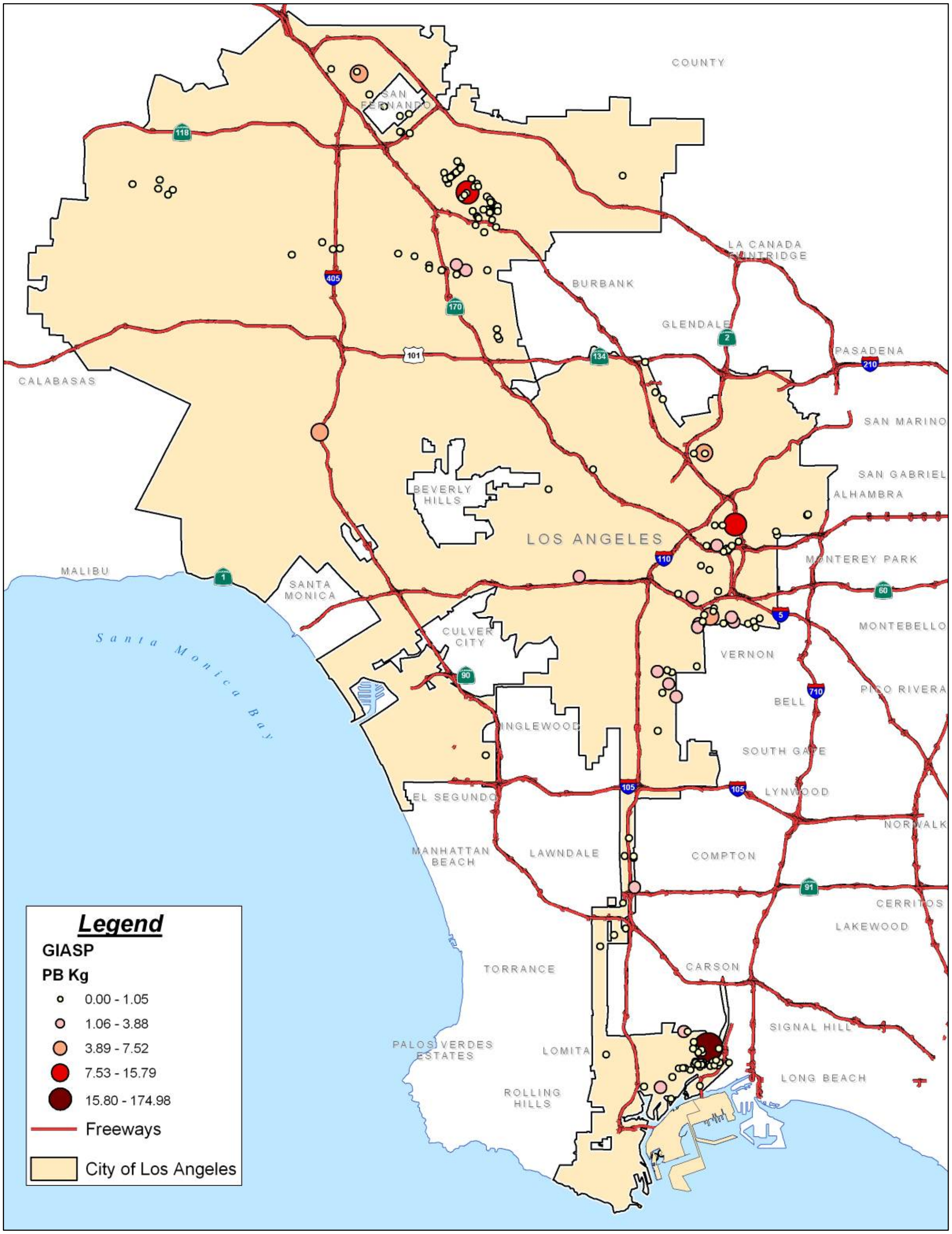
Map 6 GIASP Locations

The listing of GIASP permitted was provided by LARWQCB and was subsequently mapped.



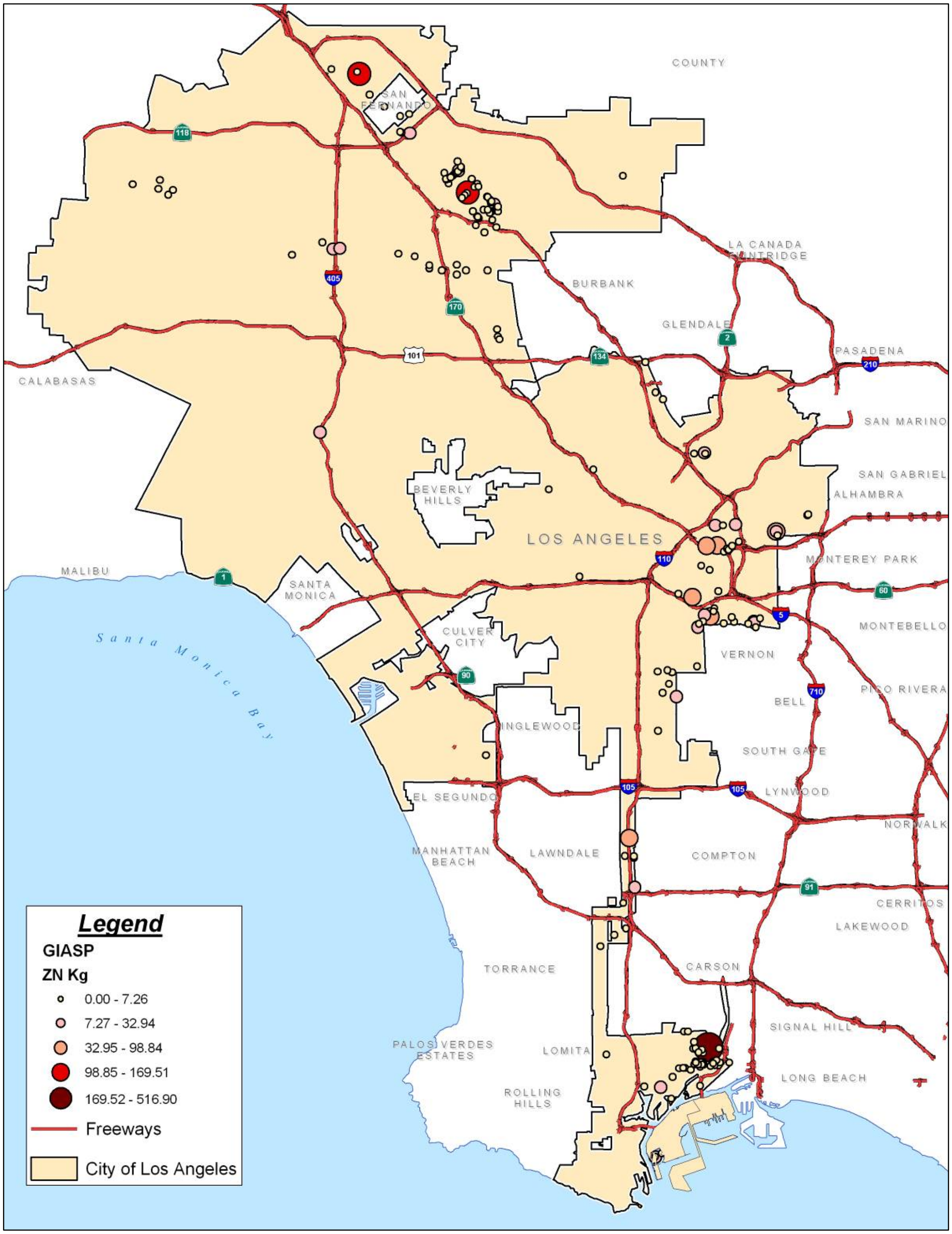
Map 7 Industrial Copper Sources

Annual loads of copper was estimated and mapped for each facility using the size of the facility and the runoff concentrations obtained under the GIASP program.



Map 8 Industrial Lead Sources

Annual loads of lead was estimated and mapped for each facility using the size of the facility and the runoff concentrations obtained under the GIASP program.



Map 9 Industrial Zinc Sources

Annual loads of zinc was estimated and mapped for each facility using the size of the facility and the runoff concentrations obtained under the GIASP program.

References

1. Stolzenbach, K.D., Turco, R., Lim, J.H., Lu, R., Sabin, L.D., Schiff, K.C. (2004). Atmospheric deposition of metals on watersheds in the Los Angeles region. Report to the Santa Monica Bay Restoration Commission, Los Angeles, CA. (http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=TRD&recid=06677417EN&q=&uid=1217987&setcookie=yes).

Appendix 4-3
List of Bacteria Source Identification Studies

Watershed Type	Indicators Used	Results/Conclusions/Discussion	Actions Suggested
1592 acre coastal watershed, mostly open space (incl. parks) (***Ref. 1***)	Fecal indicators (total coliform, *E. Coli*, Enterococci) Ammonia	Bacterial growth is encouraged by sediment deposits in the storm drain underneath Sunset Blvd.	● Remove sediment by cleaning/flushing storm drain ●Continue with planned implementation of dry weather low flow diversion system (has since been completed)
1856 acre mostly developed harbor watershed (12% harbor waters, 5% open space, 82% developed) (***Ref. 2***)	Fecal indicators (fecal coliform, Enterococci)Q-PCR (Bacteroides) Ribotyping	Majority of bacteria in both wet and dry weather samples were avian in origin, followed by rodents and dogs. Illicit boat discharges do not constitute a major source of bacterial loading for the back basins, but could potentially cause episodic disturbances. Sediment re-suspension is unlikely to contribute. Oxford Basin contributes the majority of the bacterial load to the back basins. Oxford Basin and Boone-Olive Pump Plant contribute more bacterial load than direct avian sources. Wet weather loadings from Oxford Basin and Boone-Olive are higher than dry weather loadings. Oxford Basin is attributed with the greatest impact on fecal coliform loads; Boone-Olive also directly impacts the water quality at Basin E.	●Deter birds from congregating around the marina back basin area ●Install a "pump-out" station in the back basin area ●Use efficient landscape watering techniques ●Remove bird fecal matter from the beach face on a periodic basis ●Educate restroom, restaurant, and parking lot attendance staff to decrease wash down practices ●Repair cracked sewers ●Implement diversion and other structural and source control BMPs for Oxford Basin and Boone-Olive Pump Plant.
Six mostly (>93%) undeveloped coastal watersheds: Point Mugu: 13616 acres Deer Creek: 766 acres Leo Carrillo: 6944 acres Dan Blocker: 2842 acres San Onofre: 27182 acres San Mateo: 85498 acres (***Ref. 3***)	Fecal indicators (total coliform, E. Coli, Enterococci) Human enterovirus (for samples from first day of flow)	Wet weather samples exceeded more often than dry weather samples. San Diego Co. beaches had the most exceedances and Ventura Co. beaches had the least exceedances. Most exceedances occur at the start of the storm, and gradually decrease thereafter. Exceedances occurred more often during larger storms except for the fecal-to-coliform ratio. Watershed/freshwater discharges seem to be predominant source. Enterococci flux from land-based sources show most variation. Larger watersheds had more exceedances. Factors other than flow account for exceedances, i.e. – birds.	●Consider study for upcoming Bacteria TMDLs and as a reopener item for current Bacteria TMDLs ●Further investigate local beach sources

Watershed Type	Indicators Used	Results Conclusions Discussion	Actions Suggested
Five large-scale watershed areas of interest: LA River, Ballona Creek, Dominguez Channel San Gabriel + River, Santa Monica Bay (***Ref. 4***) and Santa Monica Coastal Watershed (***Ref. 5***)	Fecal indicators (E. Coli, Enterococci)	E. Coli were positively correlated with TSS from agricultural, recreational/horse, and open space land use sites, and Enterococci were positively correlated with agricultural, recreational/horse, and transportation land use sites. Recreational/horse and agricultural land use sites had concentrations of fecal indicator bacteria as high as primary wastewater effluent. Larger watersheds had the greatest number of bacterial exceedances compared to AB 411 standards, and Enterococci were responsible for the majority of exceedances in all watersheds.	●Implement site-specific source control best management practices for equestrian and agricultural sites. ●Further investigate non-point sources in more detail (focus on specific parameters or smaller watersheds)
LA River - 533760 acre mostly developed watershed (20% open space, excluding mountain areas) Reach 2:173184 acres Reaches 4 & 5:195535 acres Reach 6:76675 acres (***Ref. 6***)	Undetermined, but the following are suggested: PCR /Q-PCR (Bacteroides) Ribotyping	This future study is designed to answer the following inquires: Are storm drains and tributaries responsible for the significant bacteria loads entering Reaches 2 and 4, and if so, which ones? Are human or non-human sources responsible for bacteria loads entering Reaches 2, 4, and 6; how do human/non-human loads from storm drains and tributaries compare? Which runoff sources or areas along Reaches 2 and 4 exhibit the highest human fecal discharges? Is there a correlation between land uses and drainage areas of the sub-watersheds?	●Use future results of study to develop LA River Bacteria TMDL Implementation Plan
Marina del Rey - 29 acre localized drainage area, with high-density residential development and park space (***Ref. 7***)	Undetermined	This future study will be designed to determine whether the main sources of bacterial loading in Del Rey Lagoon are natural or anthropogenic.	● Use future results of study to exclude Del Rey Lagoon from Ballona Creek Bacteria TMDL requirements, if applicable. ●Use future results of study to determine appropriate BMPs for Del Rey Lagoon, if applicable.

References

1. City of Los Angeles (2001). Temescal Canyon Bacterial Source Identification Study.
2. Weston Solutions and County of Los Angeles, Cities of Los Angeles, Culver City, Caltrans (2007). Mother's Beach and Back Basins Bacteria TMDL Non-Point Source Study.
3. SCCWRP (2006). Microbiological Water Quality at Non-Human Impacted Reference Beaches in Southern California During Wet Weather.

4. SCCWRP (2007). Sources, Patterns and Mechanisms of Storm Water Pollutant Loading from Watersheds and Land Uses of the Greater Los Angeles Area, California, USA.
5. Lay J. (2006). Persistence of fecal indicator bacteria in Santa Monica Bay beach sediments; UCLA.
6. CREST (2007).Conceptual Approach for the Los Angeles River Bacteria Source Identification Study.
7. City of Los Angeles. Natural Source Exclusion Study for Del Rey Lagoon; to be completed by 2010; special study in planning.

Appendix 5-1
Wasteload Allocations Applicable to Waterbodies with Approved TMDLs in the Los Angeles Area

Ballona Creek Watershed

Ballona Creek Metals (Effective Date: January 11, 2006)

Dry-weather Storm Water WLAs for MS4 Permittees (grams/day)				
Waterbody	**Copper**	**Lead**	**Selenium**	**Zinc**
Ballona Creek	807.7	432.6	169	10,273.1
Sepulveda Channel	365.6	196.1	76	4646.4

Wet-weather Storm Water WLAs for MS4 Permittees (grams/day)			
Copper	**Lead**	**Selenium**	**Zinc**
1.70E^{-05} x daily storm volume (L)	5.58E^{-05} x daily storm volume (L)	4.73E^{-06} x daily storm volume (L)	1.13E^{-04} x daily storm volume (L)

Ballona Creek Estuary Toxic Pollutants (Effective Date: January 11, 2006)

Metals Storm Water WLAs for MS4 Permittees (kg/yr)				
Cadmium	**Copper**	**Lead**	**Silver**	**Zinc**
8.0	227.3	312.3	6.69	1003

Organics Storm Water WLAs for MS4 Permittees (g/yr)			
Chlordane	**DDTs**	**Total PCBs**	**Total PAHs**
3.34	10.56	152	26,900

Ballona Creek and Wetland Trash (Effective Date: August 11, 2005)

Phased reduction over a period of 10 years, from existing baseline load to zero by 2015.

Ballona Creek Watershed (continued)

Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria (Effective Date: April 27, 2007)

Segment/Waterbody	Water Quality Objectives	Waste Load Allocation(1) (Number of exceedance days)
Ballona Creek Reach 1	REC-2 Freshwater	No more than 10% of the Single Sample Bacteria Water Quality Objectives *(Dry- and wet-weather)* Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives *(Dry- and wet-weather)*
Benedict Canyon Channel	LREC-1 Freshwater at confluence with Reach 2	For single sample objectives:*(0) summer dry weather,(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Ballona Creek Reach 2	LREC-1 Freshwater	
Sepulveda Channel	REC-1 Freshwater	
Ballona Estuary	REC-1 Marine water	
Centinela Creek	REC-1 Marine water at confluence with Ballona Estuary	
Del Rey Lagoon	REC-1 Marine water at confluence with Ballona Estuary	

(1) Based on daily sampling. For weekly sampling, the number of allowable exceedance days is reduced proportionally (summer dry weather, 0 days; winter dry weather, 1 day; wet weather, 3 days).

Dominguez Channel Watershed

<u>Los Angeles Harbor Bacteria (Inner Cabrillo Beach and Main Ship Channel)</u> (Effective Date: March 10, 2005)

Final Allowable Exceedance Days (5 years after effective date)			
Waterbody	**Summer Dry Weather (April 1 - October 31)**	**Winter Dry Weather (November 1 □ March 31)**	**Wet Weather**
Inner Cabrillo Beach			
Daily Sampling (no. days)	0	3	17
Weekly Sampling (no. days)	0	1	3
Main Ship Channel			
Daily Sampling (no. days)	0	3	15
Weekly Sampling (no. days)	0	1	3

<u>Machado Lake Trash</u> (Effective Date: March 6, 2008)

Phased reduction over a period of 8 years, from existing baseline load to zero by 2016.

<u>Machado Lake Nutrients</u> (Effective Date: March 11, 2009)

Indicator	**Numeric Target**
Total Phosphorous	0.1 mg/L monthly average
Total Nitrogen (TKN □ NO_3-N □ NO_2-N)	1.0 mg/L monthly average
Ammonia-N	5.95 mg/L hourly average
Ammonia-N	2.15 mg/L 30-day average
Dissolved Oxygen	5 mg/L single sample measured 0.3 m above the sediments
Chlorophyll a	2.0 ug/L monthly average

Los Angeles River Watershed

<u>Los Angeles River and Tributaries Metals</u> (Effective Date: Jan 11, 2006)

Dry-Weather WLAs (total recoverable metals) (shared by MS4 and Caltrans)				
Waterbody	**Critical Flow (cfs)**	**Cu (kg□day)**	**Pb (kg□day)**	**Zn (kg□day)**
LA River Reach 6	7.20	0.53	0.33	
LA River Reach 5	0.75	0.05	0.03	
LA River Reach 4	5.13	0.32	0.12	
LA River Reach 3	4.84	0.06	0.03	
LA River Reach 2	3.86	0.13	0.07	
LA River Reach 1	2.58	0.14	0.07	
Bell Creek	0.79	0.06	0.04	
Tujunga Wash	0.03	0.001	0.0002	
Burbank Channel	3.3	0.15	0.07	
Verdugo Wash	3.3	0.18	0.10	
Arroyo Seco	0.25	0.01	0.01	
Rio Hondo Reach	0.50	0.01	0.006	0.16
Compton Creek	0.90	0.04	0.02	

MS4 Wet-weather WLAs (kg□day)			
Cadmium	**Copper**	**Lead**	**Zinc**
2.8x10-9 x daily volume(L) □1.8	1.5x10-8 x daily volume (L) □9.5	5.6x10-8 x daily volume (L) □3.85	1.4x10-7 x daily volume (L) □83

Los Angeles River Watershed (continued)

Los Angeles River Nutrients (Effective Date: March 23, 2004)

Major Point Sources Total Ammonia as Nitrogen (NH3-N)		
POTW	**One-hour average WLA**	**Thirty-day average WLA**
Donald C. Tillman WRP	4.2 mg/L	1.4 mg/L
Los Angeles-Glendale WRP	7.8 mg/L	2.2 mg/L
Burbank WRP	9.1 mg/L	2.1 mg/L

Major Point Sources Total Nitrate, Nitrite, and Nitrate+Nitrite	
Constituent	**Thirty-day average WLA**
Nitrate-nitrogen (NO3-N)	7.2 mg/L
Nitrite-nitrogen (NO2-N)	0.9 mg/L
NO3-N + NO2-N	7.2 mg/L

Minor Point Sources Total Ammonia as Nitrogen (NH3-N)		
Waterbody	**One-hour average WLA**	**Thirty-day average WLA**
LA River above Los Angeles-Glendale WRP (LAG)	4.7 mg/L	1.6 mg/L
LA River below LAG	8.7 mg/L	2.4 mg/L
LA River Tributaries	10.1 mg/L	2.3 mg/L

Minor Point Source WLAs for Nitrate, Nitrite, and Nitrate+Nitrite	
Constituent	**Thirty-day average WLA**
Nitrate-nitrogen (NO3-N)	8.0 mg/L
Nitrite-nitrogen (NO2-N)	1.0 mg/L
NO3-N + NO2-N	8.0 mg/L

Minor Point Sources-Tapia, Whittier Narrows, LA Zoo, Industry & Construction, MS4 etc.

