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RIVERSIDE COUNTY FLOOD CONTROL
AND WATER CONSERVATION DISTRICT

CRWQCB - REGION 8
MCG
KLF

December 30, 2010

DEC 30 2010

Mr. Kurt Berchtold, Executive Officer
California Regional Water Quality Control Board
– Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3348

Dear Mr. Berchtold:

Re: Transmittal of the Middle Santa Ana River Bacterial Indicator TMDL Draft Comprehensive Bacteria Reduction Plan in Compliance with Board Order R8-2010-0033, Requirement VI.D.1.c

The purpose of this letter is to transmit the Draft Comprehensive Bacteria Reduction Plan (per Section VI.D.1.c) and perjury statements required by Board Order R8-2010-0033.

Board Order R8-2010-0033 required the Permittees to comply with Section VI.D.1.c by submitting:

> "...a Comprehensive Bacteria Reduction Plan (CBRP) describing, in detail, the specific actions that have been taken or will be taken to achieve compliance with the Urban WLA during the Dry Season (April 1st through October 31st)". The draft CBRP must be submitted by December 31, 2010.

The required report, titled the "Comprehensive Bacteria Reduction Plan" (CBRP) for the Middle Santa Ana River Bacterial Indicators Total Maximum Daily Load (TMDL) is attached to this transmittal letter and is being submitted on behalf of the Middle Santa Ana River TMDL Municipal Separate Storm Sewer System (MS4) Permittees, including the County of Riverside and Cities of Corona, Norco and Riverside.

Please note that consistent with the requirements of the Board Order, the concepts contained in this document have been discussed and refined through discussions at the Middle Santa Ana River TMDL Task Force meetings (see Section 1.5 of the CBRP). Section 7 of the CBRP addresses the implementation schedule for proposed BMPs, studies, monitoring and other follow-up actions necessary to comply with the TMDL. Section 6 provides the scientific analysis to support that the plan, as proposed, can reasonably be expected to attain the Waste Load Allocations for Urban Runoff by 2015.

Please also find enclosed the required perjury statement (Section IV.B.1) that is required by Board Order R8-2010-0033, National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit for the Santa Ana Region of Riverside County. Requirement IV.B.1 of Appendix 3 of Board Order R8-2010-0033 requires:

"All progress reports and proposed strategies and plans required by this Order shall be signed by the Principal Permittee, and copies shall be submitted to the Executive Officer under penalty of perjury."

The Riverside County Flood Control and Water Conservation District, as Principal Permittee for Board Order R8-2010-0033, is submitting this letter, which includes a signed perjury statement to ensure that the transmittal of the CBRP is in full compliance with Board Order R8-2010-0033.

If you have any questions regarding this letter or the CBRP submittal, please feel free to contact me at 951.955.1273.

Very truly yours,

JASON E. UHLEY
Chief of Watershed Protection Division

ec: Mark Norton, SAWPA
Santa Ana MSAR Permittees
Matt Yeager, San Bernardino County Flood Control

AM:cw
P8/134757

CERTIFICATION

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

Signed: ______________________________

JASON E. UHLEY
Chief of Watershed Protection Division
Riverside County Flood Control
and Water Conservation District

Bill Luna
County Executive Officer

Jay E. Orr
Assistant County Executive Officer

Executive Office, County of Riverside

Date: December 29, 2010

Subject: **Certification Statement -** Comprehensive Bacteria Reduction Plan

I certify under penalty of law that the Comprehensive Bacteria Reduction Plan submittal for December 2010 and all attachments were prepared by a consulting firm contracted to compile the report on behalf of the Permittees in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted, Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: Bill Luna

Bill Luna
County Executive Officer
County of Riverside

cc: Michael R. Shetler, Senior Management Analyst

Robert T. Andersen Administrative Center
4080 Lemon Street • 4th Floor • Riverside, California 92501 • (951) 955-1100 • Fax (951) 955-1105

PW040-10

OFFICE OF: PUBLIC WORKS DEPARTMENT

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CORONA CITY HALL - ONLINE, ALL THE TIME (http://www.discovercorona.com)

December 14, 2010

Riverside County Flood Control
And Water Conservation District
1995 Market Street
Riverside, CA 92501-1770

SUBJECT: CERTIFICATION

I certify under penalty of law that the Draft Comprehensive Bacteria Reduction Plan, December 2010 and all attachments were prepared by a consulting firm contracted to compile the report on behalf of the Permittees in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: ____________________ Date: 12-22-10
Kip D. Field, Public Works Director

G:\Land Development\Sandra\letters\2010-12-14 RCFC.doc

CITY of NORCO

CITY HALL • 2870 CLARK AVENUE • NORCO CA 92860 • (951) 735-3900 • FAX (951) 270-5622

December 27, 2010

CERTIFICATION

I certify under penalty of law that the Draft Comprehensive Bacteria Reduction Plan and all attachments were prepared by a consulting firm contracted to compile the report on behalf of the Permittees, in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: *Lori J. Askew*
Lori J. Askew, Senior Engineer

Date: *12/27/10*

CITY OF RIVERSIDE

Public Works
Department

December 10, 2010

Riverside County Flood Control and Water Conservation District
1995 Market Street
Riverside, CA 92501-1770

SUBJECT: CERTIFICATION – DRAFT COMPREHENSIVE BACTERIA REDUCTION PLAN

*I certify under penalty of law that the **Draft Comprehensive Bacteria Reduction Plan** and all attachments therein were prepared by a consulting firm contracted to compile the report on behalf of the Permittees in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Sincerely,

Thomas J. Boyd, P.E.
Deputy Public Works Director/City Engineer

cc: Kevin Street, Regulatory Programs and Compliance Manager

Comprehensive Bacteria Reduction Plan

December 31, 2010

Submitted to:

California Regional Water Quality Control Board, Santa Ana Region

Submitted by:

Riverside County Stormwater Program

Principal Permittee
Riverside County Flood Control & Water Conservation District

Co-Permittees
County of Riverside
City of Corona
City of Norco
City of Riverside

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List of Acronyms

AB	Assembly Bill
BMPs	Best Management Practices
BPS	Bacterial Prioritization Score
CAP	Compliance Assistance Program
CBRP	Comprehensive Bacteria Reduction Plan
CUWCC	California Urban Water Conservation Council
CWA	Clean Water Act
CWP	Center for Watershed Protection
DAMP	Drainage Area Management Plan
DWF	Dry Weather Flow
EPA	Environmental Protection Agency
IDDE	Illicit Discharge Detection and Elimination
IEUA	Inland Empire Utilities Agency
LID	Low Impact Development
MEP	Maximum Extent Practicable
mL	Milliliters
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MSAR	Middle Santa Ana River
MST	Microbial Source Tracking
MWD	Metropolitan Water District
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly-owned Treatment Works
QAPP	Quality Assurance Project Plan
RCFC&WCD	Riverside County Flood Control and Water Conservation District
REC-1	Water Contact Recreation
REC-2	Non-Contact Recreation
RPU	Riverside Public Utilities
RWQCB	Regional Water Quality Control Board
SAR	Santa Ana River
SAWPA	Santa Ana Watershed Protection Authority
SB	Senate Bill
SBCFCD	San Bernardino County Flood Control District
SCAG	Southern California Association of Governments

SWQSTF	Stormwater Quality Standards Task Force
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
USEP	Urban Source Evaluation Plan
USGS	United States Geological Study
WDR	Waste Discharge Requirements
WAP	Watershed Action Plan
WBIC	Weather-based Irrigation Controller
WLA	Wasteload Allocation
WQMP	Water Quality Management Plan
WWTP	Wastewater Treatment Plant

Section 1
Background and Purpose

The Santa Ana Regional Water Quality Control Board adopted a Municipal Separate Storm Sewer System (MS4) permit for Riverside County on January 29, 2010 that requires the development of a Comprehensive Bacteria Reduction Plan (CBRP). The CBRP is a long term plan designed to achieve compliance with dry weather condition (April 1 – October 31) wasteload allocations for bacterial indicators established by the Middle Santa Ana River (MSAR) Bacterial Indicator Total Maximum Daily Load (TMDL) ("MSAR Bacterial Indicator TMDL"). This document fulfills this MS4 permit requirement. The following sections provide the regulatory background, purpose, and framework of the CBRP.