Los Angeles River Trash (Effective date revised TMDL: September 23, 2008)

Phased reduction over a period of 10 years, from existing baseline load to zero (0) by 2016.

Santa Monica Bay Watershed

Marina del Rey Toxic Pollutants (Effective Date: March 22, 2006)

Metals Stormwater WLAs (kg/yr)			
Allocation	**Copper**	**Lead**	**Zinc**
MS4 Permittees	2.01	2.75	8.85

Organics Stormwater WLAs (g/yr)		
Allocation	**Chlordane**	**Total PCBs**
MS4 Permittees	0.0295	1.34

Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria (Effective Date: March 18, 2004)

Final Allowable Exceedance Days by Sampling Location						
Waterbody	**Summer Dry Weather (April 1 - October 31)**		**Winter Dry Weather (November 1 – March 31)**		**Wet Weather**	
	Daily Sampling	**Weekly Sampling**	**Daily Sampling**	**Weekly Sampling**	**Daily Sampling**	**Weekly Sampling**
Mothers' Beach, at Lifeguard Tower	0	0	3	1	17	3
Mothers' Beach, at Playground Area	0	0	3	1	17	3
Mothers' Beach, between Lifeguard Tower and Boat Dock	0	0	3	1	17	3
Los Angeles County Fire Dock - end of main channel	0	0	3	1	17	3
Mothers' Beach, near first slips outside swim area	0	0	3	1	17	3
Mothers' Beach, 20 meters off of the wheel chair ramp	0	0	0	0	15	3
Mothers' Beach, end of wheel chair ramp	0	0	3	1	17	3
Basin F, innermost end	0	0	3	1	8	1
End of Main Channel	0	0	3	1	17	3
Basin E, near center of basin	0	0	3	1	17	3
Basin E, in front of tidegate from Oxford Basin	0	0	3	1	17	3

Santa Monica Bay Watershed (continued)

Santa Monica Bay Beaches Wet-Weather Bacteria (Jurisdictions 2 & 3 only) (Effective Date: July 15, 2003)

Final Allowable Exceedance Days by Sampling Location			
Site ID	**Sampling Locations**	**Sampling Frequency**	**Allowable Exceedance Days**
SMB 2-1	Castlerock storm drain, Topanga County Beach	Weekly	3
SMB 2-2	SantaYnez storm drain, Will Rogers State Beach	Weekly	3
SMB 2-3	Pacific Coast Hwy., Pacific Palisades	Weekly	3
SMB 2-4	Pulga Canyon storm drain, Will Rogers State Beach	Weekly	3
SMB 2-5	Pacific Palisades storm drain, Pacific Coast Hwy.	Weekly	3
SMB 2-6	Temescal storm drain, Los Angles	Weekly	3
SMB 2-7	Santa Monica Canyon storm drain, Santa Monica State Beach	Daily	17
SMB 2-8	Venice Pier, Venice Beach	Weekly	3
SMB 2-9	Topsail St extended, Venice	Weekly	3
SMB 2-10	Culver storm drain, Dockweiler State Beach	Weekly	3
SMB 2-11	North Westchester storm drain, Dockweiler State Beach	Weekly	3
SMB 2-12	World Way extended, Playa Del Rey	Weekly	3
SMB 2-13	Imperial Hwy storm drain, Dockweiler State Beach	Weekly	3
SMB 2-14	Opposite Hyperion Plant, Playa Del Rey	Weekly	3
SMB 2-15	Grand Ave extended, El Segundo	Weekly	3
SMB 3-1	Montana Ave storm drain, Santa Monica	Weekly	3
SMB 3-2	Wilshire Blvd storm drain, Santa Monica	Weekly	3
SMB 3-3	Santa Monica Pier storm drain, Santa Monica State Beach	Daily	17
SMB 3-4	Pico Kenter storm drain, Santa Monica State Beach	Daily	17
SMB 3-5	Ashland storm drain, Santa Monica State Beach	Daily	17
SMB 3-6	Rose Ave storm drain, Venice Beach	Weekly	3
SMB 3-7	Brooks Ave extended, Los Angeles	Weekly	3
SMB 3-8	Windward Ave storm drain, Venice Beach	Weekly	3
SMB 3-9	Strand St extended, Santa Monica	Weekly	3

Santa Monica Bay Watershed (continued)

<u>Santa Monica Bay Beaches Dry- Weather Bacteria (Jurisdictions 2 & 3 only)</u> (Effective Date: July 15, 2003)

Final Allowable Exceedance Days by Sampling Location				
Site ID	**Sampling Locations**	**Sampling Frequency**	**Allowable Exceedance Days**	
			Summer	**Winter**
SMB 2-1	Castlerock storm drain, Topanga County Beach	Weekly	0	1
SMB 2-2	SantaYnez storm drain, Will Rogers State Beach	Weekly	0	1
SMB 2-3	Pacific Coast Hwy., Pacific Palisades	Weekly	0	1
SMB 2-4	Pulga Canyon storm drain, Will Rogers State Beach	Weekly	0	1
SMB 2-5	Pacific Palisades storm drain, Pacific Coast Hwy.	Weekly	0	1
SMB 2-6	Temescal storm drain, Los Angles	Weekly	0	1
SMB 2-7	Santa Monica Canyon storm drain, Santa Monica State	Daily	0	3
SMB 2-8	Venice Pier, Venice Beach	Weekly	0	1
SMB 2-9	Topsail St extended, Venice	Weekly	0	1
SMB 2-10	Culver storm drain, Dockweiler State Beach	Weekly	0	1
SMB 2-11	North Westchester storm drain, Dockweiler State Beach	Weekly	0	1
SMB 2-12	World Way extended, Playa Del Rey	Weekly	0	1
SMB 2-13	Imperial Hwy storm drain, Dockweiler State Beach	Weekly	0	1
SMB 2-14	Opposite Hyperion Plant, Playa Del Rey	Weekly	0	1
SMB 2-15	Grand Ave extended, El Segundo	Weekly	0	1
SMB 3-1	Montana Ave storm drain, Santa Monica	Weekly	0	1
SMB 3-2	Wilshire Blvd storm drain, Santa Monica	Weekly	0	1
SMB 3-3	Santa Monica Pier storm drain, Santa Monica State Beach	Daily	0	3
SMB 3-4	Pico Kenter storm drain, Santa Monica State Beach	Daily	0	3
SMB 3-5	Ashland storm drain, Santa Monica State Beach	Daily	0	3
SMB 3-6	Rose Ave storm drain, Venice Beach	Weekly	0	1
SMB 3-7	Brooks Ave extended, Los Angeles	Weekly	0	1
SMB 3-8	Windward Ave storm drain, Venice Beach	Weekly	0	1
SMB 3-9	Strand St extended, Santa Monica	Weekly	0	1

Key Compliance Dates Established in Effective Los Angeles Area TMDLs

Watershed	**TMDL**	**Final Compliance Landmark No. 1**		**Final Compliance Landmark No. 2**	
		Date	**Action**	**Date**	**Action**
Ballona Creek	Ballona Creek Metals	01/11/16	MS4 - 100□ of total drainage meets dry-weather and 50□ meets wet-weather WLAs.	01/11/21	MS4 - 100□ of total drainage area meets both dry and wet-weather WLAs.
	Ballona Creek Estuary Toxic Pollutants	01/11/21	MS4 - 100□ of total drainage meets WLA for sediment.		
	Ballona Creek Trash	09/30/15	Zero trash.		
	Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL	04/27/13	Achieve compliance with the allowable exceedance days for summer and winter dry-weather AND rolling 30-day geometric mean targets in Ballona Creek TMDL staff report.	04/27/17	Achieve compliance with the allowable exceedance days AND rolling 30-day geometric mean targets during wet-weather in Ballona Creek TMDL staff report.
Los Angeles River	Los Angeles River Metals	01/11/24	MS4 - 100□ of total drainage meets dry-weather and 50□ meets wet-weather WLAs.	01/11/28	MS4 - 100□ of total drainage area meets both dry and wet-weather WLAs.
	Los Angeles River Nutrient TMDL	03/23/04	Apply interim limits to POTWs, apply WLAs to minor point sources dischargers and MS4.	10/23/07	Interim limits expire and WLAs apply to major point sources.
	Los Angeles River Trash	09/30/15	0□ of baseline load.		

Key Compliance Dates Established in Effective Los Angeles Area TMDLs(1) (Continued)					
Santa Monica Bay	Marina del Rey Harbor Toxic Pollutants	03/22/16	If no IRA[(1)] - 100% of total area effectively meets WLAs for sediment.	03/22/21	If IRA - MS4 - 100 % of total drainage area meets WLAs.
	Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria	03/18/07	Achieve compliance with allowable exceedance days and rolling 30-day geometric mean targets during summer and dry-weather.	3/18/14	Achieve wet weather compliance with the allowable exceedance days AND rolling 30-day geometric mean targets unless IRA is implemented (in which case compliance must be achieved before 03/22/21)
	Santa Monica Bay Beaches Wet-Weather Bacteria	07/15/13	For responsible jurisdictions and agencies not pursuing an IRA: final implementation targets in terms of allowable wet-weather exceedance days AND the geometric mean targets must be achieved for each individual beach location.	07/15/21	For responsible agencies pursuing an IRA: Final implementation targets in terms of allowable wet-weather exceedance days AND the geometric mean targets must be achieved for each individual beach location.
	Santa Monica Bay Beaches Dry- Weather Bacteria	07/15/06	Achieve summer dry weather compliance[(2)] with allowable exceedance days as set forth in the Basin Plan Amendment and rolling 30-day geometric mean targets.	07/15/09	Achieve winter dry weather compliance[(3)] with allowable exceedance days as set forth in the Basin Plan Amendment and rolling 30-day geometric mean targets.
Dominguez Channel	Los Angeles Harbor Bacteria	03/09/10	City must ensure that there is no exceedance in excess for single sample limits at any location during summer or winter dry-weather and the rolling 30-day geometric mean targets.	03/09/10	No allowable exceedances of single sample limits at any location and the rolling 30-day geometric mean targets .

(1) IRA: Integrate Resources Approach.
(2) Summer Dry Weather Period: April 1 through October 31.
(3) Winter Dry Weather Period: November 1 through March 31.

Appendix 5-2
Impaired Waters Still Requiring TMDL Development

Watershed	Waterbody	303(d) Pollutant Stressor	TMDL Date(1)	Consent Decree(2)
Los Angeles River	Aliso Canyon Wash	Fecal Coliform	2019	N
		Copper	2019	N
	Arroyo Seco Reach 1 (LA River to West Holly Ave.)	Coliform Bacteria	2009	Y
	Arroyo Seco Reach 2 (Figueroa St. to Riverside Dr.)	Coliform Bacteria	2009	Y
	Bell Creek	Coliform Bacteria	2009	Y
	Echo Park Lake	Algae	2019	Y
		Ammonia	2019	Y
		Eutrophic	2019	Y
		Copper	2019	Y
		Lead	2019	Y
		Odor	2019	Y
		PCBs	2019	Y
		pH	2019	Y
	Burbank Western Channel	Cyanide	2019	N
	Compton Creek	Coliform Bacteria	2009	Y
	Lincoln Park Lake	Ammonia	2019	Y
		Eutrophic	2019	Y
		Organic Enrichment/Low Dissolved Oxygen	2019	Y
		Odor	2019	Y
		Lead	2019	Y
	Los Angeles River Estuary (Queensway Bay)	Lead (sediment)	2019	N
		Zinc (sediment)	2019	N
		Chlordane (sediment)	2019	N
		DDT (Sediment)	2019	N
		PCBs	2019	N
		Sediment Toxicity	2019	N

Watershed	Waterbody	303(d) Pollutant Stressor	TMDL Date[1]	Consent Decree[2]
Los Angeles River	Los Angeles River Reach 1 (Estuary to Carson St.)[3]	Coliform Bacteria	2009	Y
		Diazinon	2019	N
		Cyanide	2019	N
	Los Angeles River Reach 2 (Carson to Figueroa St.)	Coliform Bacteria	2009	Y
		Oil	2019	Y
	Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	Coliform Bacteria	2009	Y
	Los Angeles River Reach 5 (Within Sepulveda Basin)	Oil	2019	Y
	Los Angeles River Reach 6 (Above Sepulveda Flood Control Basin)	Coliform Bacteria	2009	Y
		1,1-Dichloroethane (1,1-DCE)/ /Vinylidene chloride	2019	Y
		Tetrachloroethylene/PCE	2019	Y
		Trichloroethylene/TCE	2019	Y
	Los Angeles/Long Beach Inner Harbor	Beach closures	2004	Y
		Benthic Community Effects	2019	Y
		Copper	2008	Y
		DDT	2019	Y
		PCBs	2019	Y
		Sediment Toxicity	2019	Y
		Zinc	2008	Y
	Los Angeles/Long Beach Outer Harbor (inside breakwater)	PCBs	2019	Y
		DDT	2019	Y
		Sediment Toxicity	2008	Y
	McCoy Canyon Creek	Nitrate	2019	N
		Nitrogen, Nitrate	2019	N
		Fecal coliform	2009	N
Los Angeles River	Rio Hondo Reach 1 (Confluence Los Angeles River to Santa Ana Freeway)	Coliform Bacteria	2009	Y
	Rio Hondo Reach 2 (At Spreading Grounds)	Coliform Bacteria	2009	Y
	Tujunga Wash (LA River to Hansen Dam)	Coliform Bacteria	2009	Y
	Verdugo Wash Reach 1 (LA River to Verdugo Rd.)	Coliform Bacteria	2009	Y
	Verdugo Wash Reach 2 (Above Verdugo Road)	Coliform Bacteria	2009	Y

Watershed	Waterbody	303(d) Pollutant/Stressor	TMDL Date[1]	Consent Decree[2]
Ballona Creek	Ballona Creek	Cadmium (sediment)	2005	Y
		Silver (sediment)	2005	Y
		Cyanide	2019	N
	Ballona Creek Wetlands	Habitat alterations	2019	Y
		Hydromodification	2019	Y
		Exotic Vegetation	2019	Y
		Reduced Tidal Flushing	2019	Y
	Sepulveda Canyon	Ammonia	2019	Y
Santa Monica Bay	Cabrillo Beach (Outer)	DDT	2019	Y
		PCBs	2019	Y
	Castlerock Beach	DDT	2019	Y
		PCBs	2019	Y
	Marina del Rey Harbor – Back Basins (Note: EPA reviewing these to determine if addressed by Marina del Rey Harbor Toxics TMDL)	DDT (tissue)	2005	Y
		Dieldrin (tissue)	2005	Y
	Santa Monica Bay – Offshore/Nearshore	DDT (tissue & sediment)	2019	Y
		Debris	2019	Y
		Fish Consumption Advisory	2019	Y
		PCBs (tissue & sediment)	2019	Y
		Sediment Toxicity	2019	Y
	Santa Monica Canyon	Lead	2019	Y
	Topanga Beach	DDT	2019	Y
		PCBs	2019	Y
	Topanga Canyon Creek	Lead	2019	Y
	Whites Point Beach	PCBs (Fish Consumption)	2019	Y
		DDT (Fish Consumption)	2019	Y
Dominguez Channel	Dominguez Channel (lined portion above Vermont Ave)	Ammonia	2019	Y
		Copper	2019	Y
		Zinc (sediment)	2019	Y
		Dieldrin (tissue)	2019	Y
		Lead (tissue)	2019	Y
		Sediment Toxicity	2019	N
		Indicator Bacteria	2007	Y
	Dominguez Channel Estuary (unlined portion below Vermont Ave)	Ammonia	2019	Y
		Benthic Community Effects	2019	Y
		Benzo (a) pyrene (PAHs)	2019	N
		Benzo (a) anthracene	2019	N
		Chlordane (tissue)	2019	N
		Chrysene (C1-C4)	2019	N
		Coliform bacteria	2007	Y
		DDT (tissue & sediment)	2019	Y

Watershed	Waterbody	303(d) Pollutant/Stressor	TMDL Date(1)	Consent Decree(2)
		Dieldrin (tissue)	2019	Y
		PCBs (Polychlorinated biphenyls)	2019	Y
		Phenanthrene	2019	N
		Pyrene	2019	N
		Lead (tissue)	2019	Y
		Zinc (sediment)	2019	Y
	Los Angeles Harbor – Cabrillo Marina	DDT	2019	Y
		PCBs	2019	Y
Dominguez Channel	Los Angeles Harbor – Consolidated Slip	Benzo(a)anthracene	2008	N
		Chrysene (C1-C4)	2008	N
		Dieldrin	2008	N
		Phenanthrene	2008	N
		Pyrene	2008	N
		2-Methylnaphthalene	2008	N
		Benthic Community Effects	2019	Y
		Benzo(a)pyrene (PAHs)	2008	Y
		Cadmium (sediment)	2019	N
		Chlordane (tissue & sediment)	2019	Y
		Chromium (sediment)	2019	Y
		Copper (sediment)	2019	N
		Lead (sediment)	2019	Y
		Zinc (sediment)	2019	Y
		Mercury (sediment)	2019	N
		DDT (tissue & sediment)	2019	Y
		PCBs (tissue & sediment)	2019	Y
		Sediment Toxicity	2019	Y
		Toxaphene (tissue)	2019	N
	Los Angeles Harbor – Fish Harbor	Mercury	2019	N
		Zinc	2019	Y
		Lead	2019	N
		Benzo(a)pyrene (PAHs)	2008	Y
		Benzo[a]anthracene	2019	N
		Chlordane	2019	N
		Chrysene (C1-C4)	2019	N
		Copper	2019	Y
		DDT	2019	Y
		Dibenz[a,h]anthracene	2019	N
		PAHs	2019	Y
		PCBs	2019	Y
		Phenanthrene	2019	N
		Pyrene	2019	N
		Sediment Toxicity	2019	Y

Watershed	Waterbody	303(d) Pollutant/Stressor	TMDL Date(1)	Consent Decree(2)
Dominguez Channel	Los Angeles Harbor – Inner Cabrillo Beach Area	Copper	2019	N
		DDT	2019	Y
		PCBs	2019	Y
	Machado Lake (Harbor Park Lake)	Ammonia	2019	Y
		Algae	2019	Y
		ChemA (tissue)	2019	Y
		Chlordane (tissue)	2019	Y
		DDT (tissue)	2019	Y
		Dieldrin (tissue)	2019	Y
		Eutrophic	2019	Y
		Odor	2019	Y
		PCBs (tissue)	2019	Y
		Trash	2019	Y
	Point Fermin Park Beach	DDT (Fish Consumption)	2019	Y
		PCBs (Fish Consumption)	2019	Y
	San Pedro Bay Near/Offshore Zones	Chlordane	2019	N
		Chromium (sediment)	2019	Y
		Copper (sediment)	2019	Y
		DDT (tissue & sediment)	2019	Y
		PAHs	2019	Y
		PCBs	2019	Y
		Sediment Toxicity	2019	Y
		Zinc (sediment)	2019	Y
	Torrance Carson Channel	Copper	2019	Y
		Lead	2019	Y
		Coliform bacteria	2007	Y
	Wilmington Drain	Ammonia	2019	Y
		Copper	2019	Y
		Lead	2019	Y
		Coliform bacteria	2007	Y

(1) Date listed for completion of TMDL (***Ref. 1***).
(2) Y – Yes, listed as impaired in the 1999 Consent Decree; N – No, waterbody not listed as impaired in the Consent Decree (Note: In a few cases current 303(d) (***Ref. 1***) listings are not listed exactly the same as the impairments to be addressed by the Consent Decree; in these cases best professional judgment was used to determine if current listing was part of 1999 Consent Decree).

References

1. State Water Resources Control Board. 2006. 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs (http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html).

Appendix 6-1
Overview of Best Management Practices

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Outdoor Equipment Maintenance	SC-32	✓			✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Outdoor Storage of Raw Materials	SC-33	✓	✓		✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Waste Handling & Disposal	SC-34				✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		–	–
Safer Alternative Products	SC-35		✓		✓		✓	✓			✓		✓	✓	✓	✓		–	–
Contaminated or Erodible Areas	SC-40	✓	✓		✓	✓	✓	✓			✓		✓	✓	✓	✓		–	–
Building & Grounds Maintenance	SC-41	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓		–	–
Building Repair and Construction	SC-42	✓		✓	✓		✓	✓			✓		✓	✓	✓	✓		–	–
Parking/Storage Area Maintenance	SC-43	✓		✓	✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Drainage System Maintenance	SC-44	✓		✓		✓					✓		✓	✓	✓	✓		–	–
Over Water Activities	SC-50			✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Housekeeping Practices	SC-60	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Safer Alternative Products	SC-61		✓		✓		✓	✓				✓	✓	✓	✓	✓		–	–
Road and Street Maintenance	SC-70	✓		✓	✓		✓	✓				✓	✓	✓	✓	✓		–	–
Plaza and Sidewalk Cleaning	SC-71	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Fountain & Pool Maintenance	SC-72	✓	✓	✓		✓		✓				✓	✓	✓	✓	✓		–	–
Landscape Maintenance	SC-73	✓	✓	✓								✓	✓	✓	✓	✓		–	–
Drainage System Maintenance	SC-74	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Waste Handling and Disposal	SC-75	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Water & Sewer Utility Maintenance	SC-76	✓	✓			✓	✓	✓				✓	✓	✓	✓	✓		–	–
Site Design & Landscape Planning	SD-10	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Roof Runoff Controls	SD-11	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Efficient Irrigation	SD-12	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Storm Drain Signage	SD-13			✓					✓				✓	✓	✓	✓		–	–
Pervious Pavements	SD-20		✓		✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Alternative Building Materials	SD-21				✓			✓	✓				✓	✓	✓	✓		–	–
Fueling Areas	SD-30				✓		✓		✓				✓	✓	✓	✓		–	–
Maintenance Bays & Docs	SD-31				✓		✓	✓	✓				✓	✓	✓	✓		–	–
Trash Storage Areas	SD-32		✓	✓		✓	✓	✓	✓				✓	✓	✓	✓		–	–
Vehicle Washing Areas	SD-33	✓	✓		✓		✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Material Storage Areas	SD-34	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Work Areas	SD-35	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Processing Areas	SD-36	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Treatment Control BMPs																			
Infiltration Trench	TC-10	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	P	P	✓	Slopes>15%, sites with risk of groundwater contamination.	P
Infiltration Basin	TC-11	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	P	P	✓	Slopes>15%, sites with risk of groundwater contamination.	P
Retention/Irrigation	TC-12	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	✓	✓	✓	<100 ft from wells, septic systems, natural wetlands; <12" soil.	P
Wet Pond	TC-20	H	M	H	H	H	H	H	✓		✓	✓	✓	✓	✓	✓		Steep unstable soils, not sustainable in arid climates.	P
Constructed Wetlands	TC-21	H	M	H	H	H	H	H	✓		✓			✓	✓	✓		Steep unstable soils.	P
Extended Detention Basin	TC-22	M	L	H	M	M	M	M	✓		✓	✓	P	✓	✓	✓	✓	Tight spaces; areas without hydraulic head, minimum 5 acre site.	P
Vegetated Swale	TC-30	M	L	L	M	L	M	M	✓		✓	✓	✓	✓	✓	✓		Slopes>6%. Steep topography. Heavily gopher-populated areas. Certain industrial.	P
Vegetated Buffer Strip	TC-31	H	L	M	H	L	H	M	✓		✓	✓	✓	✓	✓	✓		Slopes>15%; Tight spaces; Certain industrial.	P
Bioretention	TC-32	H	M	H	H	H	H	H	✓		✓	✓	✓	✓	✓	P	✓	Slopes >20%. Unstable soil stratum.	P
Media Filter	TC-40	H	L	H	H	M	H	H	✓		✓	✓	✓	✓	✓	✓	✓	unstable soils lead to clog. Large sites >25 acres. <4ft heads	P
Water Quality Inlet	TC-50	L	L	M	L	L	M	L	✓		✓	✓	✓	✓	✓	✓		Unvegetated areas.	P
Multiple Systems	TC-60	H	L	H	H	M	H	H	✓		✓	✓	P	P	P	P		Tight land areas.	P
Wetland	MP-20	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓						–	P
Media Filter	MP-40	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		Unstable soils lead to clog.	P
Wet Vault	MP-50	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		–	P
Vortex Separator	MP-51	M	L	✓	L		✓	✓	✓		✓	✓	✓	✓	✓	✓		–	P
Drain Inlet	MP-52	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓		Large areas. Areas with trash/leaves	P
Non-Stormwater/Material Management BMPs																			
Water Conservation Practices	NS-1	✓								✓			□	□	□	□		–	–
Dewatering Operations	NS-2	✓								✓			□	□	□	□		–	–
Paving and Grinding Operations	NS-3	✓								✓			□	□	□	□		–	–
Temporary Stream Crossing	NS-4	✓								✓			□	□	□	□		–	–
Clear Water Diversion	NS-5	✓								✓			□	□	□	□		–	–
Illicit Connection/Discharge	NS-6		✓	✓	✓	✓	✓	✓		✓			□	□	□	□		–	–
Potable Water/Irrigation	NS-7	✓	✓		✓			✓		✓			□	□	□	□		–	–
Vehicle and Equipment Cleaning	NS-8	✓	✓				✓	✓		✓			□	□	□	□		–	–
Vehicle and Equipment Fueling	NS-9						✓			✓			□	□	□	□		–	–
Vehicle & Equipment Maintenance	NS-10		✓	✓			✓	✓		✓			□	□	□	□		–	–
Pile Driving Operations	NS-11	✓					✓			✓			□	□	□	□		–	–

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Concrete Curing	NS-12	✓			✓		✓			✓			□	□	□	□		–	–
Concrete Finishing	NS-13	✓			✓			✓		✓			□	□	□	□		–	–
Material Over Water	NS-14	✓	✓	✓	✓	✓	✓	✓		✓			□	□	□	□		–	–
Demolition Adjacent to Water	NS-15	✓	✓	✓	✓	✓	✓	✓		✓			□	□	□	□		–	–
Temporary Batch Plants	NS-16	✓	✓	✓	✓					✓			□	□	□	□		–	–
Material Delivery and Storage	WM-1	✓	✓	✓	✓		✓	✓		✓			□	□	□	□		–	–
Material Use	WM-2	✓	✓	✓	✓		✓	✓		✓			□	□	□	□		–	–
Stockpile Management	WM-3	✓	✓	✓	✓		✓	✓		✓			□	□	□	□		–	–
Spill Prevention and Control	WM-4	✓	✓	✓	✓		✓	✓		✓			□	□	□	□		–	–
Solid Waste Management	WM-5	✓	✓	✓	✓		✓	✓		✓			□	□	□	□		–	–
Hazardous Waste Management	WM-6		✓	✓	✓	✓	✓	✓		✓			□	□	□	□		–	–
Contaminated Soil Management	WM-7		✓	✓	✓	✓	✓	✓		✓			□	□	□	□		–	–
Concrete Waste Management	WM-8	✓			✓					✓			□	□	□	□		–	–
Sanitary/Septic Waste Management	WM-9		✓	✓		✓		✓		✓			□	□	□	□		–	–
Liquid Waste Management	WM-10	✓	✓	✓	✓		✓			✓			□	□	□	□		–	–
Erosion & Sediment Control BMPs																			
Scheduling	EC-1	✓								✓			□	□	□	□		–	
Preservation of Existing Vegetation	EC-2	✓								✓			□	□	□	□		–	
Hydraulic Mulch	EC-3	✓								✓			□	□	□	□		–	
Hydroseeding	EC-4	✓								✓			□	□	□	□		–	
Soil Binders	EC-5	✓								✓			□	□	□	□		–	
Straw Mulch	EC-6	✓								✓			□	□	□	□		–	
Geotextiles and Mats	EC-7	✓								✓			□	□	□	□		–	
Wood Mulching	EC-8	✓								✓			□	□	□	□		Not suitable for use on slopes steeper than 3:1 (H:V).	
Earth Dikes and Drainage Swales	EC-9	✓								✓			□	□	□	□		–	
Velocity Dissipation Devices	EC-10	✓								✓			□	□	□	□		–	
Slope Drains	EC-11	✓								✓			□	□	□	□		Maximum drainage area per slope drain is 10 acres.	
Streambank Stabilization	EC-12	✓								✓			□	□	□	□		–	
Polyacrylamide	EC-13	✓								✓			□	□	□	□		–	
Silt Fence	SE-1	✓								✓			□	□	□	□		Streams, Channels, Drain Inlets	
Sediment Basin	SE-2	✓		✓						✓			□	□	□	□		Not appropriate for drainage areas greater than 75 acres.	
Sediment Trap	SE-3	✓		✓						✓			□	□	□	□		Not appropriate for drainage areas greater than 5 acres.	
Check Dams	SE-4	✓								✓			□	□	□	□		Not appropriate in channels that drain areas greater than 10 acres.	
Fiber Rolls	SE-5	✓								✓			□	□	□	□		–	
Gravel Bag Berm	SE-6	✓								✓			□	□	□	□		May not be appropriate for drainage areas greater than 5 acres.	
Street Sweeping and Vacuuming	SE-7	✓		✓			✓			✓			□	□	□	□		–	
Sandbag Barrier	SE-8	✓								✓			□	□	□	□		Drainage area upstream of the barrier limited to 5 acres.	
Straw Bale Barrier	SE-9	✓								✓			□	□	□	□		Are suitable only for sheet flow on slopes of 10 % or flatter.	
Storm Drain Inlet Protection	SE-10	✓		✓						✓			□	□	□	□		Drainage area should not exceed 1 acre.	

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Chemical Treatment	SE-11									✓			□	□	□	□		–	
Stabilized Construction Entrance/Exit	TR-1	✓								✓			□	□	□	□		–	
Stabilized Construction Roadway	TR-2	✓								✓			□	□	□	□		–	
Entrance/Outlet Tire Wash	TR-3	✓								✓			□	□	□	□		–	
Wind Erosion Control	WE-1	✓								✓			□	□	□	□		–	

References:

1. California Stormwater Quality Association (2003). Stormwater Best Management Practice Handbook (www.cabmphandbooks.com).
2. Santa Clara Valley Urban Runoff Pollution Prevention Program (2004). Stormwater Handbook (www.scvurppp-w2k.com).

Notes:

H High
M Medium
L Low
P Potential
✓ Yes

Appendix 6-2
BMP Performance Data

Example of variability of BMP performance data: this table summarizes effluent concentrations of various pollutants that have been observed at detention basins.

Source: Data from Geosyntec Consultants.

Effluent Statistics					Effluent Percentiles						
BMPID	Parameter	Count	NDCount	%ND	5th	10th	25th	50th	75th	90th	95th
Detention Basins	Cadmium, Dissolved (ug/L as Cd)	75	43	57%	0.012	0.020	0.050	0.144	0.566	1.830	2.167
Detention Basins	Cadmium,Total (ug/L as Cd)	97	29	30%	0.083	0.110	0.248	0.568	1.313	2.359	3.145
Detention Basins	Copper, Dissolved (ug/L as Cu)	152	0	0%	1.947	2.526	4.864	8.117	13.727	24.263	28.125
Detention Basins	Copper, Total (ug/L as Cu)	184	14	8%	2.870	3.697	7.180	13.016	21.922	32.357	42.223
Detention Basins	Lead, Dissolved (ug/L as Pb)	111	52	47%	0.061	0.093	0.185	1.031	3.353	5.731	7.519
Detention Basins	Lead, Total (ug/L as Pb)	146	18	12%	0.837	1.639	4.902	12.725	28.191	52.553	97.903
Detention Basins	Nitrate + Nitrite, Total (mg/L as N)	27	18	67%	0.002	0.003	0.010	0.048	0.142	0.575	1.020
Detention Basins	Nitrate Nitrogen, Total (mg/L as N)	103	10	10%	0.133	0.174	0.270	0.578	0.918	1.684	2.150
Detention Basins	Nitrogen, Ammonia Total (mg/L as N)	13	3	23%	0.016	0.019	0.029	0.048	0.098	0.208	0.289
Detention Basins	Nitrogen, Kjeldahl, Total (mg/L as N)	97	14	14%	0.436	0.542	0.781	1.242	1.951	3.162	3.918
Detention Basins	Nitrogen, Total (mg/L as N)	12	0	0%	0.528	0.575	0.775	1.272	2.431	3.856	4.495
Detention Basins	Phosphorous, Dissolved (mg/L as P)	49	12	24%	0.028	0.035	0.049	0.085	0.143	0.251	0.329
Detention Basins	Phosphorous, Total (mg/L as P)	174	20	11%	0.014	0.019	0.037	0.108	0.283	0.460	0.670
Detention Basins	Solids, Total Dissolved (mg/L)	81	1	1%	9.083	19.536	45.677	73.510	111.402	233.722	379.539
Detention Basins	Solids, Total Suspended (mg/L)	177	8	5%	2.114	3.043	9.192	21.958	43.145	76.742	117.692
Detention Basins	Zinc, Dissolved (ug/L as Zn)	153	1	1%	3.585	7.232	20.610	34.267	60.530	101.297	146.808
Detention Basins	Zinc, Total (ug/L as Zn)	207	2	1%	12.097	17.843	34.930	60.976	105.574	197.697	263.675

Appendix 7-1
Summary of TMDL Implementation and Proposition O Projects

Table 1
Non-Structural and Structural BMPS Recommended for Implementation for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2/3)	Marina Del Rey Mother's Beach & Back Basins	Comments
Green Solutions			
Infiltration/Reduction of Runoff			
Infiltration BMPs (inf. basin, inf. trench, culvert, porous pavement, grass/gravel pavers, dry well, mulching, planters, rain gardens, retention grading, tree wells, permeable catch basin bottoms, etc.)	✓	✓	At parks, open areas, abandoned alleys, vacant lots, schools and government facilities.
Vegetated swale/basin or bioswale	✓	✓	
Redirecting downspouts	✓	✓	
Green roofs	✓	✓	
Stormwater Use			
Cisterns/Rain Barrels	✓	✓	
Onsite Storage and Use of Stormwater	✓		Includes: cisterns, rain barrels, driveway dry wells, redirected downspouts.
Source Control			
Source control	✓	✓	
Localized Treatment			
Constructed Wetlands and bioretention	✓	✓	Bay Restoration Plan - not specific to water quality but can have water quality improvement effects. J2/3 and J1/4 TMDL IPs specifically call out subsurface wetlands instead of the general constructed wetland
Dry Weather Diversions	✓	✓	
Local storage, treatment (chlorination) and use of stormwater	✓	✓	
Regional Solutions			
Treatment and Discharge at Urban Runoff Plants (URPs); End of Pipe Treatment	✓		
Treatment and Reuse at Urban Runoff Plants		✓	
Storage (multi-use retention basin, extended detention basin, underground retention/infiltration, and underground detention)	✓	✓	DCWMMP and LARRMP refer to detention/retention basins for flood control, could expand to include runoff water quality improvement. Includes diverting runoff to the basins
Treatment Options			
Catch basin inserts		✓	
Oil absorbing bilge pads to capture and recycle used oil from boats		✓	
Education and Outreach			
General Public Education			
Public Education and Outreach (k-12, coordinated between jurisdictions)	✓	✓	

Table 1 (Continued)
Non-Structural and Structural BMPS Recommended for Implementation for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2/3)	Marina Del Rey Mother's Beach & Back Basins	Comments
Reduce non-point source pollutants through public education	✓	✓	Note: the Bay Restoration Plan seeks a focus on household toxins
Catch basin/storm drain stenciling program		✓	
Public signage		✓	
Industry Education			
Industry/BMP/Activity/Pollutant/Community specific BMP outreach	✓	✓	
Planning and Design BMPs			
Street Planning and Design			
Incorporate green streetscapes and public landscapes	✓	✓	
Street Cleaning			
Street and storm drain maintenance	✓	✓	
Increase and coordinate street cleaning with trash pickup schedule		✓	
Pre-wet weather storm drain flushing	✓		
Other			
Business Improvement District outreach	✓		
Waste Collection			
Trash Collection			
Increase number of public receptacles in high priority areas (trash, cigarette, recyclable containers)	✓	✓	
Improved restaurant and grocery store trash management	✓	✓	
Litter			
Increased litter removal	✓		
Other			
Portable toilets	✓		J2/3 Imp Plan calls out as a way to reduce pollution from homeless population.
Training			
Employees			
Support NPDES program - inspections, training of staff/number of staff, legal support, etc.		✓	

Table 2
Recommended Policy Changes in TMDL Implementation Plans Prepared for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2–3)	Marina Del Rey Mother's Beach & Back Basins
Green Solutions		
Evaluate BMP requirements for special/holiday events and suggest enhancement, if needed.		✓
Pollution Prevention Partner pledge program		✓
Planning and Design		
Plans and Guidelines		
Development planning		✓
Coordination		
Jurisdictions and Agency Coordination		
Inter-agency coordination		✓
Investigate the potential to form Business Improvement Districts		✓
Ordinances and Codes		
Land Use		
Changes to zoning/land use to accommodate runoff management options	✓	
Infiltration, Conservation, Habitat		
Evaluate impacts of the County and City ordinances requiring down spouts from rooftops to discharge into landscape planters, swales, dry wells, and cisterns		✓
Pet Waste		
"Pooper-scooper" ordinance strengthening		✓
Consider dog restrictions in problematic areas		✓
Incentives		
Rewards		
Incentives for private implementation of cisterns/rain barrels, porous pavement, water efficient landscaping, and similar practices	✓	
Incentives for multi-objective projects		✓
Fines–Penalties		
Enforcement actions	✓	
Existing Program Expansion		
SUSMP		
Require priority development projects to treat stormwater runoff in accordance with SUSMP guidelines		✓
Other		
Recommend the LARWQCB consider amending the point discharge permit's constituent requirements to include bacteria indicators and 303(d) list pollutants for industrial and commercial facilities		✓

Table 3
Wet Weather BMPs Planned for Construction to Support TMDL Implementation for Santa Monica Bay Beaches

No.	Project Name	Project Sponsor	Project Components	Estimated Cost	Status
1	Grand Ave. Tree Wells Project	City of LA	Installation of 20 stormwater bioretention filtration BMPs. Dry weather flow and a portion of the wet weather flow along Abbot Kinney Blvd. and Grand Ave. will be diverted and treated using Filterra Stormwater Bioretention Filtration System before it enters the storm drain, eliminating trash, bacteria, metals and TSS discharges to the Bay. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedances days by 10□ July 15, 2009	□1,075,927	Pre-design
2	Imperial Highway Sunken Median Stormwater Best Management Practices Project	City of LA	Retrofit 1.3 miles of the highway median by installing infiltration trenches and a vegetated buffer strip to capture and infiltrate the runoff from Imperial Highway. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ July 15, 2009	□2,723,403	Pre-design
3	Westminster Dog Park Stormwater Best Managements Practices Project	City of LA	Installation of a vegetated swale and modular biofiltration (StormTreat) system to capture and treat runoff from the dog park. The treated water will be reused for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009	□1,438,755	Pre-design
4	Westchester LAX	City of LA	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from North Westchester. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009	□32,722,000	Approved
5	Temescal Canyon	City of LA	Installation of various BMPS, including hydrodynamic separators and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Temescal Canyon. Treated stormwater runoff will be re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacterial TMDL milestones of reducing exceedance days by July 15, 2009	□18,646,000	Approved
6	Penmar Canyon Park	City of LA/ City of Santa Monica	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Rose Avenue near Penmar Golf Course. Treated storm water runoff will be infiltrated and partially re-used for irrigation. The project will assist the City in meeting SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ July 15, 2009	□23,585,000	Approved
7	Santa Ynez Park	City of LA	Subsurface constructed wetland.	□1,500,000	Under Construction

Table 3 (Continued)
Wet Weather BMPs Planned for Construction to Support TMDL Implementation for Santa Monica Bay Beaches

No.	Project Name	Project Sponsor	Project Components	Estimated Cost	Status
8	Main Library	City of Santa Monica	Cistern/Rain barrel. Stormwater will be used for local storage and use	□700,000	Completed
9	Big Blue Bus Phase I	City of Santa Monica	Infiltration pits	□16,000	Completed
10	Big Blue Bus Phase II	City of Santa Monica	Infiltration pits	□500,000	Under-design
11	Civic Center Parking Structure	City of Santa Monica	Separation-screening, catch basin insert	□60,000	Completed
12	Fire Station □2	City of Santa Monica	Infiltration pits, permeable pavement	□14,000	Completed
13	Clover Park	City of Santa Monica	Infiltration	□27,000	Completed
14	Virginia Ave. Park	City of Santa Monica	Infiltration	□35,000	Completed
15	Memorial Park	City of Santa Monica	Bioretention, infiltration trench or basin, dry wells, pervious pavement	□1,117,551	Under-design
16	Crescent Bay Park	City of Santa Monica	Infiltration	□1,117,551	Under-review
17	Civic Center Village Housing	City of Santa Monica	Infiltration, storage/stromwater use, or permeable pavement	□1,117,551	-
18	Storm Water Stations □16	City of El Segundo	Cistern/rain barrel and local storage and stormwater use	□250,000	Under Construction
19	Storm water stations □17	City of El Segundo	Cistern/rain barrel and local storage and stormwater use	□250,000	Under Construction