1.1 Regulatory Background

The Federal Water Pollution Control Act and its amendments of 1972, 1977 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), but may delegate its authority to the State.

California implements the CWA by promulgating water quality protection laws and regulations and issuing discharge permits directly or through the Regional Water Quality Control Boards (RWQCBs). 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). The Porter-Cologne Act grants the California State Water Resources Control Board ("State Board") and nine California Regional Water Quality Control 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 Water Resources Control Board (SWRCB) and the Regional Board's 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 portion of Riverside County within the Santa Ana River watershed is the Santa Ana Regional Water Quality Control Board (RWQCB).

The Porter-Cologne Act gives the SWRCB and RWQCBs different responsibilities to establish water quality regulations. Chapter 4, Article 3, Section 13240 of the Porter-Cologne Act requires that the RWQCBs adopt Water Quality Control Plans ("Basin

Plan") to protect inland freshwaters and estuaries. The Basin Plans establish the level of protection required for specific waterbodies under the RWQCB's jurisdiction. Amendments to the Basin Plan are periodically adopted 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 objectives are required to protect those uses. Under the Porter-Cologne Act, water quality standards for inland waters, which include beneficial uses and water quality objectives to protect those uses, are established in the Basin Plan.

The SWRCB and the RWQCBs evaluates 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 the EPA. For this assessment, within the context of established state-wide policies, 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.

- CWA Section 303(d) requires states to regularly identify waterbodies not meeting water quality objectives even after all required effluent limitations have been implemented (e.g., through a point source 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 TMDL developed.

The SWRCB has established guidelines for the development of the State of California's 303(d) list. 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 objectives.

The most recent EPA-approved 303(d) list for California is the 2006 list (the 2010 list is currently under review by EPA), which provides information on impaired waters, likely pollutant sources, and priority for TMDL development. TMDLs have been established for various pollutants on several waterbodies in Riverside County; additional TMDLs are expected to be developed over the next 10-15 years.

The development of TMDLs affecting waterbodies in the Santa Ana River watershed is the responsibility of the RWQCB. Adoption of a TMDL requires an amendment to the Basin Plan and is subject to a public review process. After the RWQCB adopts the TMDL as a Basin Plan amendment, it is submitted to the SWRCB for approval. Once the SWRCB 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.

National Pollutant Discharge Elimination System (NPDES) (CWA, Section 402) permits are required for point source discharges to surface waters under the jurisdiction of the CWA. The EPA has delegated its authority for issuing NPDES permits to the State of California. In turn, the RWQCB is responsible for developing and issuing these permits in the Santa Ana River watershed. In California, NPDES permits are issued as Waste Discharge Requirements (WDR) for both wastewater, e.g., publicly-owned treatment works (POTWs), and stormwater discharges. California WDRs may include requirements more stringent than federal NPDES permits. Permits for stormwater discharges are often referred to as MS4 permits. Such permits typically rely solely on the use of Best Management Practices (BMPs) to control urban sources of pollutants in the MS4.

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 the MS4, then the MS4 permit will likely contain TMDL implementation requirements.

1.2 Santa Ana River Watershed Basin Plan

The Basin Plan designates beneficial uses (including recreational uses) for surface waters in the Santa Ana River watershed (RWQCB 1995) (see Table 3-1 of the Basin Plan). The following sections describe existing and potential future Basin Plan requirements that are relevant to this CBRP.

1.2.1 Existing Basin Plan Requirements

The recreational uses applicable to waterbodies in the MSAR watershed include Water Contact Recreation (REC-1) and Non-Contact Recreation (REC-2). These are currently defined in the Basin Plan as follows:

- *REC-1* - Waters that are used for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses may include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and use of natural hot springs.

- *REC-2* - Waters that are used for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses may include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, and aesthetic enjoyment in conjunction with the above activities.

To evaluate whether these recreational uses are protected in a given waterbody, the Basin Plan (Chapter 4) currently relies on fecal coliform[1] as a bacterial indicator for the potential presence of pathogens. Fecal coliform present at concentrations above certain thresholds are believed to be an indicator of the potential presence of fecal pollution and harmful pathogens, thus increasing the risk of gastroenteritis in recreational bathers exposed to the elevated levels. Section 4 of the Basin Plan specifies the following water quality objectives for protection of recreational uses:

- REC-1 - Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30-day period, and not more than 10 percent of the samples exceed 400 organisms/ 100 mL for any 30-day period.

- REC-2 - Fecal coliform: average less than 2000 organisms/100 mL and not more than 10 percent of samples exceed 4000 organisms/100 mL for any 30-day period

1.2.2 Proposed Amendments to the Basin Plan

The RWQCB is currently considering replacing the REC-1 bacterial indicator water quality objectives for fecal coliform with *E. coli* objectives. EPA published revised bacterial indicator guidance in 1986 (EPA 1986) that recommended the adoption of *E. coli* as the freshwater bacterial indicator for pathogens. This guidance was based on epidemiological studies that found that the positive correlation between *E. coli* concentrations and the frequency of gastroenteritis was better than the correlation between fecal coliform concentrations and gastroenteritis.

The RWQCB is considering this Basin Plan revision through the work of the Stormwater Quality Standards Task Force (SWQSTF). Since 2003, RWQCB staff and members of the SWQSTF (which includes representatives from the Santa Ana Watershed Protection Authority [SAWPA]; the counties and cities of Orange, Riverside, and San Bernardino; Orange County Coastkeeper; Inland Empire Waterkeeper; among others) have been engaged in the implementation of a workplan that is evaluating both recreational uses and associated water quality objectives. The key proposed amendments, relevant to this MSAR Bacterial Indicator TMDL that are expected to be adopted by the RWQCB in Spring 2011 include:

- Re-definition of REC-1 waters;

- Deletion of the current fecal coliform objectives for REC-1 and REC-2 beneficial uses;

- Adoption of geometric mean *E. coli* objectives for REC-1 waters based on EPA (1986) guidance;

[1] Fecal coliform and *E.coli* are a group of bacteria considered by the Regional Board as bacterial indicators for pathogens. Within this CBRP, references to fecal coliform and *E.coli* should be considered equivalent to the term bacterial indicators.

- Subcategorization of REC-1 waters into classes and establishment of a class-specific method for assessing *E. coli* data in the absence of sufficient data to calculate a geometric mean;

- For waters designated only REC-2 (only after approval of a Use Attainability Analysis [UAA] that removes the presumptive REC-1 use), establishment of an antidegradation-based bacterial indicator water quality objective; and

- Temporary suspension of recreational uses during high flow conditions in freshwater streams.