Table 4
Santa Monica Bay Beach J2□J3 Low-Flow Diversion Projects

No.	Locations of Low-Flow Diversions	Lead Agency	Construction Completion Date
Jurisdiction 2			
1	Castlerock/Parker Canyon	LA County	4/10/2007
2	Santa Ynez Canyon	LA County	6/22/2006
3	Palisades Park	City of Los Angeles	10/1/2000
4	Pulga Canyon	LA County	10/5/2004
5	Bay Club Drive	City of Los Angeles	1/24/2001
6	Temescal Canyon	City of Los Angeles	6/23/2003
7	Santa Monica Canyon	City of Los Angeles	6/10/2003
8	North Westchester	LA County	10/5/2004
9	Playa del Rey	LA County	4/15/2001
10	Imperial Highway (2 LFDs)	City of Los Angeles / LA County	4/15/2006
11	Marquez Avenue	City of Los Angeles	6/15/2006
Jurisdiction 3			
12	Montana Ave.	City of Santa Monica	7/31/2007
13	Wilshire Blvd	City of Santa Monica	1/31/2008
14	Santa Monica Pier	City of Santa Monica	10/1/1997
15	Pico-Kenter	City of Los Angeles/ City of Santa Monica	10/1/2001
16	Ashland Ave.	LA County	4/15/2006
17	Rose Ave.	LA County	11/11/2005
18	Brooks Ave.	LA County	4/15/2001
19	Venice Pavilion	City of Los Angeles	6/10/2003
20	Thornton Avenue	City of Los Angeles	6/22/1999

Table 5
BMPs to Support Marina Del Rey Mother□s Beach and Back Basins Bacteria TMDL

Project	Jurisdiction Areas	Structural BMPs	Status	Cost
Storm Drain No. 5243 and 3872	City of Los Angeles/Culver City	Low flow diversion	No. 5243 Completed; No. 3872 not completed, location is being changed	Project 5243: □800,000 Project 3872: □1,000,000
Storm Drain No. 3874	City of Los Angeles	Low flow diversion	Completed	Project 3874: □1,000,000
Small parcel and road drains	County Unincorporated	Source identification and control	Completed	□
Basin D circulation	County Unincorporated	Increase circulation in Basin D	Completed	□2,000,000

Table 6
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category(1)	Status(2)
Dominguez Channel Watershed							
01-35	Rosecrans Recreational Center Storm Water Enhancements	WQ improvement project that will capture and treat runoff through redirection to bioswales and a vegetated retention basin, install permeable paving for parking lots, an infiltration cistern, a synthetic turf soccer field, and "smart" irrigation systems. Includes site grading, tree planting and landscaping.	Trash Metals TSS Bacteria	Metals: 100□ TSS: 99□ Bacteria: 15□	□4,829,119	3	Design
01-36a	Wilmington Drain Multiuse Project	WQ and habitat improvement project that is the first phase of the Machado Lake Project. This project will install trash booms and habitat improvements in the Wilmington Channel to reduce the amount of pollutants discharged into the lake. Includes channel re-alignment, grading and wetland restoration.	Trash Metals Bacteria TSS O&G	Trash: 100□ Metals: 82□ Bacteria: 78□ TSS: 91□ O&G: 90□	□2,200,613 (pre-design/design) □15,741,921 (set aside)	1 and 3	Design
01-36b	Machado Lake Ecosystem Rehabilitation Project	WQ and habitat improvement project that will rehabilitate the lake and surrounding riparian areas. Project includes removal and reuse of sediment from the lake, habitat improvements including wetland restoration, installing outlet devices and dam spillways, treating runoff, installing trash capture devices, installing a pump and pipe system, installing pervious paving, bioswales, smart irrigation and cisterns.	Trash Metals Bacteria TSS O&G	Trash: 100□ Metals: 82□ Bacteria: 78□ TSS: 91□ O&G: 90□	□10,124,312 (pre-design/design) □89,399,585 (set aside)	1 and 3	Design
01-40	Peck Park Canyon Enhancement Project	Flood control and WQ improvements will be provided through the infiltration of stormwater and associated pollutants. The project will use a combination of in-stream, source control and over-bank BMPs, including bioswales, catch basin and rock slope protection measures, native planting, educational enhancements and restoration and extension of trails.	Trash TSS Metals O&G Bacteria TKN	All: 100□	□6,190,000	3	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category(1)	Status(2)
01-41	Inner Cabrillo Beach Bacterial Water Quality Improvement Project	WQ improvement project that will install wave generators among other measures to improve the WQ of the inner Cabrillo beach that has been historically polluted. This project will target bacteria removal in stormwater and urban runoff and improve the WQ in the nearby beach by providing recirculation. This project will assist the City in meeting the goals of the Harbor Bacteria TMDLs, particularly since many elements of this project are identified in the TMDL Implementation Plan.	Bacteria	100□ compliance with AB411	□8,000,000	1	Construct ion
Los Angeles River Watershed							
01-9	Los Angeles Zoo Parking Lot: Demonstration on Environmental Sustainability Project	WQ)improvement project that will install various Best Management Practices (BMPs), including trash screens, porous pavement and bioswales, to reduce trash, sediments, heavy metals, oil and grease in parking lot runoff to assist the City in complying with the Los Angeles River Trash and Metals Total Maximum Daily Loads (TMDLs). The project will also provide educational benefits to zoo patrons.	Trash TSS Metals O&G	Trash: 90□ TSS: 99□ Metals: 99□ O&G: 80□	□13,904,242	1	Design
01-10	Strathern Pit Multiuse Project	WQ and flood control protection project that will convert a 30-acre gravel pit into a multi-purpose facility that includes a retention basin and constructed wetland to capture and treat flow using BMPs.	TrashTSSM etals O&GBacteri aTKN	Compliance with WQ objectives of the Basin Plan, Ocean Plan, and California Toxics Rule	□17,800,000	3	Land Acquisitio n

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category(1)	Status(2)
01-11	Cesar Chavez Ground Water Improvement Project	Groundwater improvement project that will install and increase gas transport piping to allow gas to be removed from underground to create space for the aquifer to receive more recharge water. Recharging underground aquifers with stormwater and urban runoff will reduce runoff, and its associated pollutants such as trash, nutrients, total suspended solids, and heavy metals, from reaching the Los Angeles River. This project will assist the City in complying with the Los Angeles River Trash, Nutrients/Odor, and Metals TMDLs.	Trash TSS Metals O&G Bacteria TKN	100□ of the tributary storm water from the sub-drainage area will be percolated into the ground.	□3,040,000	2	Post-Construct ion
01-12	Cabrito Paseo Walkway / Bike Path Project	WQ improvement project that will convert an unimproved street into a bike path/walkway that is graded to direct flow into bioswales and tree wells for infiltration. The project will also install trash collectors at storm drain inlets and install "smart" irrigation.	Trash TSS Metals O&G Bacteria TKN	TSS: 62□ Metals: 75□ O&G: 88□ TKN: 17□	□1,337,696	3	Pre-design
01-14	Hansen Dam Recreational Area Parking Lot and Wetlands Restoration Project	WQ improvement project that will create treatment wetlands to capture, treat and use wet and dry-weather flows from three parking lots. The project will redirect flow from three lots into the treatment wetlands for pollutant removal, groundwater recharge and have environmental education and recreation benefits. This project will assist the City in complying with the Los Angeles River Trash, Nutrients/Odor and Metals TMDLs.	TSS TP TKN Metals O&G Bacteria	TSS: 95□ TP: 58□ TKN: 48□ Metals: 80□ O&G: 81□ Bacteria: 80□	□2,220,702	3	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category(1)	Status(2)
01-16	South Los Angeles Wetlands Park	WQ improvement project that will convert a MTA maintenance yard into a constructed wetlands habitat to capture, treat, and reuse the polluted runoff from the surrounding sub-basins. The cleansed runoff will be recycled through the wetlands to provide a constant flow in the habitat. The proposed wetlands habitat will remove bacteria, trash, total suspended solids, and heavy metals. The project will assist the City in complying with the Los Angeles River Trash, Nutrient, Metals and future Bacteria TMDLs.	Metals O&G TKN Bacteria	Metals: 50□ Bacteria: 75□	□8,100,000	3	Design
01-28	Oros Green Street	WQ improvement project that installed 30 rain gardens to capture, treat and reuse polluted runoff generated by Oros Street and residential dwellings. The treated runoff will be released into a park at Oros Street. This project targets trash, nutrients and heavy metals to assist the City in meeting the Trash, Nutrients/Odor, and Metals TMDLs for the Los Angeles River.	Metals O&G TKN Bacteria	All: 80□	□386,000	4	Completed
01-29	Echo Park Lake Restoration Project	WQ and flood control project that will include draining the lake to remove contaminated sediments, repairing or replacing storm drain pipes to prevent water loss, reconstructing concrete inlet structures, installing devices to capture sediments, trash, and oil and grease, reconstructing walking paths with permeable surfaces, installing "smart" irrigation systems, and providing educational signage and kiosks.	Trash Metals Bacteria TSS O&G TKN	Trash: 100□ Metals: 100□ Bacteria: 80□ TSS: 100□ O&G: 82□ TKN: 43□	□10,997,899 (pre-design/design) □73,265,414 (set aside)	1 and 3	Design
	Taylor Yard River Park - Parcel G2 Land Acquisition	Acquire a parcel of land adjacent to the LA River as part of Revitalization Master Plan. □25M in Prop O funds must be augmented. CD 1 leads purchase negotiations (coordination with Trust for Public Land	Nutrients Bacteria Trash Metals	---	□25,000,000	1	Land Acquisition

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
	Albion Dairy Park	Acquire a parcel of land adjacent to the LA River as part of LA River Revitalization Master Plan.	Nitrogen Metals Trash Bacteria O&G	---	$5,000,000	2	Land Acquisition
Los Angeles River & Ballona Creek Watersheds							
n/a	Catch Basin Inserts and Coverings Phase I	WQ improvement project installed 8,000 catch basin inserts and 6,000 catch basin screens in the high trash generation areas of the City. This project assisted the City in meeting the first milestone of reducing trash by 20% by September 2006.	Trash	Achieved compliance with 20% reduction milestone	$17,000,000	1	Completed
01-52a	Catch Basin Opening Screen Covers Phase II	WQ improvement project that will install 6,000 catch basin screens to remove trash and debris from stormwater and urban runoff. This project will assist the City in meeting the goals of the Los Angeles River and Ballona Creek Trash TMDL 30% reduction target of September 30, 2007.	Trash	90%	$10,000,000	1	Completed
01-52b	Catch Basin Opening Screen Covers Phase III	WQ improvement project that will install 34,000 catch basin screens in medium and low trash generation areas of the City to remove trash and debris from stormwater and urban runoff. This project will assist the City in meeting the goals of the Trash TMDL.	Trash	100% compliance with water quality objectives of the Los Angeles River and Ballona Creek Trash TMDLs	$44,500,000	1 and 3	Contstruction

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
Santa Monica Bay Beaches Watershed							
01-20a	La Cienega/Fairfax DWP Power Line Easement Stormwater BMP Project	WQ improvement project that will install a stormwater lift station, flow diversion facility, hydrodynamic separator, underground detention tank (800,000 gallons), bioretention area, effluent detention tank, final effluent pump station, recirculation pump, and overflow pipes. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75% - 82% Bacteria: 75% TP: 50% TN: 50%	$7,667,888		Design
01-20b	Mar Vista Recreation Center Stormwater BMP Project	WQ improvement project that will divert dry weather flows and the "first flush" from the Sawtelle Channel to the adjacent Mar Vista Rec. Center and Park. The project will include the installation of a stormwater lift station, flow diversion facility, hydrodynamic separator, 500,000-gallon underground detention tank, chlorination facility, final effluent pump station, recirculation pump, and overflow piping. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75% - 82% Bacteria: 75% TP: 50% TN: 50%	$4,556,186	1	Construction

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
01-20c	Grand Avenue Tree Wells Project	WQ improvement project that will install twenty (20) stormwater bioretention filtration BMPs. Dry weather flow and a portion of the wet weather flow along Abbot Kinney Blvd. and Grand Blvd. will be diverted and treated using a Bioretention Filtration System before it enters the storm drain, thus eliminating trash, bacteria, metals, and TSS discharges to the Bay. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75□ - 82□ Bacteria: 75□ TP: 50□ TN: 50□	□1,075,927		Post-Construction
01-22a	Imperial Highway Sunken Median Stormwater Best Management Practices Project	WQ improvement project that will retrofit 1.3 miles of the highway median by installing infiltration trenches and a vegetated buffer strip to capture and infiltrate the runoff from Imperial Highway. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009.	BacteriaMetalsTSSO&G TPTN	100□ compliance with AB411	□2,723,403	1	Bid & Award

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[(1)]	Status[(2)]
01-22c	Westminster Dog Park Stormwater Best Management Practices Project	WQ improvement project that will install a vegetated swale and modular biofiltration system to capture and treat runoff from the dog park. The treated water will be reused for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009.	Bacteria TSS TP TN	100□ compliance with AB411	□1,438,755	4	Construction
01-22e	Temescal Canyon Recreation Center Stormwater Best Management Practices Project	WQ improvement project that will install various BMPs, including hydrodynamic separators and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Temescal Canyon. Treated stormwater runoff will be re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009.	Bacteria TSS Metals TP TN	100□ compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	□18,646,000	4	Bid & Award (Phase I)
01-22f	Westchester Stormwater Best Management Practices Project	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from North Westchester. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10□ by July 15, 2009.	Bacteria TSS Metals TP TN	100□ compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	□32,722,000	2	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[(1)]	Status[(2)]
01-22g	Penmar Water Quality Improvement & Runoff Reuse Project	WQ improvement project that will install various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Rose Avenue near Penmar Golf Course. Treated storm water runoff will be infiltrated and partially re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Bacteria TSS Metals TP TN	100% compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	$23,585,000	2,4	Bid & Award (Phase I)
01-51	Santa Monica Bay Beaches Low Flow Diversions Upgrades Project	WQ improvement project that will upgrade eight low flow diversion structures to remove bacteria from dry weather flow, thereby assisting the City in meeting the SMB bacteria TMDL winter dry weather conditions by July 15, 2009.	Bacteria	100% compliance with AB411	$5,980,000 (pre-design/design) $29,020,000 (set aside TBD)	1	Bid & Award

(1) Proposition O Funding Categories and Bond Approved Amounts:
Category 1 - Rivers Lakes, Beaches, Bays and Ocean Water Quality Protection Projects - $250 million
Category 2 - Water Conservation, Drinking Water and Source Protection Projects - $75 million
Category 3 - Flood Water Reduction, River and Neighborhood Parks That Prevent Polluted Runoff and Improve Water Quality Projects - $100 million
Category 4 - Storm Water Capture, Clean-up and Re-Use Projects - $75 million
(2) As of March 2009.

Appendix 7-2
Proposition O Project Selection Criteria (adopted by the Board of Public Works)

Proposition O, a $500M General Obligation Bond that was approved by 76% of the City of LA voters, says "*all projects shall provide water quality benefits and have as their **primary purpose** the reduction of pollutant loads to the impaired waters of Los Angeles to meet water quality standards.*"

The project selection criteria, below, will help meet the intent of the bond language and will be applicable to all projects in order to meet Water Quality Standards set by the RWQCB. Proposition O projects must demonstrate that they will alone, or with other proposed or existing projects, result in attainment of one or more Water Quality Standards (WQS).

The Purpose of These Criteria

These criteria are provided as a guide for City staff to use as they review projects proposed to receive funding from Proposition O funds.

The project selection criteria have been developed so that staff can select projects that meet the intent of the bond language that appears above.

Proposed projects found to be consistent with these criteria will be evaluated in detail. Those projects that are evaluated in detail will then be scored. Staff will present proposed projects that exceed specified scores to the Proposition O Citizens Advisory Committee (COAC) and the Proposition O Administrative Oversight Committee (AOC).

Eligibility to be Scored

The project must demonstrably reduce pollutant loads to the impaired waters of Los Angeles to comply with Water Quality Standards as identified in the 303(d) list. Funds can be used for project planning, design, construction and monitoring. The project shall avoid or mitigate negative impacts including: flood control, loss of habitat hardening of creeks or rivers, and shall not exacerbate any existing environmental problems in the vicinity or downstream of the project.

Eligibility for Presentation to the COAC and AOC

Projects can be judged eligible for presentation to the COAC and AOC if projects receive a total of 75 points from any of the project selection criteria. ***Any project that does not obtain a minimum of 75 points will not be considered for further investigation.***

Adopted Project Evaluation Criteria:

Project Significance	
5 points	1. Is the project located in a high priority catchment area? 2. Are the pollution problem and the loads for the drainage area served by the project site Best Management Practices (BMPs) treatment train significant?
Compliance with Water Quality Goals	
30 points	1. Does the project BMP treatment train help achieve water quality standard compliance for the impaired waters? 2. Can compliance objectives be quantified? 3. During which seasons (wet and/or dry) would compliance be achieved? (year-round improvement is the preferred goal)
Pollution Reduction	
10 points	1. Does the project result in reduction of loads/concentrations of more than one impairing pollutant? 2. What are the number and types of impairing pollutants that can be reduced? Trash, bacteria, toxic sediment, and metals have highest priority. 3. Does the project cause positive or negative impacts to other pollution problems? (Up to 4 pts for positive and minus 4 pts for negative)
10 points	1. Is the BMP a proven BMP for pollutant removal of this type based upon available ASCE, USEPA, or site-specific BMP scientific data? 2. What are the magnitude and percent of overall load/concentration reduction predicted by the BMP treatment train? The magnitude/removal percentage is very significant.
Multiple Objectives	
25 points (maximum)	***These criteria are intended to serve as guidelines for awarding points to a proposed project. Other environment enhancements not found in this list may be used.*** (5 pts. maximum for each criteria) 1. Does the project augment local water supply? Quantify. 2. Does the project significantly reduce flood risk? Quantify. 3. Does the project provide stream restoration? Quantify. 4. Does the project provide recreational open space? Quantify. 5. Does the project provide significant habitat value? Quantify. 6. Does the project address an environmental justice issue? How? 7. Is the project visible (i.e. can it be visually seen)? 8. Is the project environmentally sustainable? How? 9. Does the project integrate with IRP, IRWMP, TMDLs Implementation plans, LA River Revitalization Plan, and other existing watershed management plan? How? 10. Does the project have a strong community support? 11. Does the project involve a multi-agency and stakeholder partnership? 12. Does the project provide educational or demonstrational functions?
Project Cost Effectiveness	
10 points	1. Do the project capital and O&M costs meet industry wide standards? How long does the project remain in operation before its replacement? 2. What is cost per unit of pollutant reduction? (example cost per pound of pollutant reduced) 3. Can the project be cost effectively adapted to changing conditions (regulatory, pollution, land-use, etc)? 4. Does the project leverage any existing or potential funds from state and other sources? How much and from where?

Project Readiness	
10 points	1. How ready is the project for construction? 2. How complete are the project plans and specifications? When will the project be completed? 3. What is the status of CEQA and other permitting requirements? Is it CEQA ready? 4. Is there a site available for the project? Or, does a clear process exist for attainment (the parcel size, proximity to an impaired water body, soil condition, permeability, etc. are some characteristics considered when identifying a candidate parcel.)? What is the project's construction duration?
Total points	**100 points**

Note (1): In evaluating the different categories, an adopted plan or a validated and calibrated computer model would be used in the assessment.

Note (2): The breakdown of points in each category is for the ease of project evaluation and scoring. Even though summation of each category's sub-points may exceed the category maximum allowable points, only maximum allowable points for the category will be allocated.

Note (3), Legend: American Society of Civil Engineer (ASCE), United States Environmental Protection Agency (USEPA) , Integrated Resources Planning (IRP), Integrated Regional Water Management Plan (IRWMP), Total Maximum Daily Load (TMDLs), Operation and Maintenance (O&M), California Environmental Quality Act (CEQA), Best Management Practices (BMP).

Appendix 7-3
Proposition O Project Selection Criteria (revised draft, not adopted)

Proposition O, a $500M General Obligation Bond, that was passed by 76% of the City of LA voters says "all projects shall provide water quality benefits and have their **primary purposes** the reduction of pollutant loads to the impaired waters of Los Angeles to meet Water Quality Standards."

The **proposed** project selection criteria below will help meet the intent of the above bond language and will be applicable to all projects in order to meet Water Quality Standards set by the RWQCB. Proposition O projects must demonstrate that they will alone, or with other proposed or existing projects, result in attainment of one or more Water Quality Standards (WQS).

The Purpose of These Criteria

These criteria are provided as a guide for City staff to use as they review projects proposed to receive funding from Proposition O funds.

The project selection criteria have been developed so that staff can select projects that meet the intent of the bond language that appears above.

Proposed projects found to be consistent with these criteria will be evaluated in detail. Those projects that are evaluated in detail will then be scored. Staff will present proposed projects that exceed specified scores to the Proposition O Citizens Advisory Committee (COAC) and the Proposition O Administrative Oversight Committee (AOC).

Eligibility to be Scored

The project must demonstrably reduce pollutant loads to the impaired waters of Los Angeles to comply with Water Quality Standards as identified in the 303(d) list. Funds can be used for project planning, design, construction and monitoring. The project shall avoid or mitigate negative impacts including: flood control, loss of habitat hardening of creeks or rivers, and shall not exacerbate any existing environmental problems in the vicinity or downstream of the project.

Eligibility for Presentation to the COAC and AOC

Projects can be judged eligible for presentation to the COAC and AOC if projects receive a total of 75 points from any of the project selection criteria. *Any project that does not obtain a minimum of 75 points will not be considered for further investigation.*

Proposed Project Evaluation Criteria (Not Adopted):

Project Significance	
5 points	Is the project located in a high priority catchment area? Are the pollution problem and the loads for the drainage area served by the project site Best Management Practices (BMPs) treatment train significant? Note: Where possible, an adopted plan or a validated and calibrated computer model supports these characterizations.
Compliance with Water Quality Goals	
30 points	Does the project BMP treatment train help achieve water quality standard compliance for the impaired waters? Can compliance objectives be quantified? During which seasons does compliance achieve (where year round improvement is the preferred goal and regular seasonal improvements are preferred to erratic improvements)? Note: Where possible, a validated and calibrated computer model supports these compliance conclusions.
Pollution Reduction	
10 points	Does the project result in reduction of loads/concentrations of more than one impairing pollutant? What are the number and types of impairing pollutants that can be reduced? Trash, bacteria, toxic sediment, and metals have highest priority. Does the project cause positive or negative impacts to other pollution problems? (Up to 4 pts for positive and minus 4 pts for negative) Note: A validated/calibrated computer model can quantify the load reductions.
10 points	Is the BMP a proven BMP for pollutant removal of this type based upon available ASCE, USEPA, or site-specific BMP scientific data? What are the magnitude and percent of overall load/concentration reduction predicted by the BMP treatment train? The magnitude/removal percentage is very significant. Note: Where possible, a validated and calibrated computer model supports these conclusions.
Multiple Objectives	
25 points (maximum)	These criteria are intended to serve as guidelines for awarding points to a proposed project. Other environment enhancements not found in this list may be used. (5 pts. maximum for each criteria) Does the project augment local water supply? Quantify. Does the project significantly reduce flood risk? Quantify. Does the project provide stream restoration? Quantify. Does the project provide recreational open space? Quantify. Does the project provide significant habitat value? Quantify. Does the project address an environmental justice issue? How? Is the project visible (i.e. can it be visually seen)? Is the project environmentally sustainable? How? Does the project integrate with IRP, IRWMP, TMDLs Implementation plans, LA River Revitalization Plan, and other existing watershed management plan? How? Does the project have a strong community support? Does the project involve a multi-agency and stakeholder partnership? Does the project provide educational or demonstrational functions?

Project Cost Effectiveness	
10 points	Do the project capital and O&M costs meet industry wide standards? How durable is the project? What is cost per unit of pollutant reduction? (example – cost per pound of pollutant reduced) Can the project be cost effectively adapted to changing conditions (regulatory, pollution, land-use, etc)? Does the project leverage any existing or potential funds from state and other sources? How much and from where?
Project Readiness	
10 points	How ready is the project for construction? How complete are the project plans and specifications? When will the project be completed? What is the status of CEQA and other permitting requirements? Is it CEQA ready? Is there a site available for the project? Or, does a clear process exist for attainment (the parcel size, proximity to an impaired water body, soil condition, permeability, etc. are some characteristics considered when identifying a candidate parcel.)?
Total points	100 points

Note: The points' breakdown in each category is for the ease of project evaluation and scoring. Even though summation of each category's sub-points may exceed the category maximum allowable points, only maximum allowable points for the category will be allocated.

Legend: American Society of Civil Engineer (ASCE), United States Environmental Protection Agency (USEPA) , Integrated Resources Planning (IRP), Integrated Regional Water Management Plan (IRWMP), Total Maximum Daily Load (TMDLs), Operation and Maintenance (O&M), California Environmental Quality Act (CEQA), Best Management Practices (BMP).

Appendix 9-1
Approved and Funded Projects (Capital Improvement Program)

Table 1
Proposition O Projects

Project Name	Council District	Responsible Office	Total Project Budget
Oros Green Street	13	BSS	$972,651
Catch Basin Inserts/Covers – Phase I	1, 4, 8, 9, 10, 13, 14, 15	BOS	$17,000,000
Catch Basin Inserts/Covers – Phase II	1, 4, 5, 8, 9, 10, 13, 14, 15	BOS	$10,000,000
Catch Basin Inserts/Covers – Phase III	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15	BOS	$44,500,000
Inner Cabrillo Beach Bacterial Water Quality	15	Harbor	$16,000,000
Cesar Chavez Recreation Complex	6	DWP	$9,841,230
Grand Avenue Tree Wells	11	BOE	$1,075,927
Strathern Pit Multiuse	6	LA County	$22,505,000
La Cienega/Fairfax Power Line Easement	10	BOE	$7,667,887
Mar Vista Recreation Center	10	BOE	$4,556,186
Imperial Highway Sunken Median	11	BOE	$2,723,403
Westminster Dog Park	11	BOE	$1,438,755
Los Angeles Zoo Parking Lot	4	BOE	$13,904,243
Temescal Canyon BMP (Phases I and II)	11	BOE	$18,646,000
Westchester BMP	11	BOE	$32,722,000
Penmar BMP (Phases I and II)	11	BOE	$23,585,000
Rosecrans Recreational Center	15	BOE	$6,754,033
Peck Park Canyon	15	BOE	$8,231,118
Santa Monica Bay Beaches Low Flow Diversion Upgrades	11	BOE	$37,119,028
Cabrito Paseo Walkway/Bike Path	6	BOE	$4,463,009
Hansen Dam Recreational Area	7	BOE	$2,220,702
South Los Angeles Wetlands Park	9	BOE	$25,328,910
Wilmington Drain Restoration Multiuse	15	BOE	$17,942,534
Machado Lake	15	BOE	$99,523,897
Echo Park Lake Restoration	13	BOE	$84,263,313
Taylor Yard Park (G2) – Land Acquisition	1	BOE	To be determined
Albion Dairy Park – Land Acquisition	1	BOE	To be determined
Total			**$512,984,826**

STORMWATER POLLUTION ABATEMENT FUND (SPAF) PROJECTS										
PROJECT NAME	**WORK ORDER**	**CD**	**RESPONSIBLE OFFICE**	**PROJECT ESTIMATE**	**YEAR 2006-07**	**YEAR 2007-08**	**YEAR 2008-09**	**YEAR 2009-10**	**YEAR 2010-11**	**YEAR 2011-12**
					SPA Funded	**SPA Funded**	**SPA Funded**	**SPA Funded**	**SPA Funded**	**SPA Funded**
Maintenance Hole Resetting	SSDMHADJ	ALL	BOS	1,253,000	196,000	203,000	210,000	217,000	210,000	217,000
Menlo Avenue - Vermont SD S/O 69th	SZS11297	8	BOE	700,000	700,000					
11th Street Sd - Maple Ave to Wall St	SZS11296	9	BOE	1,015,000	1,015,000					
Vermont Ave S/O PCH SD Improvements	SZS11275	5,11	STREET							
Santa Monica Transit Pkwy Drainage Improvement	SZS11279	2	BOE							
Mulholland Dr. at Allenwood Rd. Slope Repair	NOT OPEN	15	STREET	840,000	840,000					
Vermont Ave S/O Pch SD Improvements	NOT OPEN	1	BOE	665,000	665,000					
Evadale Drive Phase II Emergency SD	SZS11264	14	BOE	98,000	98,000					
Avenue 44 SD Emergency Replacement Phase II	SZS11370	15	BOE	462,000	462,000					
Carolina St Emergency Replacement	NOT OPEN	15	BOE	1,400,000		420,000	980,000			
Lakme Ave SD	SZS11298	2	BOE	1,400,000			1,400,000			
Lennox Ave - Riverside Dr to LA River SD	NOT OPEN	14	BOS	1,400,000			1,400,000			
Garvanza Park BMP	NOT OPEN	10	BOE	770,000			770,000			
Pico Wilton SD	NOT OPEN	14	BOE	903,000			903,000			
Burwood S/O Figueroa SD	NOT OPEN	3	BOE	1,190,000			1,190,000			
Sherman Way & Capps SD	SZS11276	2	BOE	420,000			420,000			
Bessemer St SD Alcove Ave to Tujunga Wash	NOT OPEN	11	BOE	448,000			448,000			
Swarthmore Avenue Storm Drain	NOT OPEN	2	BOE	84,000			84,000			
McGroarty St. SD	NOT OPEN	8	BOE	1,680,000			700,000	980,000		
Century Boulevard & Gramercy Pl SD	NOT OPEN	2	BOE	1,680,000				1,680,000		
Wheatland E/O Debris Basin N/O Foothill	NOT OPEN	5	BOE	1,068,200				1,068,200		
Waring Ave SD	NOT OPEN	12	BOE	1,820,000				1,820,000		
White Oak Avenue SD - Nordhoff St to Plummer St	NOT OPEN	3	BOE	1,642,200				1,642,200		
Oakdale Avenue - Redwing Street SD	NOT OPEN	7	BOE	1,274,000				1,274,000		
Sayre Garrick SD	NOT OPEN	14	BOE	1,008,000				1,008,000		
Hawley Avenue S/O Sinova St	NOT OPEN	6	BOE	1,358,000					1,358,000	
Laurel Canyon Bl - Kagel Cyn to Osborne St	NOT OPEN	5,2	BOE	1,400,000					1,400,000	
Fulton Av LA River to 150 Feet S/O Ventura Bl	NOT OPEN	7	BOE	980,000					980,000	
S.F. Mission And Laurel Cyn. Bl. SD	NOT OPEN	6	BOE	315,000					315,000	
Roscoe Dora SD	NOT OPEN	14	BOE	448,000					448,000	
Kenneth Drive & Huntington Drive SD	NOT OPEN	2	BOE	1,330,000					1,330,000	
Commerce Valmont SD	NOT OPEN	7	BOE	1,680,000					1,680,000	
Roxford St Herrick Av to Stetson Cyn Ch	NOT OPEN	2	BOE	1,680,000					700,000	980,000
Moorpark Tujunga SD	NOT OPEN	9	BOE	385,000						385,000
City Hall Main Street Storm Drain	NOT OPEN	3	BOE	504,000						504,000
Collier Street SD - E/O Quakertown Ave To Winnetka	NOT OPEN	15	BOE	1,355,200						1,355,200
Hawaiian and Opp Storm Drain	NOT OPEN	15	BOE	1,680,000						1,680,000
Anaheim Street W/O I Street	NOT OPEN	7	BOE	665,000						665,000
Foothill SD-Pacoima Cyn Ch to Sump S/O Maclay	NOT OPEN	15	BOE	2,450,000						2,450,000
SUBTOTAL				**$ 39,450,600**	**$ 3,976,000**	**$ 623,000**	**$ 8,505,000**	**$ 9,689,400**	**$ 8,421,000**	**$ 8,236,200**

Appendix 9-2 Development of BMP Alternatives for Water Quality Management Plans

The identification of BMP alternatives and selection of the best alternative is built on the information developed in the characterization and potential strategies sections of each Water Quality Management Plan. Following completion of these sections, the focus shifts to the development of BMP alternatives in the watershed. This effort will result in a list of recommended and prioritized BMPs for implementation throughout the watershed. Critical to this effort is the establishment of an acceptable methodology and reliable performance criteria for the design and selection of BMPs. The following sections describe the steps that will be taken to establish criteria and the methodology that will be used to develop BMP alternatives.

Methodology

Siting, Design and Implementation Criteria for Screening BMPs

Prior to the planning, siting, selection, design and the implementation of any structural BMP the following information will be gathered:

- Delineation of drainage areas throughout the watershed;
- Hydrologic characteristics of drainage areas;
- Data relating to land use and activities within the drainage areas;
- Pollutant concentrations (land use based or monitoring) and known loadings estimates throughout the watershed;
- Delineation of the storm drain system;
- The targeted pollutants and required removal efficiencies; and
- Water quality standards of receiving waters.

Based on this information the following questions will be evaluated as part of the BMP screening process:

- Where are there opportunities to implement BMPs in the targeted drainage area?
- What is the expected pollutant load and flow reduction into the impaired waterbody from urban runoff sources after implementation of the BMP?

- What is the estimated resultant change in concentration and flow expected in the receiving waterbody after the implementation of a BMP?

To evaluate these questions two key technical issues will need to be decided:

- **Establishment of Design Criteria** – The design of a BMP is dependent on the hydrologic objectives established for urban runoff management. These objectives affect the sizing of the BMP facility and the types and design of selected treatment controls. Methods for selecting a design storm may be volumetric (e.g., capturing the first 0.5 inches of runoff or capturing some percentage of the runoff volume from an average year), flow-rate based (e.g., capturing the amount of flow equivalent to the pre-development runoff from selected storm size), or a combination of the two.

- **Establishment of BMP Performance Criteria** – The degree of pollution reduction (a measure of BMP performance) generally depends on the BMP that is selected and the pollutant that is being targeted. For example, a BMP that is effective at removing suspended solids may be less effective at removing metals. Several databases have been developed that list the expected pollutant removal for several combinations of BMPs and pollutants. These databases can be used to select BMPs that meet the minimum criteria of expected BMP performance, for example, the 75th percentile performance value as determined from the most current data available in the EPA-ASCE BMP database (***Ref. 1***).

Given the importance of these technical issues, prior to the development of Water Quality Management Plans, the City will establish design criteria and BMP performance criteria. These decisions will guide the development of all BMP alternatives. Ultimately, a BMP project will be selected for implementation only if:

- A “quantitative nexus” exists between implementation of the BMP(s) and water quality standards attainment, i.e., implementation of the BMP(s) will have a positive impact on the water quality in the receiving water body and support compliance with TMDL wasteload allocation requirements (***Appendix 5-1*** for waste load allocations applicable to each TMDL and ***Appendix 9-3*** for determining whether a quantitative nexus exists);

- Implementation of the BMP or series of BMPs will result in a substantial and measurable reduction in the pollutant concentration, e.g., the BMP effluent concentration meets the targeted performance value for pollutant reduction, e.g., the 75th percentile performance value as determined from the most current data available in the EPA-ASCE BMP database;

- The BMP design is consistent with the selected design criteria;

- The BMP project would receive a score of at least 75 points from the criteria used to select Prop O projects (***Appendices 7-2 and 7-3*** for selection criteria);

- The primary purpose of the project is urban runoff management-related;
- Flood control is achieved through peak flow reduction and infiltration; and
- Where possible, other benefits are optimized, including groundwater recharge, increased recreational opportunities and habitat improvements.

BMP Prioritization

Rather than develop an entirely new methodology for the development of alternatives, the City will rely on the conceptual framework of the *Los Angeles County-wide Structural BMP Prioritization Methodology Guidance Manual* ("BMP Prioritization Methodology", ***Ref. 2***). The BMP Prioritization Methodology is useful for watershed planning, integrated regional water management planning, and TMDL planning. One of its primary strengths is that it can be used to evaluate alternative BMP implementation strategies ranging from the use of small-scale local or distributed BMPs to implementation of large-scale sub-regional or regional BMPs. The BMP Prioritization Methodology is under development. Phase 1 has been completed and included the development of a prioritization method for the implementation of structural BMPs to manage wet weather runoff. Phase 2, which is ongoing, is focused on the development of a GIS tool and incorporation of an uncertainty analysis to support use of the methodology.

The BMP Prioritization Methodology uses a stepwise approach for prioritizing structural BMPs and fits between a watershed-planning phase and an on-the-ground project design and implementation phase (***Figure 1, right side of figure)***. As can be seen from ***Figure 1***, the prioritization process is functionally equivalent to the development of BMP alternatives. The ultimate goal of this prioritization process is to achieve pollutant reduction targets in the most cost-effective manner possible.

Development of BMP Alternatives

Development of BMP alternatives involves the implementation of four steps.

Step 1 - Catchment Prioritization

The first step in the development of alternatives is to prioritize where within a watershed BMPs need to be located to achieve the target water quality improvements. This effort will rely primarily on the use of watershed data and GIS as tools to develop a Catchment Prioritization Index (CPI) for each catchment. The outcome of this effort is a watershed divided into catchments that have been prioritized for the implementation of BMPs.

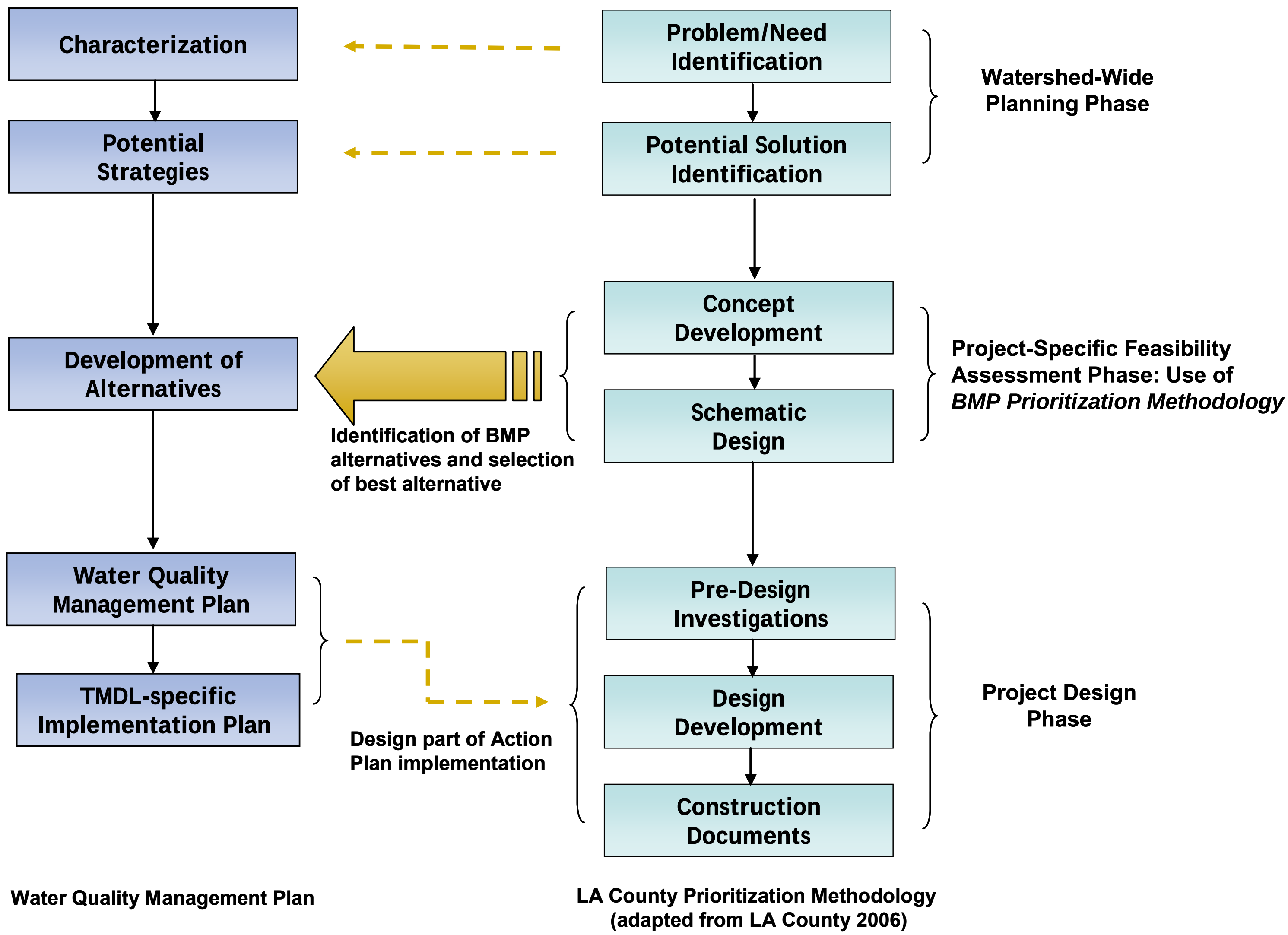


Figure 1
Relationship between Los Angeles County BMP Prioritization and the Water Quality Management Plan

Each watershed will be divided into manageable catchment units to allow for the development of BMP alternatives that are tailored to the needs of each localized area. The size of each catchment depends on the characteristics of each drainage area. For example, a small headwater drainage or area encompassed by a single small storm drain could comprise a catchment if water quality data show that the catchment is a significant contributor of pollutants to a downstream impaired water. In contrast, where several small contiguous small drainages are not contributing pollutants to downstream receiving waters, then these contiguous drainage areas could be combined into a single, but larger, catchment.

The BMP Prioritization Methodology provides a detailed explanation regarding how CPI values may be calculated using the following factors:

- Estimation of the relative pollutant contribution from each catchment;
- Location of the catchment discharge points relative to an impaired water; and
- Location of the catchment discharge points relative to an impaired water with a completed TMDL.

Step 2 - Identification of BMP Alternatives

The purpose of Step 2 is to identify opportunities for the placement and implementation of BMPs in each catchment within a given watershed using the following process:

- **Categorize BMP Opportunities** – This activity is to identify the types of BMPs by category that may be implemented in the catchment (see Text Box for BMP categories).
- **Identify BMP Opportunities within Categories** – This activity focuses on identifying where BMPs representing different categories may be implemented in each catchment. This analysis is best suited for the identification of areas where distributed and sub-regional/regional BMPs may be located in and downstream of high priority catchments.
- **Rank BMP Opportunities** - The selected list of BMP opportunities are initially assumed to have equal chance of implementation. However, additional analysis is required to rank the various BMPs based on factors such as land ownership (public vs. private) and locations where pollutant load reductions are needed the most.