The Basin Plan amendment includes several UAAs to modify presumptive REC-1 uses in the MSAR watershed. These UAAs and proposed recreational use changes include:

- *Cucamonga Creek* – Reach 1, confluence with Mill Creek (at Hellman Street) upstream to 23rd Street in Upland, California; remove both REC-1 and REC-2 uses.

- *Temescal Creek* – Reach 1, Lincoln Avenue to the 91 Freeway; remove REC-1 use.

- *Temescal Creek* – Reach 2, 91 Freeway to 1400 feet upstream of Magnolia Street; remove REC-1 and REC-2 uses.

1.3 Middle Santa Ana River Bacterial Indicator TMDL

Water quality data collected in 1994 and 1998 from waterbodies in the MSAR watershed showed exceedances of fecal coliform bacterial indicator water quality objectives. Based on these data and potential impacts to recreational uses, the RWQCB recommended that the following waterbodies be placed on the 303(d) list:

- Santa Ana River, Reach 3 – Prado Dam to Mission Boulevard

- Chino Creek, Reach 1 – Santa Ana River confluence to beginning of hard lined channel south of Los Serranos Road

- Chino Creek, Reach 2 – Beginning of hard lined channel south of Los Serranos Road to confluence with San Antonio Creek

- Mill Creek (Prado Area) – Natural stream from Cucamonga Creek Reach 1 to Prado Basin

- Cucamonga Creek, Reach 1 – Confluence with Mill Creek to 23rd Street in City of Upland

- Prado Park Lake

As noted above, waterbodies on the 303(d) list are subject to the development of a TMDL. Accordingly, on August 26, 2005, the RWQCB adopted Resolution No. R8-2005-0001, amending the Basin Plan to incorporate Bacterial Indicator TMDLs for the above-listed waterbodies in the watershed (aka, MSAR Bacterial Indicator TMDL) (RWQCB 2005). The TMDLs adopted by the RWQCB were subsequently approved by the SWRCB on May 15, 2006, by the California Office of Administrative Law on September 1, 2006, and by EPA Region 9 on May 16, 2007. The EPA approval date is the TMDL effective date.

The MSAR Bacterial Indicator TMDL established wasteload allocations for urban MS4 and confined animal feeding operation discharges and load allocations for agricultural and natural sources. The wasteload and load allocations were established for both fecal coliform and *E. coli*:

- Fecal coliform: 5-sample/30-day logarithmic mean (or geometric mean) less than 180 organisms/ 100 mL and not more than 10 percent of the samples exceed 360 organisms/100 mL for any 30-day period.

- *E. coli*: 5-sample/30-day logarithmic mean (or geometric mean) less than 113 organisms/100 mL and not more than 10 percent of the samples exceed 212 organisms/100 mL for any 30-day period.

The urban discharger requirements are listed as tasks in the TMDL, with Tasks 1.2, 3, 4.1, 4.3, 4.5, and 6 having relevance to this CBRP for Riverside County (Table 1-1). Other tasks included in the TMDL either address urban discharges associated with Riverside County or other agricultural discharge requirements.

1.4 Riverside County MS4 Permit

In large metropolitan areas with interconnected MS4s, MS4 permits are often issued to multiple permittees that work cooperatively to implement the requirements. This is the case for the Riverside County area where the MS4 facilities within the MSAR watershed are permitted under a single area-wide MS4 permit. The Riverside County Flood Control and Water Conservation District (RCFC&WCD) is the Principal Permittee and the County of Riverside and the Cities of Beaumont, Calimesa, Canyon Lake, Corona, Hemet, Lake Elsinore, Menifee, Moreno Valley, Murrieta, Norco, Perris, Riverside, San Jacinto, and Wildomar are the Co-Permittees.

The first MS4 permit was issued by the RWQCB to the Riverside County permittees in 1990. The 1990 MS4 permit was followed by MS4 permits issued in 1996 and 2002. With the issuance of each of these permits the number of requirements and the cost of program implementation has increased It was during the 2002 MS4 permit that the RWQCB began the adoption of TMDLs that included wasteload allocations applicable to urban stormwater discharges. Although the 2002 MS4 permit did not include specific TMDL implementation programs, the MS4 permittees actively participated in the development and implementation of these TMDLs.

Table 1-1. MSAR Bacterial Indicator TMDL requirements applicable to portions of Riverside County.

Task	Subtask	Required Activity	Schedule/Status
Task 1 – Review/ Revise Existing Waste Discharge Requirements	Task 1.2 – WDR requirements for Riverside County MS4	Review and revise the Waste Discharge Requirements for the Riverside County MS4 permit as necessary to include the appropriate wasteload allocations, compliance schedules and or monitoring requirements	New MS4 permit was adopted on January 29, 2010. Relevant TMDL requirements, including the preparation of the CBRP for dry weather were included in the permit
Task 3 - Watershed-Wide Bacterial Indicator Water Quality Monitoring Program	NA	All named responsible parties in the TMDL shall, as a group, submit to the RWQCB for approval a proposed watershed-wide monitoring program that will provide data necessary to review and update the TMDL.	All parties (except U.S. Forest Service) are implementing a RWQCB approved monitoring program collaboratively through the MSAR Task Force (see Sections 2.2 and 2.4)
Task 4 – Urban Discharges	Task 4.1 - Develop and Implement Bacterial Indicator Urban Source Evaluation Plan (USEP)	Responsible parties in Riverside County (as named in the TMDL) shall develop a Bacterial Indicator Urban Source Evaluation Plan. This plan shall include steps needed to identify specific activities, operations, and processes in urban areas that contribute bacterial indicators to MSAR watershed waterbodies. The plan shall also include a proposed schedule for completion of each of the steps identified. The proposed schedules can include contingency provisions that reflect uncertainty concerning the schedule for completion of the SWQSTF work and/or other investigations that may affect the steps that are proposed. The USEP shall be implemented upon RWQCB approval.	The RWQCB-approved USEP has been implemented by the responsible parties since 2008 (see Section 2.5). In addition, this CBRP incorporates the principles/activities of the USEP and replaces its implementation requirements (See Section 7.3).
	Task 4.3– Revise the Riverside County Drainage Area Management Plan (DAMP)	The Executive Office shall notify the MS4 permittees of the need to revise the DAMP to incorporate measures to address the results of the USEP and/or other studies. The revised DAMP will be implemented upon approval by the RWQCB.	The January 29, 2010 MS4 permit includes requirements for DAMP revisions that are being coordinated with TMDL implementation
	Task 4.5 – Revise the Riverside County Water Quality Management Plan (WQMP)	The Executive Office shall notify the MS4 permittees of the need to revise the WQMP to incorporate measures to address recommendations of the SWQSTF or other investigations. The revised WQMP will be implemented upon approval by the RWQCB.	The January 29, 2010 MS4 permit includes requirements for WQMP revisions that are being coordinated with TMDL implementation and this CBRP
Task 6 – Review or Revision of the MSAR Bacterial Indicator TMDL	NA	RWQCB will review all data and information generated pursuant to the TMDL requirements on an ongoing basis (at least every three years). Based on results from the monitoring programs, special studies, modeling analysis, SWQSTF and/or special studies, changes to the TMDL, including revisions to the numeric targets, may be warranted.	The first Triennial Report was submitted on February 15, 2010; additional Triennial Reports will be prepared in 2013 and 2016 as part of this CBRP (see Section 7.1)

The 2010 MS4 permit was adopted by the RWQCB on January 29, 2010 (Order No. 2010-0033, NPDES No. CAS618033). This permit contains many new requirements that will further increase the complexity and costs associated with the management of stormwater in the permitted area. In addition, for the first time the MS4 permit explicitly includes TMDL implementation requirements applicable to waterbodies in Riverside County for which TMDLs are effective, specifically Lake Elsinore/Canyon Lake (nutrients) and waterbodies within the MSAR watershed (bacterial indicators). The development of this CBRP is a MS4 permit requirement associated with implementation of the MSAR Bacterial Indicator TMDL. The CBRP is due as a draft to the RWQCB by December 31, 2010. A final plan will prepared based on RWQCB comments. Section 1.5 describes in detail CBRP development requirements and activities.

1.5 Comprehensive Bacterial Indicator Reduction Plan

This section provides detailed information on the requirements for CBRP development and the applicability of the plan to urban discharges in the Riverside County area. In addition, information is provided on the general framework of this plan and the process associated with its development.

1.5.1 Purpose and Requirements

The need for the development of the CBRP is described in the findings section of the Riverside County MS4 permit, e.g.:

- *Section II.F.7* – "The MSAR TMDL Implementation Plan assigns responsibilities to specific MS4 dischargers to identify sources of impairment, to propose BMPs to address those sources, and to monitor, evaluate, and revise BMPs as needed, based on the effectiveness of the BMP implementation program. These are generally considered as the short-term solutions. The MSAR permittees are required to develop and implement a long-term solution (a Comprehensive Bacterial Indicator Reduction Plan (CBRP)) designed to achieve compliance with the WLAs [wasteload allocations] by the dates specified in the TMDLs…"

- *Section II.F.14* – "The Permittees are required to develop a CBRP to achieve compliance with the WLAs by the compliance dates. Periodic evaluation and update of the CBRP may be necessary based on a BMP effectiveness analysis to ensure compliance with the WLAs by the compliance dates."

- *Section II.F.16* – "In the absence of an approved CBRP, the WLAs become the final numeric WQBEL that must be achieved by the compliance dates."

Based on these findings, the RWQCB established specific requirements for the CBRP's content. These requirements, found in Section VI.D.1.c.i in the Riverside County MS4 permit, include:

Section VI.D.1.c.i - The MSAR Permittees shall prepare for approval by the RWQCB a CBRP describing, in detail, the specific actions that have been taken or will be taken to achieve compliance with the urban wasteload allocation during the dry season (April 1st through October 31st) by December 31, 2015. The CBRP must include:

(1) The specific ordinance(s) adopted to reduce the concentration of indicator bacteria in urban sources.

(2) The specific BMPs implemented to reduce the concentration of indicator bacteria from urban sources and the water quality improvements expected to result from these BMPs.

(3) The specific inspection criteria used to identify and manage the urban sources most likely causing exceedances of water quality objectives for indicator bacteria.

(4) The specific regional treatment facilities and the locations where such facilities will be built to reduce the concentration of indicator bacteria discharged from urban sources and the expected water quality improvements to result when the facilities are complete.

(5) The scientific and technical documentation used to conclude that the CBRP, once fully implemented, is expected to achieve compliance with the urban wasteload allocation for indicator bacteria by December 31, 2015.

(6) A detailed schedule for implementing the CBRP. The schedule must identify discrete milestones to assess satisfactory progress toward meeting the urban wasteload allocations for dry weather by December 31, 2015. The schedule must also indicate which agency or agencies are responsible for meeting each milestone.

(7) The specific metric(s) that will be established to demonstrate the effectiveness of the CBRP and acceptable progress toward meeting the urban wasteload allocations for indicator bacteria by December 31, 2015.

(8) The DAMP, WQMP and Local Implementation Plans shall be revised consistent with the CBRP no more than 180 days after the CBRP is approved by the RWQCB.

(9) Detailed descriptions of any additional BMPs planned, and the time required to implement those BMPs, in the event that data from the watershed-wide water quality monitoring program indicate that water quality objectives for indicator bacteria are still being exceeded after the CBRP is fully implemented.

(10) A schedule for developing a CBRP needed to comply with the urban wasteload allocation for indicator bacteria during the wet season (November 1st thru March 31st) to achieve compliance by December 31, 2025.

1.5.2 Applicability

The applicability of this CBRP is limited to the following:

- *Bacterial Indicator Sources* – The CBRP is designed to mitigate, to the maximum extent practicable (MEP), controllable urban sources of bacterial indicators that cause non-attainment of bacterial indicator water quality objectives at the watershed-wide compliance sites.

- *Jurisdiction* – This CBRP only applies to the following MS4 permittees named in the TMDL: County of Riverside; the Cities of Corona, Norco, and Riverside[2].

- *Hydrologic Condition* – This CBRP applies only to urban discharges from the MS4 during dry weather conditions that have the potential to impact the downstream watershed-wide TMDL compliance monitoring site.

- *Seasonal Condition* - This CBRP applies only to urban discharges from the MS4 during the period April 1st through October 31st.

1.5.3 Compliance with Urban Wasteload Allocation

The Riverside County MS4 permittees have developed a CBRP that is designed to achieve compliance with the dry season urban wasteload allocation to the MEP by the compliance date of December 31, 2015. Compliance with the wasteload allocations can be measured in several ways:

- Water quality objectives are attained at the watershed-wide compliance sites established as part of the implementation of the TMDL (see Section 6). If not attained, then it must be demonstrated that bacterial indicators from controllable urban sources are not the cause of non-attainment.

- Compliance with urban source wasteload allocations is demonstrated from specific MS4 facilities, e.g., sampling demonstrates that MS4 outfalls or drains are in compliance with the wasteload allocation during dry weather conditions.

- MS4 facilities, e.g., outfalls, are dry, contributing no dry weather flow (DWF) to downstream waters.

1.5.4 Conceptual Framework

The development of this CBRP relied to a large degree on the use of a pragmatic source evaluation-based approach for identifying urban sources of bacterial indicators, evaluating their controllability, and implementing mitigation activities where necessary. This pragmatic approach is a direct extension of the already RWQCB-approved watershed-wide compliance monitoring program and Urban Source Evaluation Plan (USEP) (see Sections 2.4 and 2.5). Coupled with this pragmatic approach is the incorporation of activities that are relevant existing MS4 permit

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[2] During CBRP implementation, it is expected that Eastvale and Jurupa Valley will become incorporated and take over responsibilities for CBRP implementation that currently apply to Riverside County.

requirements, which are supplemented to include activities that are expected to provide additional water quality benefits.

This CBRP includes a schedule with a built in iterative and adaptive management strategy (see Sections 7 and 8). This provision allows the MS4 program to incorporate findings from CBRP implementation activities to make mid-course corrections to the plan (with RWQCB approval) that are deemed necessary to achieve compliance.

1.5.5 CBRP Development Process

The CBRP was developed collaboratively by the Riverside County permittees participating in the MSAR TMDL. Development was coordinated with the Riverside County permittees and MSAR TMDL Task Force (see Section 2.2), as needed. Activities completed or planned include:

- July 27, 2010 – Presentation was made to the MSAR TMDL Task Force on the CBRP program as presented in Sections 3 and 4. Presentation was posted by SAWPA on their website.