The primary product of this last step is the preparation of maps showing both where the greatest needs are for BMPs (outcome of Step 1) and where the greatest opportunities are for BMP implementation (outcome of Step 2). Coupled, these two key pieces of information form the basis for the beginning of the selection of projects for implementation under the Water Quality Management Plan.

Step 3 - Screening of BMP Alternatives

The purpose of this step is to assess the BMP opportunities identified in Step 2 and identify specific BMPs that could be implemented within targeted areas for each BMP category, e.g., non-structural, distributed and sub-regional/regional. The following process is implemented to screen BMP alternatives:

- **Screening Criteria** - The BMP Prioritization Methodology recommends the use of primary screening criteria and sub-criteria, such as:
    - Cost;
    - BMP effectiveness;
    - Feasibility;
    - Other environmental benefits/impacts; and
    - Other selected factors, e.g., required jurisdictional partnerships or consistency of BMPs with other goals of the WQCMPUR.
- **Criteria Weights** - All of the screening criteria established for this step must have associated weighting factors so that various alternatives can be scored. The BMP Prioritization Methodology suggests weighting factors, but also recommends that these weights be evaluated by the user, as appropriate.
- **BMP Opportunity Assessment** - The outcome of Step 3 is a BMP comparison matrix for each BMP category (non-structural, distributed, subregional/regional) with preliminary BMP scores for each evaluated catchment.

Up to this point, the assessment has relied on regional data and literature information. No site-specific data have yet to be incorporated, which is only considered in the next step.

Step 4 - Selection of the Best BMP Alternative

This step involves a site-specific analysis of the preliminary BMP assessment conducted under Step 3. This analysis will mostly apply to distributed and subregional/regional BMPs. Selection of the best alternative relies on the following process:

- **Site-Specific Screening** - Three levels of screening will be used to identify site-specific opportunities and constraints associated with potential BMPs:
    - **GIS-Level Screening** – This screening focuses on site-related constraints such as areas designated as landslide or liquefaction zones, liquefaction, areas with

poor soil infiltration and special concerns such as environmentally sensitive areas;

- **Desktop-Level Screening** – This screening primarily involves use of aerial and catchment maps to identify locations for siting BMPs, e.g., available open areas including rooftops and parking lots that can be targeted for stormwater capture; and

- **Field-Level Screening** – Field investigations as the final screening effort will verify or identify additional constraints and opportunities previously unnoticed. Examples of constraints that may be observed on the ground include limitations associated with public safety, jurisdiction, flood control or proximity issues such as closeness of planned urban runoff retention BMP to where stormwater runoff could be used.

■ **Fatal Flaws Analysis** - The information generated from the site-specific screening is used to conduct a fatal flaw analysis. Based on the constraints identified in the site-specific analysis, some BMPs that were previously recommended may no longer be feasible. When this information is factored into the preliminary analysis completed in Step 3, updated BMP scores will be developed.

■ **BMP Project Selection** - The products from Step 4 include the following:

- Updated and final BMP comparison matrix with the fatal flaws analysis factored into it;

- Field-screening analysis developed for each catchment; and most importantly

- BMP recommendations summary, which list all recommended projects (structural and non-structural) for consideration in the development of the Water Quality Management Plan.

As noted previously, the final selection of BMP projects for implementation needs to satisfy the requirements described above under the Siting, Design and Implementation Criteria for Screening BMPs section.

References

1. International Stormwater BMP Database (www.bmpdatabase.org).

2. *Los Angeles County-wide Structural BMP Prioritization Methodology Guidance Manual* (2006), prepared by Geosyntec Consultants for the County of Los Angeles, Department of Public Works, Heal the Bay, and City of Los Angeles, Bureau of Sanitation.

Appendix 9-3
Developing a Quantitative Nexus between BMP Selection and Water Quality Standards Attainment

A key challenge facing the City is the development of a quantitative nexus between implementation and water quality standards attainment. Development of this quantitative nexus is critical for a number of reasons:

1. To provide a technical basis to estimate the water quality benefits associated with implementation of selected BMPs.

2. To help ensure that City funds and resources are being allocated efficiently.

3. To quantify the uncertainties that must be considered – these include both natural variability (e.g., rainfall patterns and volumes) and uncertainties with respect to BMP performance and constituent-specific loading rates.

The following paragraphs describe the conceptual approach the City will follow to evaluate the quantitative relationship between what is proposed for implementation and our expectations for meeting water quality standards. This approach is focused on land use based solutions appropriate for planning studies and the improvement of the quality of water discharges *into* receiving waters.

Given the objectives above, the City's approach will utilize some of the most technically-defensible tools and data that are representative of the state of the practice. However, it is recognized that technologies are evolving, better information and tools will become available, and as potential projects move forward, site-specific information will be available to enhance the precision of the model. These factors will be continually incorporated into the performance models.

Within one year the City, in conjunction with key partners in the environmental and technical communities, will develop a planning tool (Phase II of the Los Angeles County-Wide Structural BMP Prioritization Methodology, discussed in ***Appendix 9-2***) to quantify water quality benefits of proposed structural BMPs in selected drainage areas.

Key input parameters for this quantitative nexus will include the following, see ***Figure 1***:

- Proposed BMP parameters (structural BMP types, locations of structural BMPs, sizes of structural BMPs);

- Known parameters related to drainage areas (land use types, runoff-response characteristics, potential pollutant concentration loadings, and existing infrastructure, tributary drainage areas of structural BMPs); and
- Variable parameters (rainfall patterns, pollutant concentrations, structural BMP effectiveness).

The following figures provide an overview of the anticipated methodology:

- ***Figure 1*** provides a description of how the quantitative nexus methodology is currently envisioned, given the state of supporting studies and ongoing efforts.
- ***Figure 2*** provides an illustration of how the quantitative nexus output could guide implementation activities so that there would be a reasonable expectation that water quality standards can be attained.
- ***Figure 3*** provides an example of output as a management tool, supporting the upsizing of a structural water quality BMP.

Upon completion of the watershed-wide quantitative analyses, and with acceptable probabilities of meeting water quality standards, additional implementation (e.g., pre-design) steps will be initiated. As site-specific data are developed during subsequent steps, uncertainties in the data will be reduced.

Upon completion of the initial evaluations conducted during development of the Water Quality Management Plans, there may be some areas where the probability of meeting water quality standards may be unacceptably low. It is also conceivable that the suite of BMPs required to meet water quality standards are not acceptable to the City and its stakeholders (e.g., BMPs without multiple benefits, or that require extensive cost, power, maintenance, etc.). Should these types of scenarios arise, the City will review alternative technologies, and should the regulatory, environmental, and technical communities so agree, a preferred approach may involve *presumptive compliance* with water quality standards, utilizing a preferred suite of acceptable BMPs (e.g., multi-benefit) that are dictated by historical BMP performance. An example of this approach could be a stipulation that, “natural treatment system” BMPs must include design and long term maintenance provisions such that resulting effluent water quality meets or exceeds the historically observed 75th percent upper confidence level, and that should a BMP systems perform at this level, it would not deemed out of regulatory compliance.

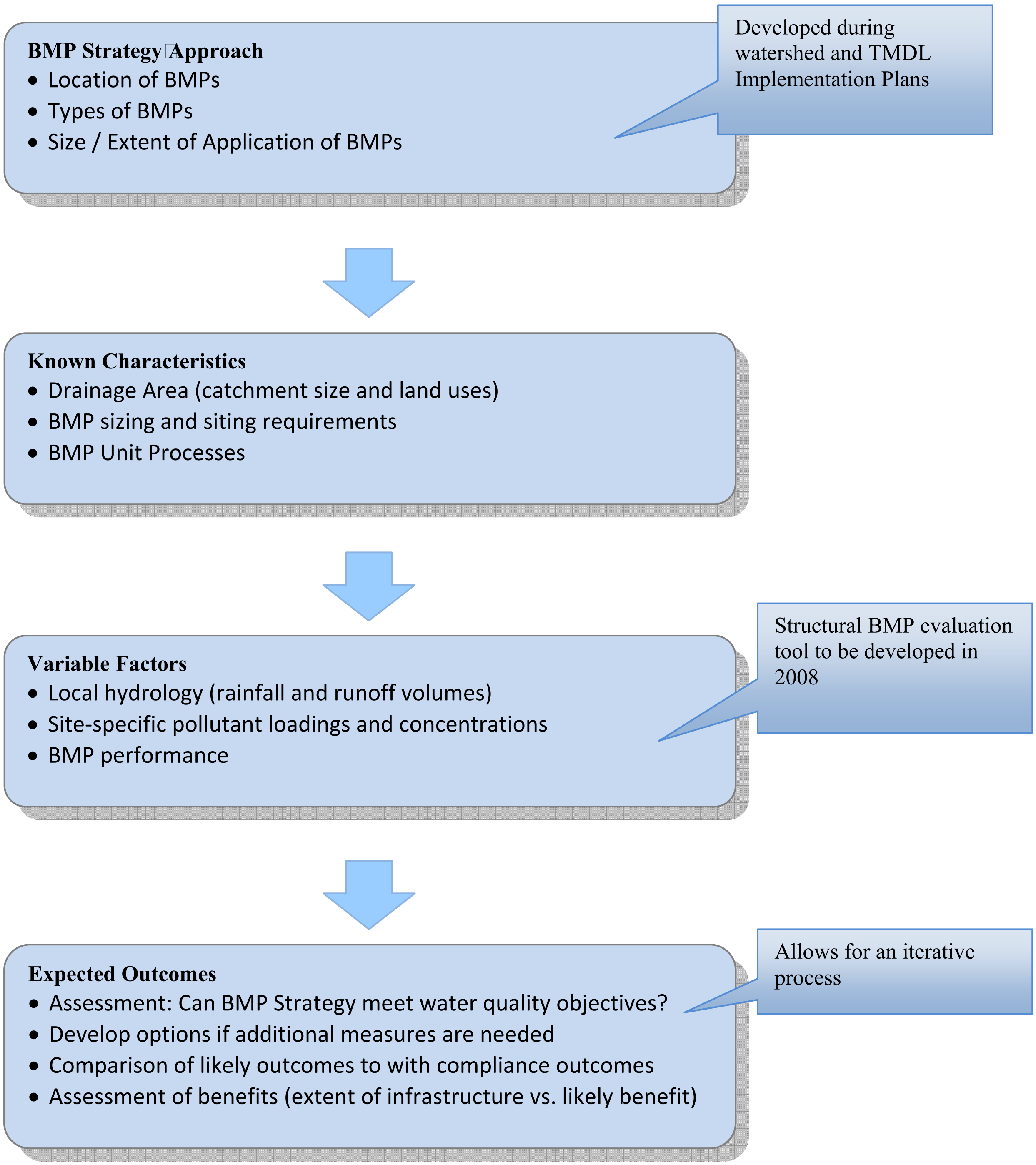


Figure 1
Overview of Quantitative Nexus Process

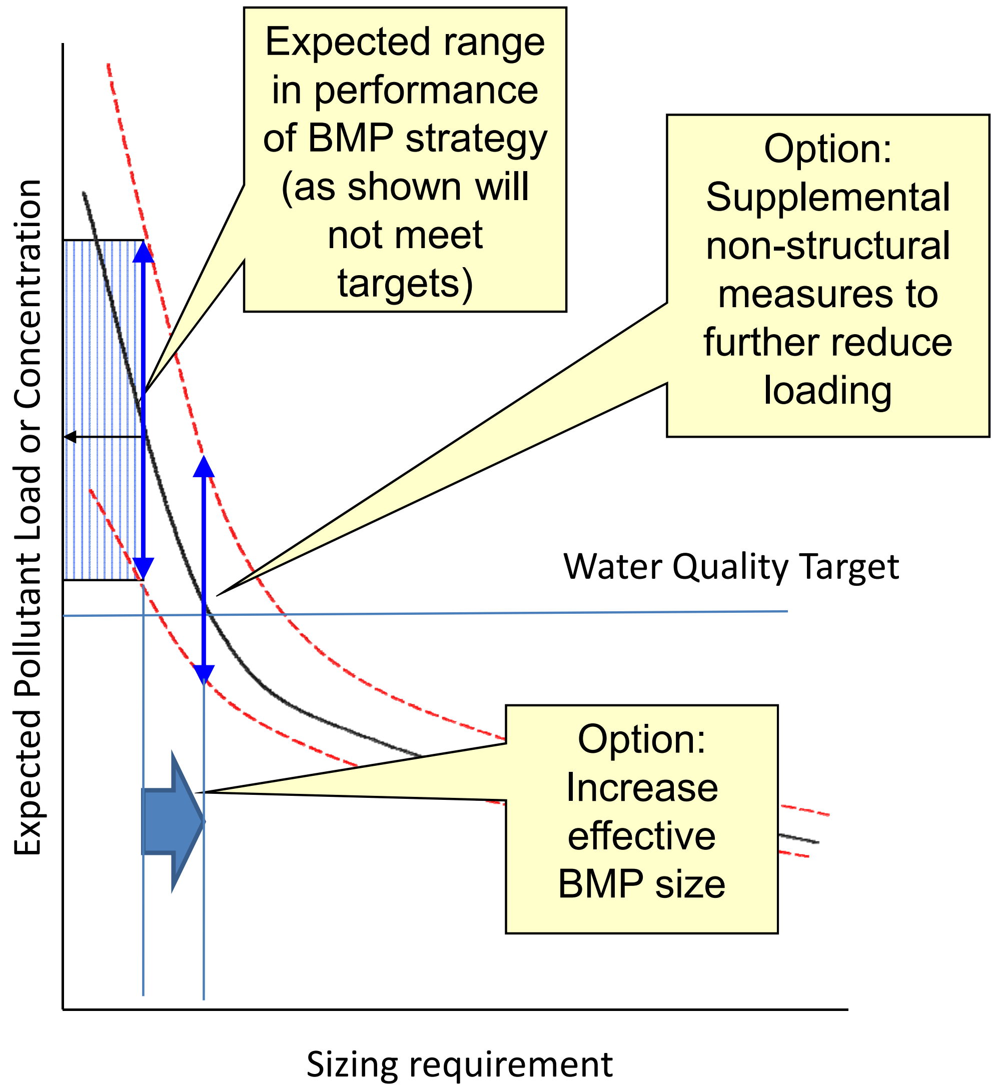


Figure 2
Potential Outcomes Examples of Options for Iterative Process
Note: The vertical axis represents the expected pollutant load or concentration in the receiving water or, similarly, in the effluent of the BMP.

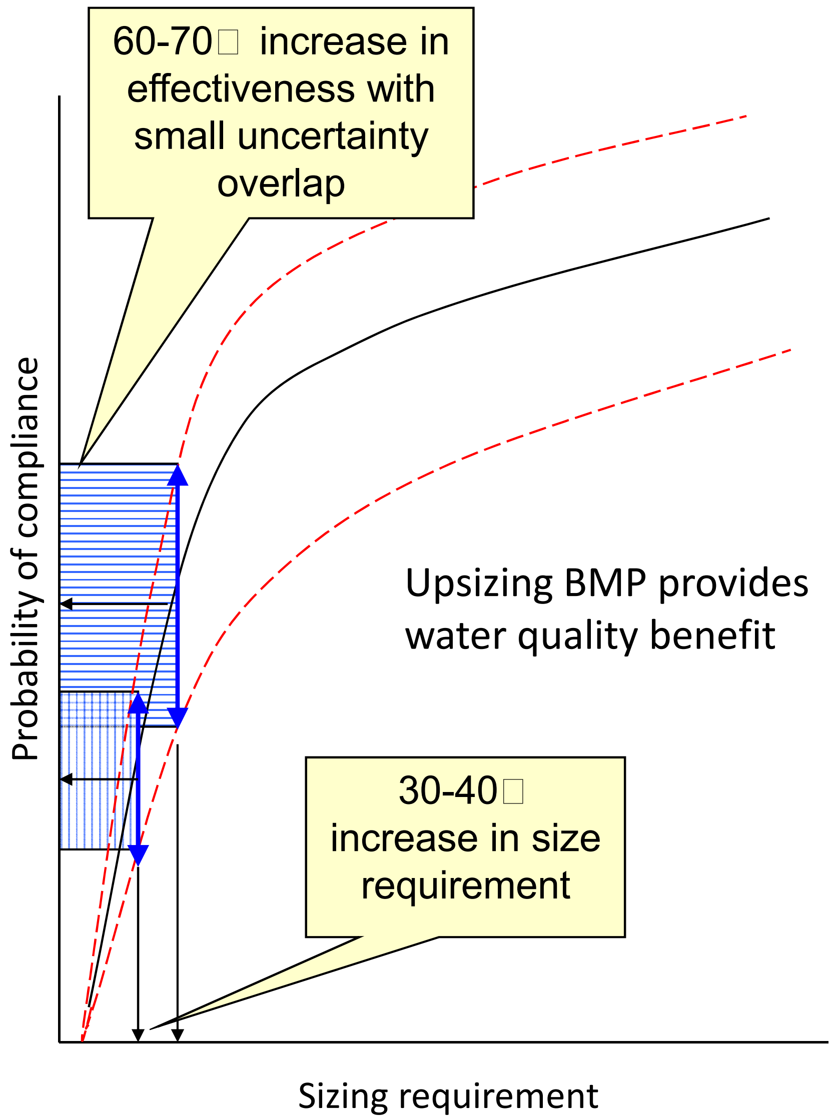


Figure 3
Potential Outcomes Structural BMP Example

Appendix 9-4
Examples of Local and Regional Urban Runoff Management Programs

Many organizations are directly or indirectly involved in urban runoff management and improving the water quality in the City of Los Angeles. This appendix lists many of the organizations, City agencies and programs that were consulted for the development of WQCMPUR. Additional sources of information can be found in the "References" section at the end of each chapter.

Organization/Program	Website
(Non)-Governmental Organizations in Los Angeles area	
Ballona Wetlands Land Trust	http://www.ballona.org
Community Coastal International	http://www.ccint.org/index.html
Heal the Bay	http://healthebay.org
LA Conservation Corps	http://www.lacorps.org/index .html
Los Angeles Community Garden Council	http://www.lagardencouncil.org
Los Angeles Neighborhood Land Trust	http://www.lanlt.org
Mountains Recreation & Conservation Authority	http://mrca.ca.gov
National Resources Defense Council	http://nrdc.org
North East Trees	http://www.northeasttrees.org
Northeast LA Open Space Coalition	http://www.nelaopenspace.org
San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy	http://www.rmc.ca.gov/index.html
Santa Monica Mountains Conservancy	http://smmc.ca.gov
TreePeople	http://treepeople.org
Santa Monica Baykeeper	http://www.smbaykeeper.org
City of Los Angeles agencies and programs	
Office of the Mayor	http://lacity.org/mayor
SustainLA	http://www.sustainla.org
Green LA	http://www.ladwp.com/ladwp/cms/ladwp010314.pdf
Million Trees LA	http://milliontreesla.org
Community Redevelopment Agency	http://crala.net
Department of City Planning	http://cityplanning.lacity.org
General Plan	http://www.ci.la.ca.us/PLN/Cwd/GnlPln/Index.htm
Department of Environmental Affairs	http://www.lacity.org/ead/environmentla/
Green Roofs – Cooling Los Angeles	http://fypower.org/news/?p=458
Los Angeles Brownfields Program	http://www.lacity.org/ead/labf
Bureau of Streets Services Special Projects	http://www.cityofla.org/BOSS/SpecialProjects/index.htm
Urban Forestry Division	http://www.cityofla.org/BOSS/UrbanForestryDivision/index.htm
Department of Water and Power (DWP)	http://www.ladwp.com
Securing L.A.'s Water Supply (DWP)	http://www.ladwp.com/ladwp/cms/ladwp010588.jsp

Stormwater Capture Program (DWP)	http://ladwp.com/ladwp/cms/ladwp001617.jsp
Water Conservation Program (DWP)	http://ladwp.com/ladwp/cms/ladwp001257.jsp
LA River Revitalization	http://www.lariver.org
Other cities and programs	
Chicago's Water Agenda	http://www.cityofchicago.org/webportal/COCWebPortal/ COC_EDITORIAL/wateragenda_1.pdf
Kansas City 10,000 Rain Gardens	http://www.rainkc.com
New York City's PlaNYC	http://www.nyc.gov/html/planyc2030/html/home/home.shtml
Philadelphia's Next Great City Initiative	http://www.nextgreatcity.com
City of Portland Bureau of Environmental Services	http://www.ortlandonline.com/BESindex.cfm?c=31892
City of Portland Office of Sustainable Development	http://www.portlandonline.com/OSD/index.cfm?c=42113
San Francisco's SFEnvironment Toxics Reduction Program	http://www.sfenvironment.org/index.html
City of Seattle Department of Planning and Development	http://www.seattle.gov/dpd/

Appendix 10-1 Potential Bonds

General Obligation Bonds

General obligation bonds can be issued by a municipal or county government to fund capital projects of the jurisdiction. General obligation bonds are secured by the general taxing power of the local jurisdiction. If planned revenues, usually property taxes, but in some jurisdictions, income and sales taxes, fall short of the amount needed to meet bond payments, the jurisdiction may raise taxes to generate needed revenue. Debt service terms and interest rates vary depending on the terms established at issuance.