- August 18, 2010 – Presentation was made to the MSAR TMDL Task Force on the CBRP program as presented in Section 5. Presentation was posted by SAWPA on their website.

- October 21, 2010 – Presentation was made to the Riverside County City Managers.

- Riverside County will conduct a parallel public review process between January and March of 2011, during RWQCB review of the draft CBRP.

1.5.6 CBRP Roadmap

Following is a summary of the purpose and content of each of the remaining sections of this CBRP:

- ***Section 2*** – Summarizes all activities completed to date as part of the implementation of the MSAR Bacterial Indicator TMDL

- ***Section 3*** – Describes the characteristics of the MSAR watershed, including general physical and jurisdictional characteristics, dry weather hydrology, relevant MS4 facilities and water quality.

- ***Section 4*** – Provides an overview of existing MS4 program activities relevant to the control of bacterial indicators in urban discharges from the permittees' MS4 that will continue to be implemented as part of the MS4 permit.

- ***Section 5*** – Describes CBRP elements that will be implemented to achieve compliance with the urban wasteload allocations for the dry season.

- ***Section 6*** **–** Provides the technical basis for the conclusion that full implementation of the CBRP will achieve compliance with the urban wasteload allocation under dry weather conditions.

- ***Section 7*** **–** Establishes the schedule for each of the CBRP elements described in Section 5.

- ***Section 8*** **–** Describes the implementation strategy associated with this plan.

- ***Section 9*** **–** Provides the schedule for development of the CBRP for achieving compliance with urban wasteload allocations under wet weather conditions.

- ***Section 10*** - References

Section 2
TMDL Implementation

2.1 Introduction

The MSAR MS4 permittees have been actively engaged in implementation of the MSAR Bacterial Indicator TMDL since its 2005 adoption by the RWQCB (almost two years before the TMDL became effective upon EPA approval in 2007). All TMDL requirements with specific completion dates from establishment of a watershed-wide monitoring program to adoption and implementation of the USEP have been met. The outcomes of the various TMDLs completed to date provide the foundation for this CBRP. Each of these activities is described in more detail below.

2.2 MSAR TMDL Task Force

With formal adoption of the MSAR Bacterial Indicator TMDL on August 26, 2005, all responsible parties named in the TMDL began the process to create a formal cost-sharing body, or Task Force, to collaboratively implement a number of requirements defined in the TMDL. Task Force participants include:

- RCFC&WCD
- County of Riverside
- Cities of Corona, Norco, and, Riverside
- San Bernardino County Flood Control District (SBCFCD) (representing the Cities of Chino, Chino Hills, Fontana, Montclair, Ontario, Rancho Cucamonga, and Rialto)
- Cities of Pomona and Claremont (Los Angeles County, pending formal agreement)
- Agricultural Pool and Milk Producers
- U.S. Department of Agriculture, U.S. Forest Service
- RWQCB
- SAWPA

SAWPA serves as administrator of the Task Force. In this role, SAWPA provides all Task Force meeting organization/facilitation, secretarial, clerical and administrative services, management of Task Force funds, annual reports of task force assets and expenditures and hiring of Task Force authorized consultants. All documents and presentation (including CBRP presentations to the Task Force) are posted on SAWPA's project website at: www.sawpa.org/roundtable-MSARTF.html.

2.3 Proposition 40 State Grant

In anticipation of EPA approval of the MSAR Bacterial Indicator TMDL, SAWPA, in cooperation with the urban dischargers (SBCFCD and RCFC&WCD) and on behalf of the Task Force submitted a California Proposition 40 grant proposal ("Grant Project") to the State Board to support implementation of the TMDL. The State Board approved the Grant Project in fall 2006 and the project was initiated in early 2007.

The overarching purpose of the Grant Project was to accelerate the TMDL implementation process by supporting efforts by urban dischargers to implement TMDL requirements, including the watershed-wide monitoring program and USEP (which are described in more detail below). Within this framework, the Grant Project focused on identifying sources of bacterial indicator contamination in the MSAR watershed and pilot testing BMP technologies designed to reduce bacterial indicators in storm drains (SAWPA 2010b). The results of these activities were used to support the development of this CBRP to achieve compliance with urban wasteload allocations during dry weather conditions.

2.4 Watershed-wide Compliance Monitoring

Task 3 of the TMDL implementation plan (see also Table 1-1) required the responsible jurisdictions named in the TMDL to submit to the RWQCB for approval a proposed watershed-wide compliance monitoring program. The purpose of this program is to provide the data necessary to review and update the TMDL as needed and evaluate compliance with the TMDL wasteload and load allocations.

Using the Grant Project as a funding vehicle to initiate this TMDL task, the MSAR Task Force worked with the RWQCB to select compliance sites consistent with the purpose of this monitoring program. Compliance sites were selected based on two key criteria:

- The sites should be located on waterbodies that are impaired and subject to Bacterial Indicator TMDL compliance requirements; and
- The sites should be located in reaches of the impaired waterbodies where REC-1 activity is likely to occur, i.e., there is an increased risk from exposure to pathogens.

Based on these criteria, six watershed-wide compliance monitoring sites were selected originally as compliance sites (Table 2-1). One of these sites, Icehouse Canyon Creek was later removed with RWQCB approval[3]. A Monitoring Plan and Quality Assurance Project Plan (QAPP) were prepared to support the monitoring program (available at www.sawpa.org/roundtable-MSARTF.html). Appendix B of the Monitoring Plan provides information regarding each of the monitoring sites listed in Table 2-1.

The RWQCB approved the Monitoring Plan and QAPP, and the Task Force initiated sampling in summer 2007. Weekly sampling occurs over a 20-week period during the dry season (April 1 – October 31) and an 11-week period during the wet season

[3] Bacterial indicator concentrations in Icehouse Canyon Creek were consistently non-detect. The MSAR Bacterial Indicator TMDL Taskforce and the RWQCB determined that this site is representative of water quality from natural background in higher elevation areas, and not representative of natural background in lowland areas, and therefore the site was removed from the list of compliance monitoring sites.

(November 1 – March 31). Four samples are collected during and after one wet weather event each year. This sampling program has been implemented annually since 2007.

Table 2-1. Watershed-wide Monitoring Program Sample Sites

MSAR Waterbody	Sample Sites	Site Code[1]
Icehouse Canyon Creek [2]	Icehouse Canyon Creek	WW-C1
Prado Park Lake	Prado Park Lake at Lake Outlet	WW-C3
Chino Creek	Chino Creek at Central Avenue	WW-C7
Mill-Cucamonga Creek	Mill Creek at Chino-Corona Rd	WW-M5
Santa Ana River, Reach 3	Santa Ana River Reach 3 @ MWD Crossing	WW-S1
	Santa Ana River Reach 3 @ Pedley Ave	WW-S4

[1] – Location of sites shown on Figures 3-8 through 3-11.
[2] – Icehouse Canyon Creek was removed from the list of watershed-wide compliance monitoring sites with RWQCB approval.

2.5 Urban Source Evaluation Plan

The MSAR Bacterial Indicator TMDL required permitted MS4 dischargers to develop the USEP within six months after TMDL adoption or November 30, 2007. Per Section 4.1 of the TMDL (RWQCB 2005), the purpose of the USEP is to identify specific activities, operations, and processes in urban areas that contribute bacterial indicators to MSAR waterbodies. The plan should also include a proposed schedule for the activities identified and include contingency provisions as needed to reflect any uncertainty in the proposed activities or schedule.

The urban dischargers developed a USEP as part of Grant Project implementation activities. The RWQCB approved the USEP as compliant with TMDL requirements on April 18, 2008 (RWQCB Resolution R8-2008-0044[4]). The approved plan included a four step process for fulfilling the purpose of the USEP (as stated by the TMDL):

- *Step 1: Urban Source Evaluation Monitoring Program* – The first step in the plan is to conduct a monitoring program at key sites to gather bacterial indicator source data associated with urban land uses.

- *Step 2: Risk Characterization* – Step 2 couples the data obtained from Step 1 with other applicable watershed data to characterize the risk of exposure to bacterial indicators and prioritize urban sites for additional investigation.

- *Step 3: Site Investigations* – This step describes the types of actions that may be implemented to further investigate urban bacterial indicator sources. Per the outcome of Step 2, site investigation activities would be focused on high priority sites first.

[4] Available from the Regional Board's website at: www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/msar_tmdl.shtml

- *Step 4: Adaptive Implementation* - As new data become available or if changes in recreational uses occur on waterbodies as a result of SWQSTF efforts, then site prioritization or the schedule for USEP implementation may change.

A summary of the elements contained within each of these steps follows. The complete USEP is available at www.sawpa.org/roundtable-MSARTF.html.

2.5.1 Urban Source Evaluation Plan Monitoring Program

The MSAR Task Force implemented the urban source monitoring program during both dry and wet seasons in 2007 and 2008. Monitoring activities occurred at 13 locations in the MSAR watershed, including all major subwatersheds that drain to waters listed as impaired for bacterial indicators in the MSAR watershed. Table 2-2 provides information on the location of each monitoring site. Additional information about each sample location is available in Appendix C of the Monitoring Plan available at www.sawpa.org/roundtable-MSARTF.html.

To characterize bacterial indicator concentrations at each site (along with flow and other field parameters), samples were collected over four five-week periods in both the dry and wet seasons. Samples were collected from each site to identify sites where human, bovine or domestic canine sources of bacterial indicator were prevalent. Section 3.4.2 below provides a summary of the results of this monitoring program (see also SAWPA 2009). While human and domestic canine sources have a high potential to be found in most portions of the MS4 system, bovine sources are likely to be restricted to areas potentially influenced by dairy farming activities. In the MSAR watershed, the number of dairy farms has declined significantly in recent years and will continue to be replaced with new urban development (SAWPA 2010c).

2.5.2 Risk Characterization

The USEP established a framework for prioritizing sites for follow-up investigation of urban sources of bacterial indicators based on a characterization of risk of exposure to pathogens. Three key factors drive the characterization process:

- *Exceedance Factor* – The first factor to be evaluated in the framework is the frequency and magnitude by which the bacterial indicator exceeds the water quality objective. The greater the frequency and magnitude of recorded exceedances, the higher the likelihood that the contamination can be tracked back to its source. Intermittent, low intensity events are more difficult to detect and, therefore, more difficult to trace.

- *Contagion Factor* – Human beings, particularly children are believed to be at greater risk of infection from water-borne pathogens generated by other people (EPA 2007). Accordingly, the risk of illness resulting from recreational use is believed to be highest where microbial source tracking methods (e.g. *Bacteroides*) indicate the probable presence of human pathogens. After human sources, exposure to fecal contamination from agricultural animals is the next most important concern (EPA 2007).

Table 2-2. Urban Source Evaluation Plan Monitoring Program Sample Locations

MSAR Waterbody	Waterbody Reach[1]	Sample Location	Site Code[2]
Santa Ana River	Reach 3	Santa Ana River (SAR) at La Cadena Drive	US-SAR
		Box Springs Channel at Tequesquite Avenue	US-BXSP
		Sunnyslope Channel near confluence with SAR	US-SNCH
		Anza Drain near confluence with Riverside effluent channel	US-ANZA
		San Sevaine Channel in Riverside near confluence with SAR	US-SSCH
		Day Creek at Lucretia Avenue	US-DAY
		Temescal Wash at Lincoln Avenue	US-TEM
Chino Creek	Reach 1	Cypress Channel at Kimball Avenue	US-CYP
	Reach 2	San Antonio Channel at Walnut Ave	US-SACH
		Carbon Canyon Creek Channel at Pipeline Avenue	US-CCCH
Mill-Cucamonga Creek	Prado Area	Chris Basin Outflow (Lower Deer Creek)	US-CHRIS
		County Line Channel near confluence with Cucamonga Creek	US-CLCH
	Reach 1	Cucamonga Creek at Highway 60 (Above RP1)	US-CUC

[1] - Reaches are defined in the Basin Plan.
[2] – Location of sites shown on Figures 3-8 through 3-11.

- *Exposure Factor* - A higher investigation/implementation priority should be assigned to locations and conditions where recreational activities are most likely to occur. Exceedances that occur in natural channels, during warmer months with relatively moderate flows, merit a higher priority than those that may occur in a concrete flood control channel during a winter rainstorm. This different priority is based on the assumption that the number of persons likely to be exposed is much higher in the first case than in the second.

The factors described above drive the prioritization of urban source investigation activities established in the USEP. Figure 2-1 provides a framework for priority ranking from high (1) to low (8). Generally speaking, the highest priority sites are those where:

- Magnitude and frequency of bacterial indicator exceedance are high;
- *Bacteroides* marker analysis indicates the persistent presence of human sources of bacterial indicators;

- The site is in an area, or is close to an area, where recreational activities are likely to occur; and

- Observed exceedances and the presence of human sources of bacterial indicators occur during periods when people are most likely to be present, e.g., during warm months and dry periods.

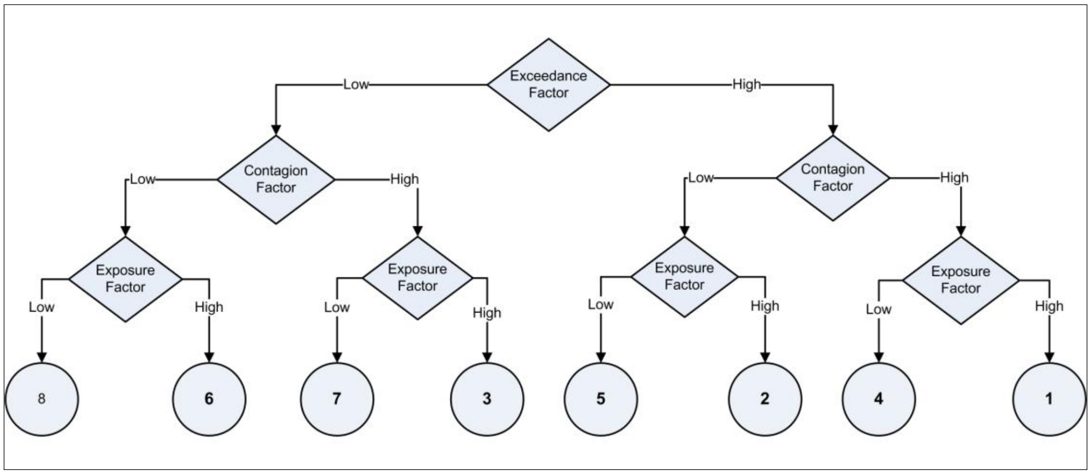


Figure 2-1. Risk Characterization Framework

In contrast, the lowest priority sites for urban dischargers would be those where the bacterial indicator exceedance frequency and magnitude is low, human or other urban sources, e.g., domestic dogs, are not present, and the site is not used for water contact recreation, e.g., a concrete, vertical walled flood control channel. Sites with bacterial indicators from agricultural sources are referred to the RWQCB for follow-up action with agricultural dischargers.