Stormwater Revenue Bonds

Generally, stormwater revenue bonds provide the funding for building infrastructure, the physical assets of a stormwater system. In most cases, a stormwater utility identifies a dedicated revenue stream to demonstrate ability to repay the bonds. Revenue bond credit agencies, such as Moody's or Standard & Poor's, review the utility's ability and willingness to repay the debt.

Revenue bonds are reviewed according to four guidelines:

- Current and future debt position;
- Experience of financial performance;
- Economic strength of the service area; and
- Management's abilities to operate the system and conduct payback of the debt.

To successfully secure stormwater revenue bonds, the utility should have a stormwater master plan, a capital improvement plan, and a history of reliable revenue collection. These three factors will demonstrate the calculated need and identify the net revenues required to repay the acquired debt. Reliable revenue collection should indicate the City has the ability to increase rates to pay debt service by demonstrating past success at increasing rates as needed. Debt service usually is structured to be paid back over a period of 10-20 years. A desired debt service coverage ratio (operating revenue divided by debt service payments) is required by financial markets to maintain bond ratings.

The tax-exempt stormwater revenue bonds are backed by stormwater service fees and charges paid by system customers. Bond investors are paid from revenues from the service fees and charges. Bonds are issued (sold) through an investment banking company or through private placement with large financial institutions.

California Revolving Fund Loan Programs

Loans are available from the State Revolving Fund Loan (SRF) program, including the Clean Water State Revolving Fund (CWSRF) administered by the State Water Resources Control Board (see http://www.swrcb.ca.gov/funding/srf.html) and the California Infrastructure SRF (ISRF) administered by the California Infrastructure and Economic Development Bank (I-Bank).

The CWSRF (established under the authority of the Federal CWA) provides low interest loans to public agencies for stormwater treatment and other point source projects, as well as other wastewater, non-point source, and conservation management projects. The intent of the program is to provide financial assistance for constructing facilities or implementing measures to reduce water quality programs and prevent pollution of state waters with the goal of achieving compliance with the CWA and state laws. Funding for the program is provided by Federal grants and state bond funds, as opposed to local bonds that are funded by taxpayers, such as Proposition O. CWSRF loans are issued for 20-year terms. Interest rates are equal to one-half of the most recent state general obligation bond rate. There is cap of $25 million in disbursements per year to a single agency.

The ISRF (see http://www.calepa.ca.gov/Border/Documents) provides low-cost financing to public agencies for a wide variety of infrastructure projects including drainage, flood control and environmental mitigation. Funding for each approved application ranges from $250,000 to $10 million under a 30-year repayment term. Interest rates are set at the issuance of the loans based on 67% of an "A" rated tax-exempt issuance with a weighted life similar to the I-Bank financing. Interest rates are fixed for the life of rates fixed for the life of the loan. Aggregate financing approval cannot exceed $20 million for a city as a whole or $10 million for an agency in a city.

Appendix 10-2
Grant Funding to City of Los Angeles

Table 1
Grant Funding to the City of Los Angeles for Water Quality Improvement, 2003-2007

Project Title	Grant Source	Year Completed	Awarded Amount
AF Hawkins Wetland	State WRCB	2005	□100,000
Machado Lake Assessment Study	State WRCB	2003	□137,000
Upper LAR Watershed Urban Runoff Pollution Removal	State WRCB	2004	□675,000
Thurman Avenue Trash Capture	State IWMB	2003	□430,000
Transportation contaminants Reduction Program	Federal TEA-21 Program	2006	□280,000
8th Street Low Flow Diversion (LFD)	State IWMB	2003	□450,000
Temescal Canyon LFD	State WRCB	2003	□800,000
Imperial Hwy LFD	State WRCB	2003	□810,000
Santa Monica Canyon LFD	State WRCB	2003	□1,020,000
Ballona Creek Stormwater Trash Capture System	State WRCB	2007	□500,000
Los Angeles River - TMDL Project	US EPA	2007	□150,000
Marquez Canyon LFD	State WRCB	2007	□870,000
IRWMP Development	State WRCB	2007	□600,000
		Total	**$6,822,000**

Table 2
Grant Funding to Proposition O Projects

Project	Grant Source	Amount
Catch Basin Inserts and Coverings Phase I	Proposition 40	□600,000
Echo Park Lake Rehabilitation	Proposition K	□600,000
Grand Boulevard Tree Wells	Proposition 50 (SMBRP)	□350,000
La Cienega Fairfax Stormwater BMP	Proposition 50 (SMBRP)	□2,000,000
Machado Lake Phase I (Wilmington Drain)	Proposition 50 (IRWMP)	□4,387,500
Machado Lake Ecosystem Rehabilitation	Proposition K	□1,000,000
Mar Vista Recreation Center Stormwater BMP	Proposition 50 (SMBRP)	□2,000,000
Oros Green Street	Proposition 13 and CWA 319th	□586,651
Peck Park Canyon Enhancement	Proposition 50 Rec & Trails Grant	□1,921,118 □120,000
Rosecrans Recreation Center Stormwater Enhancements	Proposition K	□568,690
Santa Monica Bay Low Flow Diversion Upgrades	Proposition 50 (CBI)	□5,000,000
South Los Angeles Wetlands Park	Proposition 50 (IRWMP) Proposition 12 (RZH) Proposition 40 (RZH) Proposition K	□3,300,000 □2,000,000 □1,344,221 □1,000,000

Appendix 3-M: Walnut Spreading Basin Improvements Supporting Documents

(Please see Appendix CD for additional documents)

This page intentionally left blank.

July 27, 2010

TO: Christopher Stone

FROM: Ken Zimmer
Water Conservation Planning Section

WALNUT CREEK SPREADING BASIN
PUMP STATION
PROJECT CONCEPT REPORT

Background

The Walnut Creek Spreading Basin is located in the City of Covina adjacent to Walnut Creek Wash, downstream of Puddingstone Dam within the San Gabriel River Watershed. The spreading basin conserves runoff from Walnut Creek Wash as well as releases from Puddingstone Dam.

The Walnut Creek Spreading Basin has a maximum capacity of 200 acre-feet (af) of water storage. Current percolation tests showed a percolation rate of approximately 2 cubic feet per second (cfs). Historically, the spreading basin has had a percolation rate as high as 8 cfs. The low percolation rate is currently attributed to the inflow and steady accumulation of sediment into the spreading basin from the Walnut Creek Wash and lack of maintenance due to the inability to drain the basin.

Water is stored and conserved at the spreading basin throughout the majority of the year. Due to the year round presence of water, it is difficult for routine and larger scale maintenance to be performed at the facility. Operations Section has noted that the existing gage boards are damaged and need to be replaced.

Project

The project proposes a cleanout of Walnut Creek Spreading Basin to help restore the percolation rate. A one-foot cut would remove approximately 7,000 cubic yards of sediment. The sediment would be hauled to the Manning Pit Sediment Placement Site in Irwindale. The spreading basin will also need to be completely dewatered to perform the cleanout. Dewatering of the basin will have an annual maintenance, specifically power, cost of approximately $1,600.

Alternative 1:

In order to allow for periodic maintenance and cleanouts that would improve the overall efficiency of the spreading basin, a dewatering pump station will be installed. The pump station will contain a 5 cfs pump used to dewater the basin. The installation of the pump would allow for complete dewatering of the basin in approximately 20 days.

Alternative 2:

In addition to necessary periodic maintenance and cleanouts of the basin, the installation of a higher volume pump will allow for water to be sent downstream to a better percolating facility. Walnut Creek Spreading Basin will be used as a combination spreading basin and detention basin for water conservation purposes. The pump station will contain a 20 cfs pump that will be used to dewater the basin and convey water to other downstream facilities. The installation of the pump would allow for complete dewatering of the basin in approximately five days.

In addition to the pump station, the project proposes to replace the existing gage boards and supplement the gage boards with a data logger and pressure transducer. The bubbler and logger system will enhance the operation of the spreading basin by providing more accurate water level readings.

<u>Cost</u>

The approximate cost to construct this project is $445,000 for Alternative 1 and $515,000 for Alternative 2.

The electricity cost to operate the pump for basin dewatering for Alternative 1 is approximately $1,600 per dewatering operation. The pump used in Alternative 2 utilizes a diesel engine to power the pump and can have varying costs for operation.

<u>Environmental</u>

A United States Army Corps of Engineers Channel Connection Permit will need to be obtained. Additionally a Regional Water Quality Control Board Permit will need to be obtained for discharging water into the Walnut Creek Wash.

Recommendations

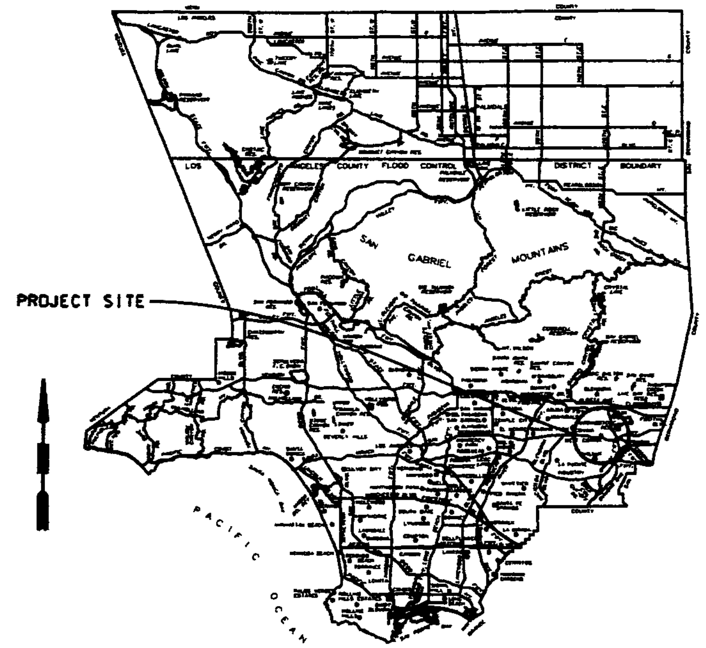
The project to clean out the spreading basin and install a dewatering pump station is crucial to restoring and maintaining the original percolation rate of the basin. It is recommended that Alternative 2, the 20 cfs pump, be installed to increase water conservation opportunities. Walnut Creek will have the ability to convey pumped water from the spreading basin to better percolating facilities downstream. After the cleanout and installation of the pump station, Walnut Creek Spreading Basin will be able to conserve an additional 240 af per year, which has a water conservation benefit of approximately $120,000. The cost/benefit ratio of this project is 4.29.

The improvements to the spreading grounds are consistent with WRD's missions and strategic goals and will greatly improve the operation and maintenance of the Walnut Creek Spreading Basin.

AS:vt
P:\wrd\Water Conservation\GENERAL\PROJECTS\Walnut Creek SG Pump Station\General\PCR.doc

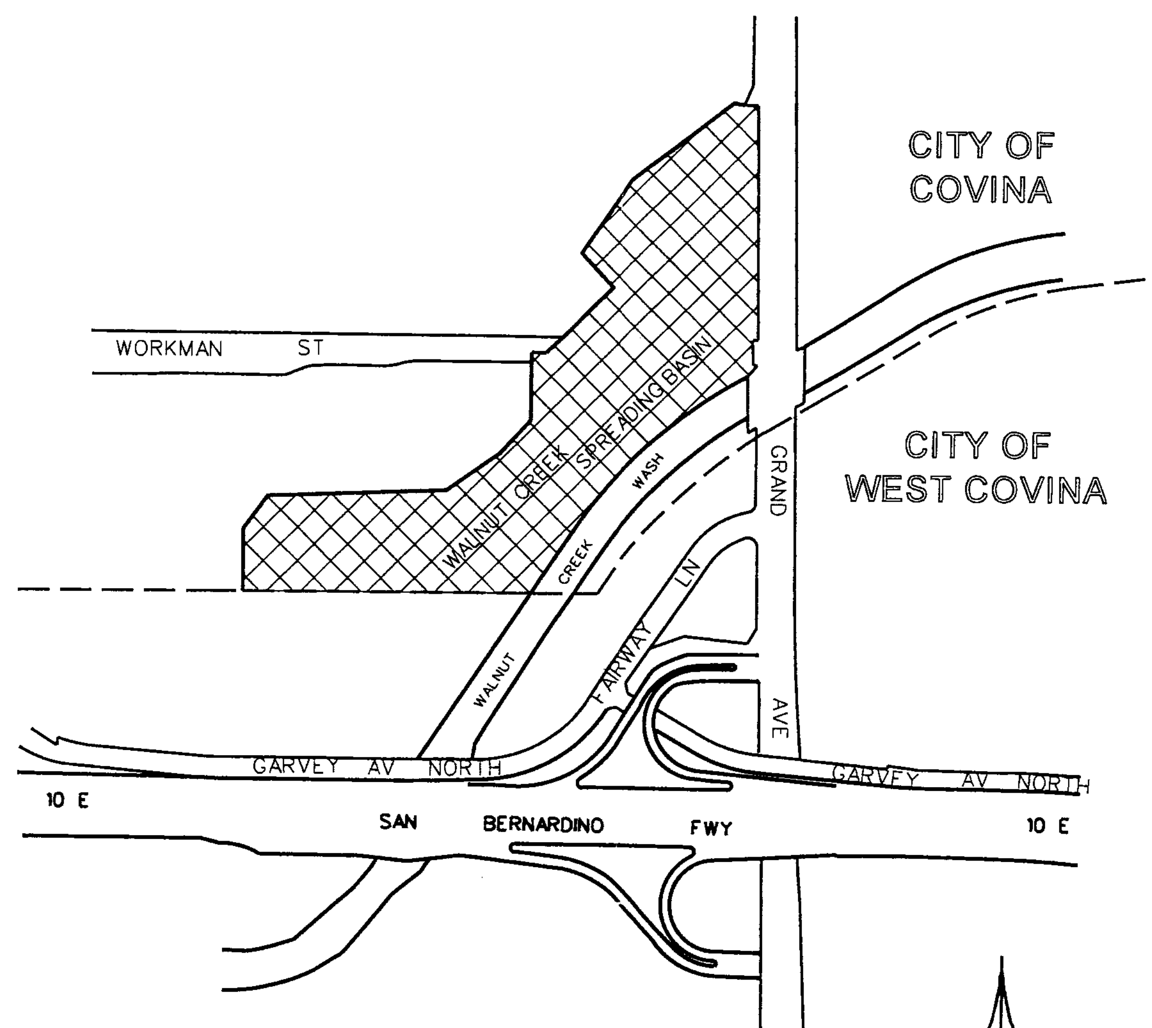
COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS

WALNUT CREEK SPREADING GROUNDS
PUMP STATION PROJECT



THOMAS BROS. PG. 599 D7

LOCATION MAP



VICINITY MAP
NOT TO SCALE

INDEX TO PROJECT PLANS

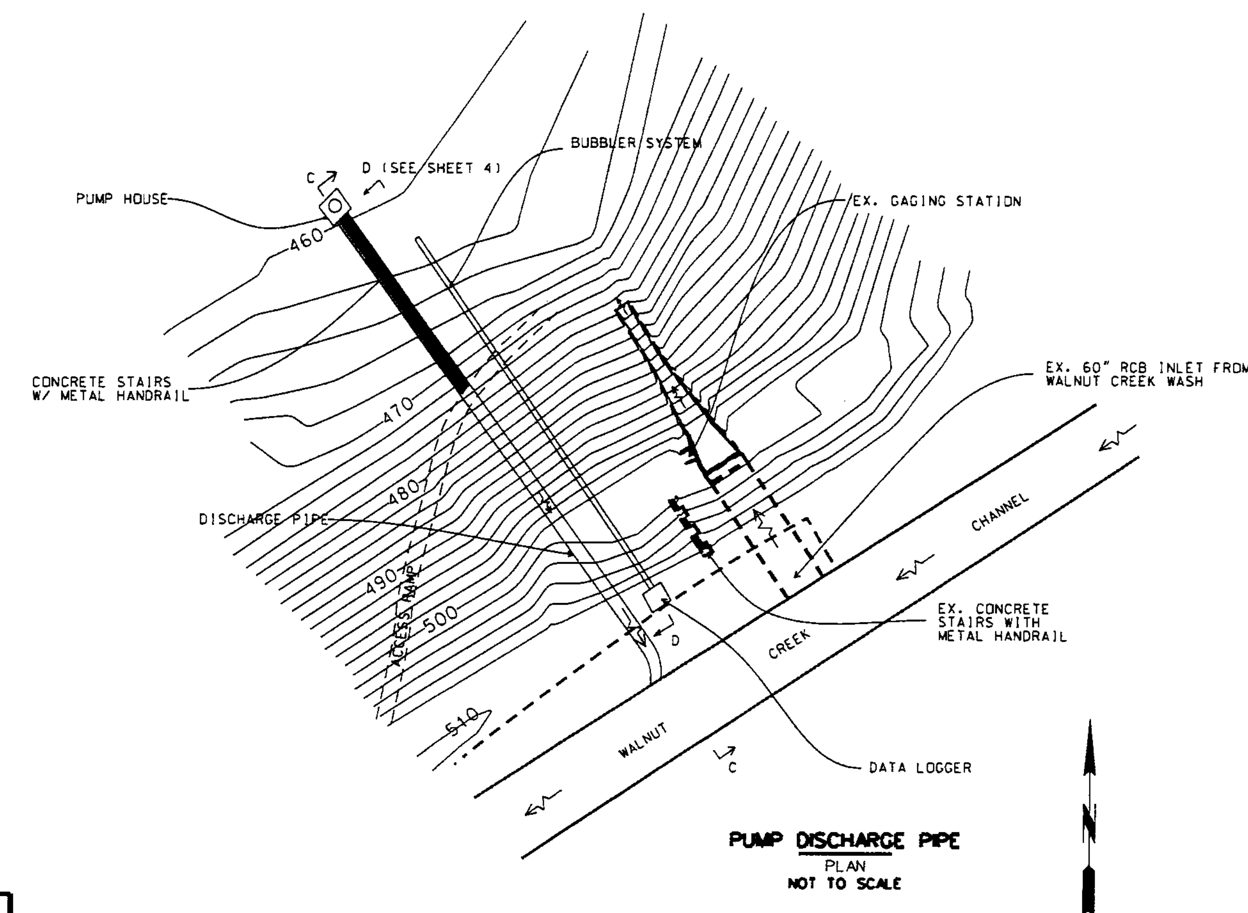
1. TITLE SHEET
2. PLAN AND CUT PLAN
3. PUMP DISCHARGE PIPE AND PROFILE
4. GAGE BOARDS AND DATA LOGGER SYSTEM

DRAFTER	DESIGNER	CHECKER	CADD PROJECT FILE NAME
A. SARAIYA	A. SARAIYA		

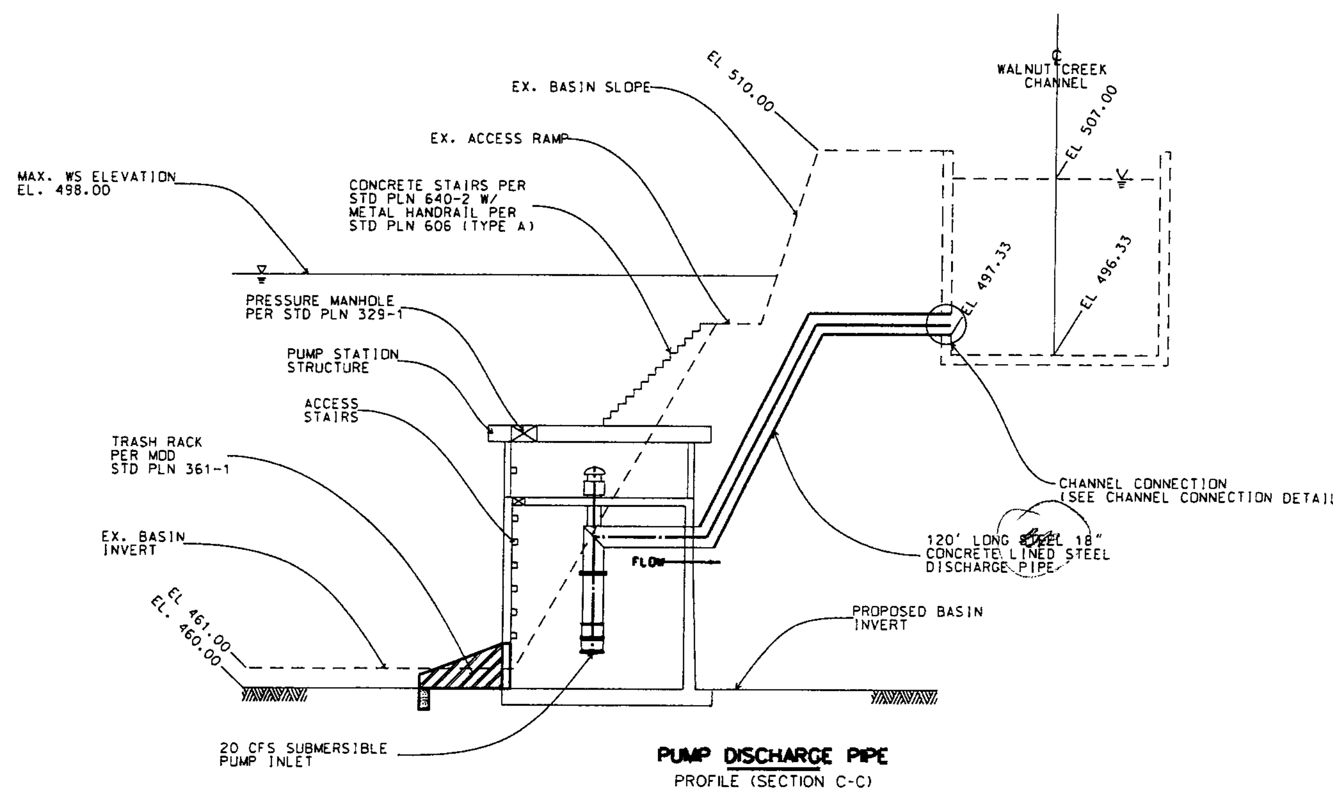
COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