The exceedance, contagion and exposure factors provide the basic foundation for prioritizing sites or areas for further investigative activities. As appropriate, additional factors may be considered to more clearly define the priority between several sites with similar priorities based on the three base factors, as described above. For example, other relevant considerations may include regulatory factors, e.g., the waterbody may be reclassified as a result of Basin Plan changes (see CBRP Sections 1.2.2 and 5.2.5) or the source is determined to be uncontrollable.

The results of the 2007-2008 USEP monitoring program provided the first opportunity to rank sites based on the factors described above. This prioritization is still valid with regards to the preparation of this CBRP (e.g., see schedule Section 7.3 for implementation of source evaluation activities in various subwatersheds). However, as additional data are developed during CBRP implementation, priorities may be revised (as envisioned in Step 4 of the USEP). Section 3.4.2 summarizes the results of the 2007-2008 USEP program and how this information was used to prioritize TMDL implementation activities.

2.5.3 Site Investigations

The USEP describes the types of actions that may be implemented to further investigate urban sources of bacterial indicators. Investigative strategies would be developed at six month intervals to address the highest priority needs. In principle, resources would be directed to the high priority areas first; implementation activities in lower priority sites would occur only after high priority sites have been addressed. However, when necessary, the priority for any site can be elevated, particularly if new data become available that changes the priority for action.

The USEP identifies three general types of investigative activities: Channel surveys; enhanced tracking methods; and controllability assessments. These activities would typically be implemented sequentially at a given site, e.g., complete channel survey work before implementing an enhanced tracking method, but a step could be skipped if the source of the elevated levels of bacterial indicators is generally known. Following is a summary of the investigative tools envisioned for implementation under each investigative activity type in the USEP:

- *Channel Surveys* – Surveys may be conducted to better define sources of bacterial indicators. Example survey tools could include:
  - UAA development (consistent with SWQSTF methods) to refine application of the recreational uses in the Basin Plan.
  - Source tracking studies in tributaries or outfalls to better define the urban sources of bacterial indicators.
  - Flow loading from tributaries and other outfalls to evaluate potential for these sources to contribute significant numbers of bacterial indicators.
  - Preliminary source reconnaissance to identify potential sources of bacterial indicators including (a) direct human sources (e.g., leaking sewers or septic systems, transient camps, illicit discharges); (b) domesticated animals associated with urban land use, especially areas where domesticated animals are concentrated; and (c) wildlife concentration areas (e.g., birds, rodents, squirrels, rabbits, feral cats and dogs)
- *Enhanced Tracking Methods* – These methods provide a means to narrow down urban sources of bacterial indicators, including where to prioritize implementation efforts. Examples of tools that may be used to support enhanced source tracking include:
  - Evaluation of relative contribution of bacterial indicators by flow sources to determine which tributaries or drains contribute the most numbers of bacterial indicators to the waterbody.
  - Use of constituent-specific sampling (analgesics, hormones, caffeine, antibiotics, nutrients, surfactants, etc.) to identify potential flow sources.

  - Use of patterns and trends analyses to identify conditions under which elevated levels of bacterial indicators occur.

- *Controllability Assessments* – Where a bacterial indicator source requiring mitigation is identified, the final step in the investigative process is to determine the controllability of the source. Controllability is largely dependent on the nature of the source. For example, elevated levels of bacterial indicators attributable to wildlife or impacts associated with use of the waterbody as a conduit for water transfers may limit the controllability of the source. In these instances, it may not be feasible to control the source. Controllability assessments will consider three alternatives:

  - Prevention (or source control) activities, including for example repair of all sewer leaks, better control of domestic animals, moving transient camps, stronger enforcement of illicit discharges, etc.

  - Construction of low flow diversions to intercept DWFs and send the water to a facility for recharge or to a regional wastewater treatment facility.

  - Use of on-site or regional BMPs, e.g., detention ponds, wetlands and bioswales for regional treatment. The practicability of using these facilities would be considered on a site-specific basis.

2.5.4 Adaptive Implementation

Adaptive implementation is an iterative process commonly incorporated into TMDL implementation plans to provide a means to reassess compliance strategies based on new data or analyses. Given the large uncertainty associated with control of pollutants such as bacterial indicators, an adaptive implementation component was included in the USEP framework to provide opportunity, where appropriate, to reconsider priorities. This adaptive component has been carried forward into this CBRP (see Section 8).

2.5.5 USEP Implementation

The USEP contains an implementation schedule that centers around periodic implementation of source evaluation activities to identify sources of bacterial indicators for potential mitigation. Along with these activities, the USEP requires submittal of a semi-annual report to document ongoing and planned activities related to the management of urban sources of bacterial indicators. These reports have been submitted since July 2009.

In spring 2009 the Task Force established the first priority areas for further investigation based on the findings of the 2007-2008 USEP monitoring program and ongoing watershed-wide monitoring at the compliance sites (see Section 3.4.2 for a discussion of this prioritization process). In fall 2009 the Task Force authorized two USEP-based studies:

- *Source Evaluation Activities in Carbon Canyon Creek and Cypress Channels in San Bernardino County* – The data analysis report prepared after completion of 2007-2008 monitoring activities (SAWPA 2009a) prioritized the next steps for USEP implementation based on the risk characterization approach described above. USEP sample locations with a combination of the largest number of exceedances of bacterial indicator water quality objectives, highest levels of bacterial indicators, and most frequent indications of contamination by human sources were given the highest priority for additional source evaluation activities. Accordingly, the Cypress Channel subwatershed was ranked high for follow-up investigations. In contrast, the Carbon Canyon Creek subwatershed was ranked very low as both the frequency of exceedances of water quality objectives and the levels of bacterial indicators was relatively low.

  Both the Cypress Channel and Carbon Canyon Creek drainage areas were recommended for source evaluation studies. Evaluation of the Carbon Canyon Creek subwatershed was included to determine if any site-specific characteristics could be identified that provide insight into how to reduce bacterial indicator levels elsewhere. Source evaluation activities involved a desktop level characterization as well as field reconnaissance to identify subwatershed or in-stream characteristics which may contribute to high or low levels of bacterial indicators at either site. A technical memorandum summarizing the findings of this effort was prepared (SAWPA 2010d).

- *Dry Weather Runoff Controllability Assessment for Lower Deer Creek Subwatershed (Chris Basin) in San Bernardino County* – SAWPA (2009a) identified Chris Basin as a high priority site for bacteria source evaluation activities. Given its location at the confluence of Cucamonga Creek and Lower Deer Creek, Chris Basin has the potential to be retrofitted for use as a regional treatment BMP for dry weather runoff. The USEP study evaluated opportunities to retrofit the site to capture DWFs and eliminate the existing dry weather discharge to Cucamonga Creek. A technical memorandum summarizing the findings of this study was prepared (SAWPA 2010e).