WALNUT CREEK
SPREADING BASIN
PUMP STATION PROJECT
TITLE SHEET

PROJECT ENGINEER	DATE	JULY 2009	JOB H0321026 DWG	SHEET 1 OF 4

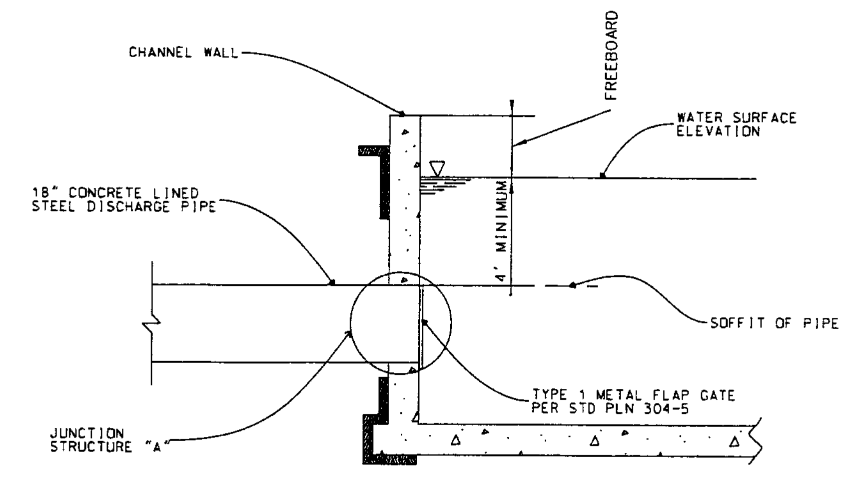


PUMP DISCHARGE PIPE
PLAN
NOT TO SCALE



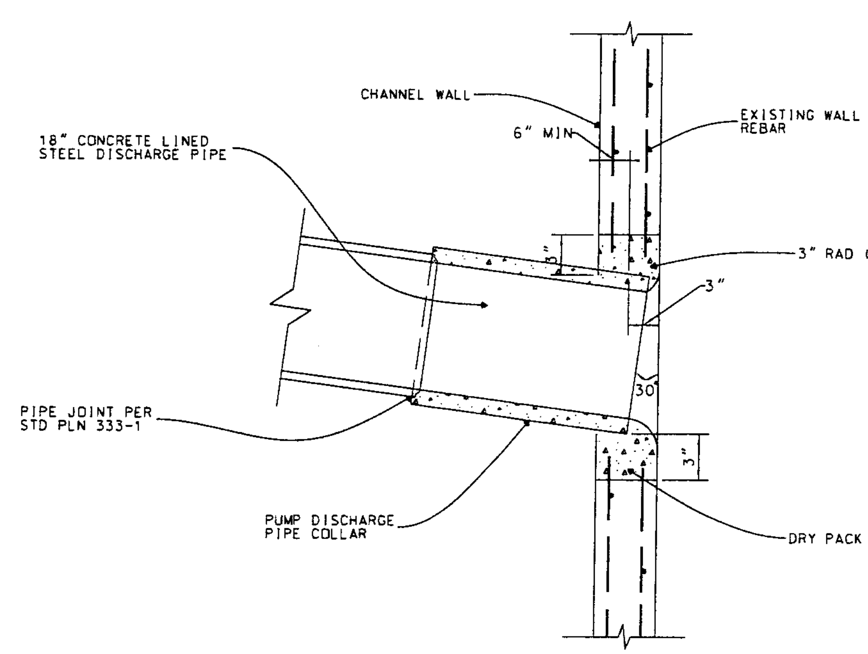
PUMP DISCHARGE PIPE
PROFILE (SECTION C-C)
NOT TO SCALE

WALNUT CREEK WASH



CHANNEL CONNECTION DETAIL
PER USAC O&M MANUAL
NOT TO SCALE

WALNUT CREEK WASH

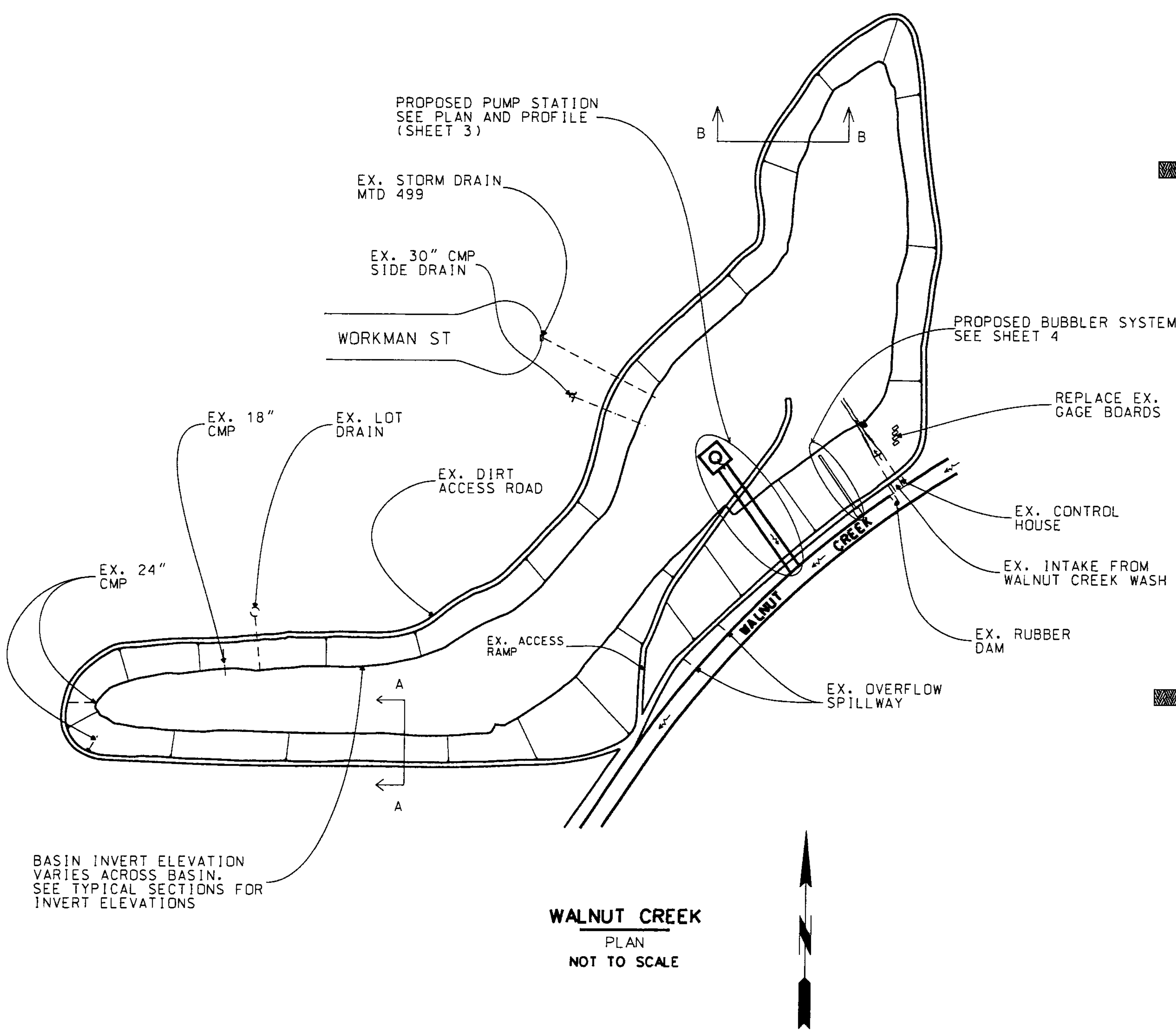


JUNCTION STRUCTURE "A" PLAN
PER USAC O&M MANUAL
NOT TO SCALE

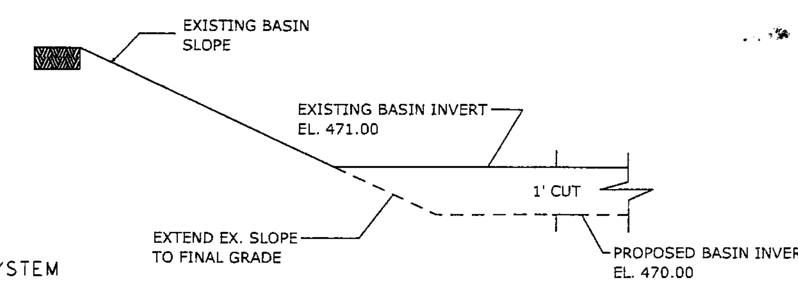
DRAFTER	DESIGNER	CHECKER	CADD PROJECT FILE NAME	REVIEWED BY	DATE
A. SARAIYA	A. SARAIYA				

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
WALNUT CREEK
SPREADING BASIN
PUMP STATION PROJECT
PUMP DISCHARGE PIPE AND PROFILE

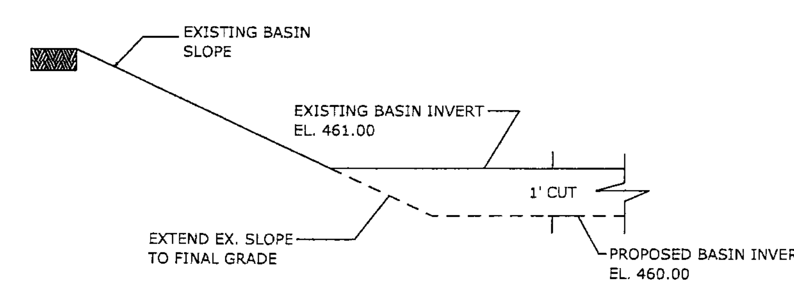
PROJECT ENGINEER	DATE	JULY 2009	JOB H0321026	DWG	SHEET 3 OF 4



WALNUT CREEK
PLAN
NOT TO SCALE



SECTION A-A
(TYP)
NOT TO SCALE



SECTION B-B
(TYP)
NOT TO SCALE

NOTE:

THE CONTRACTOR SHALL REMOVE MATERIAL FROM BASIN FOR HAULING TO MANNING PIT AS NOTED IN TABLE

SEDIMENT REMOVAL (CY)	DEPTH OF EXCAVATION (FT)
7,000	1.0

DRAFTER A. SARAIYA | DESIGNER A. SARAIYA | CHECKER | CADD PROJECT FILE NAME | REVIEWED BY | DATE

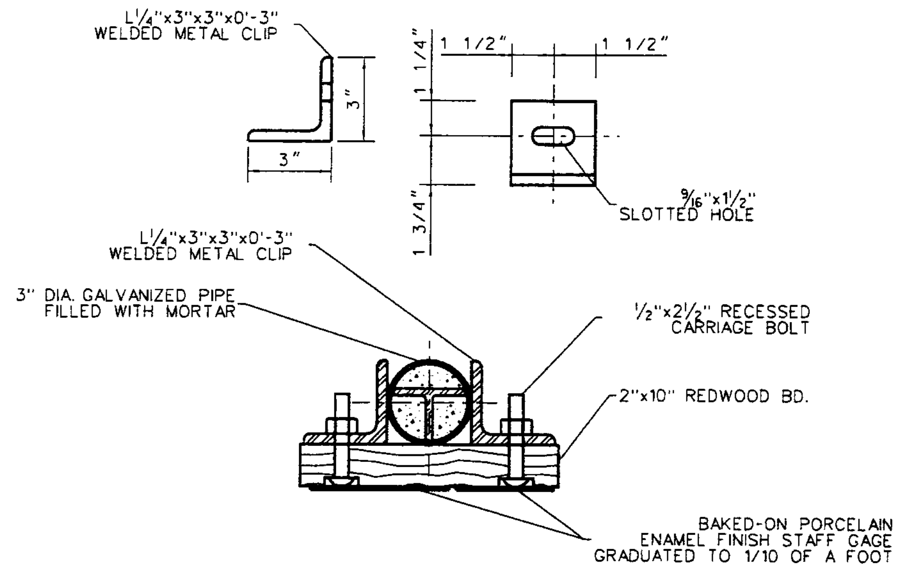
COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

WALNUT CREEK
SPREADING BASIN
PUMP STATION PROJECT
PLAN AND CUT PLAN

PROJECT ENGINEER | DATE | JULY 2009 | JOB H0321026 | DWG | SHEET 2 OF 4

CIVIL

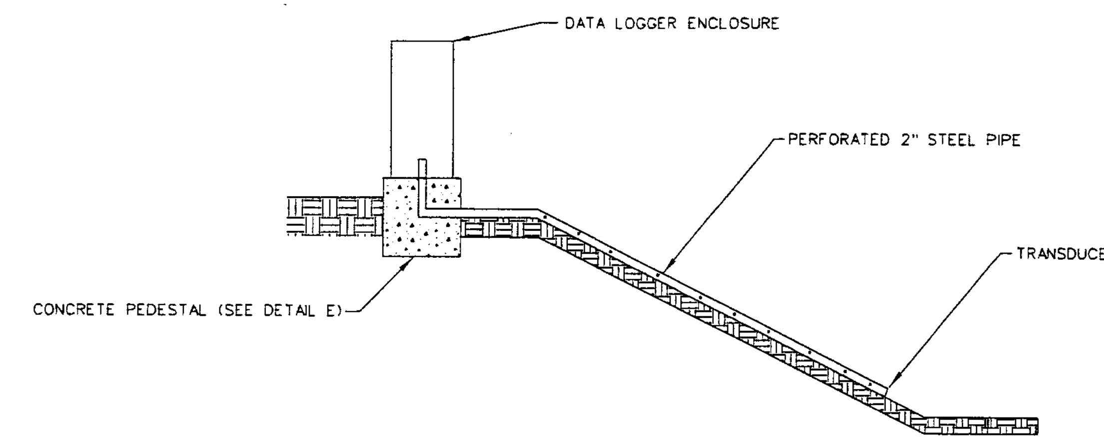
DATE: $DATE$ TIME: $TIME$ FILE: $FILE$



TYPICAL STAFF GAGE

ENLARGED TOP VIEW

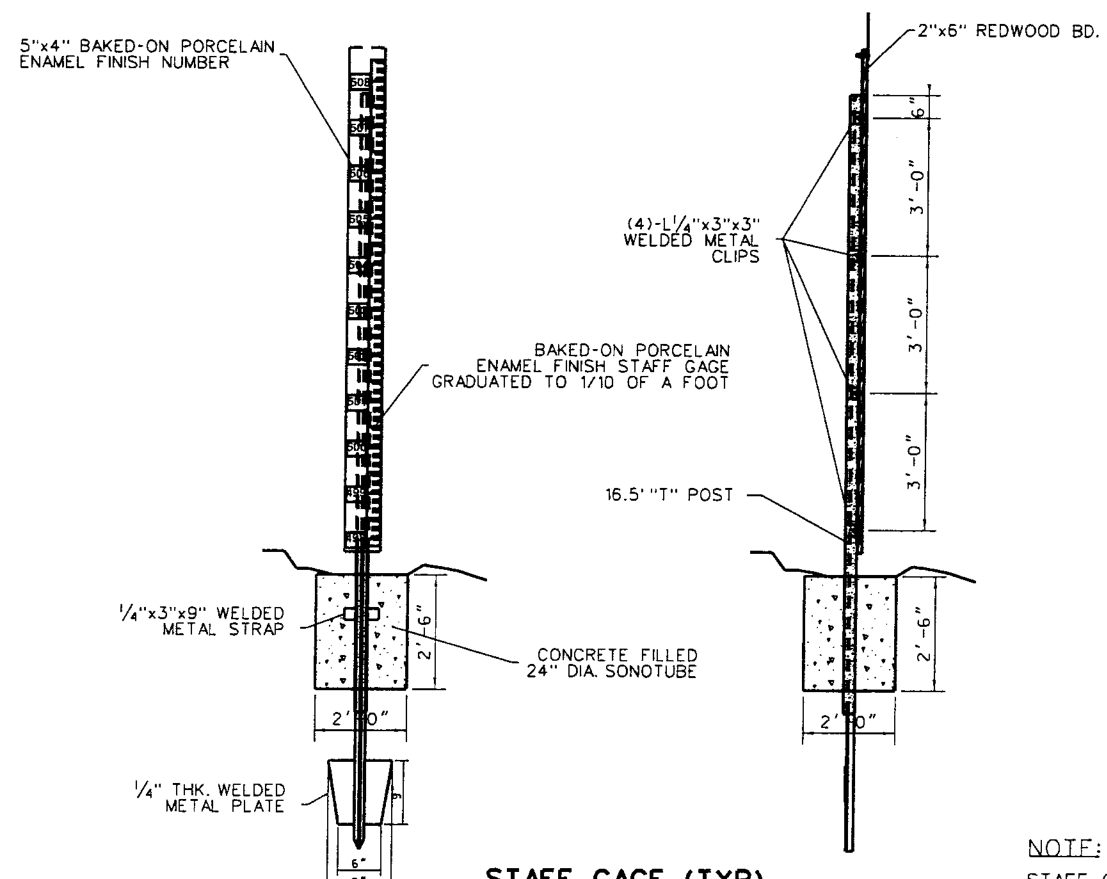
NOT TO SCALE



DATA LOGGER SYSTEM

SECTION D-D (PG. 3)

NOT TO SCALE



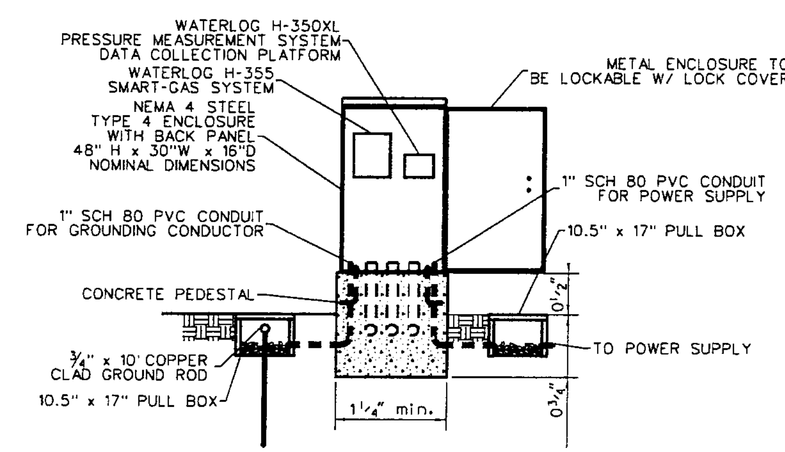
STAFF GAGE (TYP)

FRONT & SIDE ELEVATION

NOT TO SCALE

NOTE:

STAFF GAGE WILL BE MARKED WITH BASIN ELEVATIONS FROM BASIN INVERT TO MAXIMUM WATER SURFACE ELEVATION



CONCRETE PEDESTAL AND ENCLOSURE

DETAIL E (FRONT ELEVATION)

NOT TO SCALE

DRAFTER A. SARAIYA	DESIGNER A. SARAIYA	CHECKER	CADD PROJECT FILE NAME	REVIEWED BY ___ DATE

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

WALNUT CREEK

SPREADING BASIN

PUMP STATION PROJECT

GAGE BOARDS AND DATA LOGGER SYSTEM

PROJECT ENGINEER ___ DATE | JULY 2009 | JOB H0321026 | DWG | SHEET 4 OF 4

This page intentionally left blank.