Both of the above USEP studies recommended a number of follow-up actions applicable to both urban dischargers and the RWQCB. Additional source evaluation studies are currently being developed for 2010-2011 by the Task Force. However, in the future, source evaluation activities described in this CBRP will supersede the USEP and become the driving schedule for bacterial indicator source evaluation activities in the MSAR watershed (see Section 5.2.3, and Section 7.3.3).

In addition, RCFC&WCD initiated an illicit connection/illegal discharge (IC/ID) investigation in January 2008 to attempt to track down the source, which may have caused persistent human *Bacteroides* detection found at the Box Springs Channel during the 2007-2008 USEP monitoring period (see Section 3.4.4).

2.6 Triennial Review Summary

Task 6 in the implementation section of the MSAR Bacterial Indicator TMDL requires preparation of a water quality assessment every three years that summarizes the data collected for the preceding three year period and evaluates progress towards compliance with wasteload and load allocations. Referred to as a Triennial Report, the requirement for this assessment is also in the MS4 permit (Appendix 3, III.3.D.1.b). The first of these Triennial Reports was submitted to the RWQCB as required by February 15, 2010 (SAWPA 2010a).

The Triennial Report findings, relevant to the MS4 wasteload allocation, are provided in Section 3.4.1 of this CBRP (the full report is available at www.sawpa.org/roundtable-MSARTF.html). These findings provide the baseline for the CBRP analysis that demonstrates that implementation of this CBRP is expected to achieve compliance with the wasteload allocation by December 15, 2015. Additional Triennial Reports will be prepared in 2013 and 2016 as part of CBRP implementation (see Sections 7.1 and 8).

Section 3
Watershed Characterization

3.1 Middle Santa Ana River Watershed

The following sections provide background information regarding the general characteristics of the MSAR watershed, including major subwatersheds, key jurisdictions and dominant land use.

3.1.1 General Description

The Santa Ana River watershed, located in southern California, encompasses an area of approximately 2,800 square miles. Surface water flows begin in the San Bernardino and San Gabriel Mountains and flow in a generally northeast to southwest direction to the Pacific Ocean. Flows are interrupted by a number of features ranging from groundwater recharge basins to Prado Basin Dam. The MSAR watershed encompasses an area of approximately 488 square miles and is located generally in the north central portion of the Santa Ana River watershed (Figure 3-1).

The MSAR watershed includes the southwestern part of San Bernardino County, the northwestern part of Riverside County, and a small portion of Los Angeles County (Figure 3-1). Riverside County jurisdictions participating in this CBRP include the County of Riverside and the Cities of Corona, Norco, and Riverside (Figure 3-2). The City of Eastvale recently incorporated in 2010 and will be required to be a participant in the CBRP. Jurupa Valley is also in the process of incorporating and is currently scheduled for a vote in the fall 2011 elections.

Lying within an arid region, limited natural perennial surface water is present in the watershed. Flows derived from mountain areas (snowmelt or storm runoff) are mostly captured by dams or percolated in recharge basins. In the transition zone from mountains to lower lying valley areas, the sources of surface water flows vary, e.g., dry weather urban runoff, such as occurs from irrigation, stormwater runoff during rain events, treated municipal wastewater discharges, water transfers, dewatering discharges and other permitted discharges, and rising groundwater.

The largest order waterbody in the MSAR watershed is Reach 3 of the Santa Ana River which flows from Mission Boulevard to Prado Basin Dam, where Prado Dam controls flows from the middle to the lower part of the Santa Ana River watershed. Downstream of Mission Boulevard, there is less channelization of the Santa Ana River, allowing for larger meanders and riparian habitat extent within a wider floodplain. A number of major tributaries to the MSAR exist, many of which have been modified for flood control purposes.

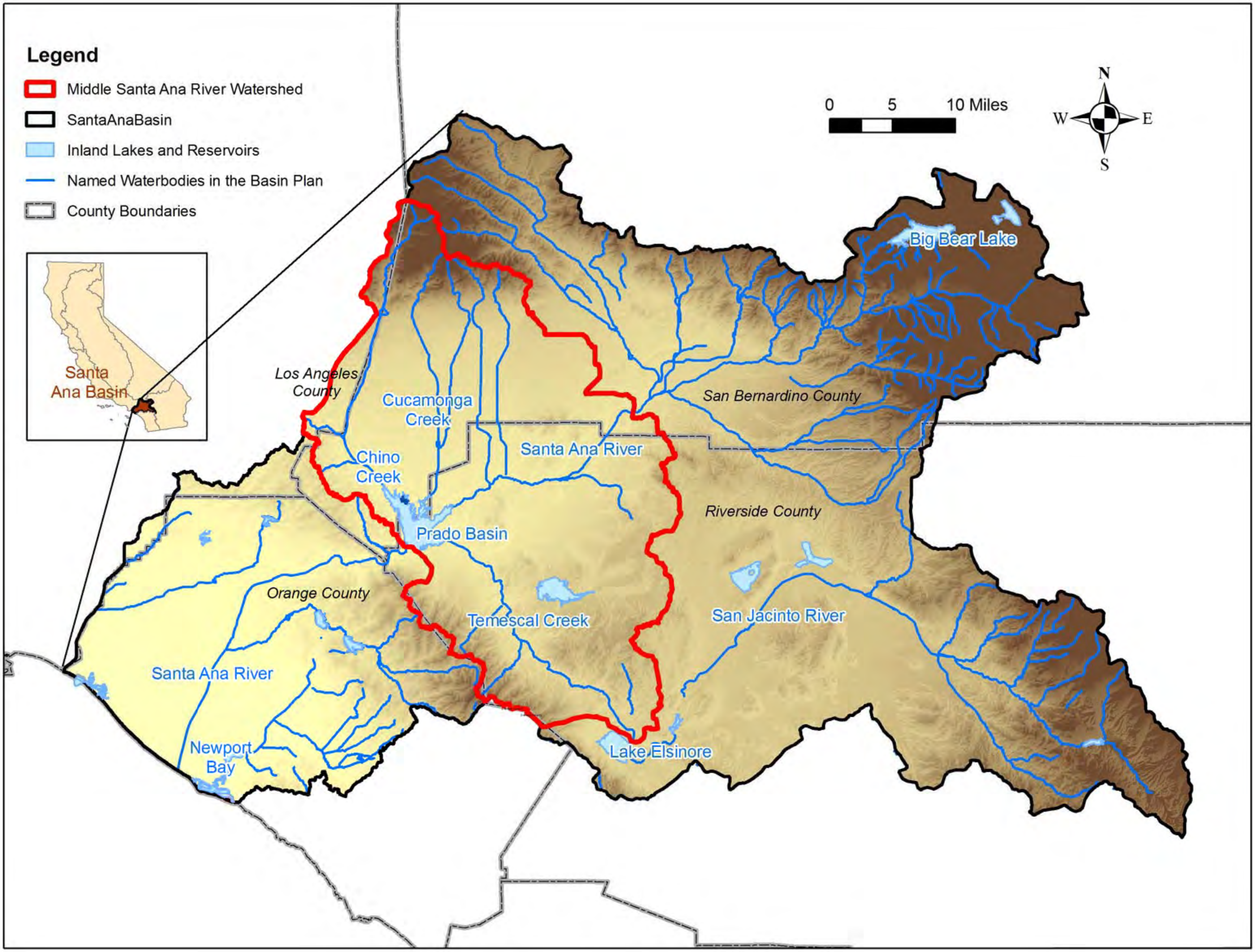


Figure 3-1. Santa Ana River Watershed

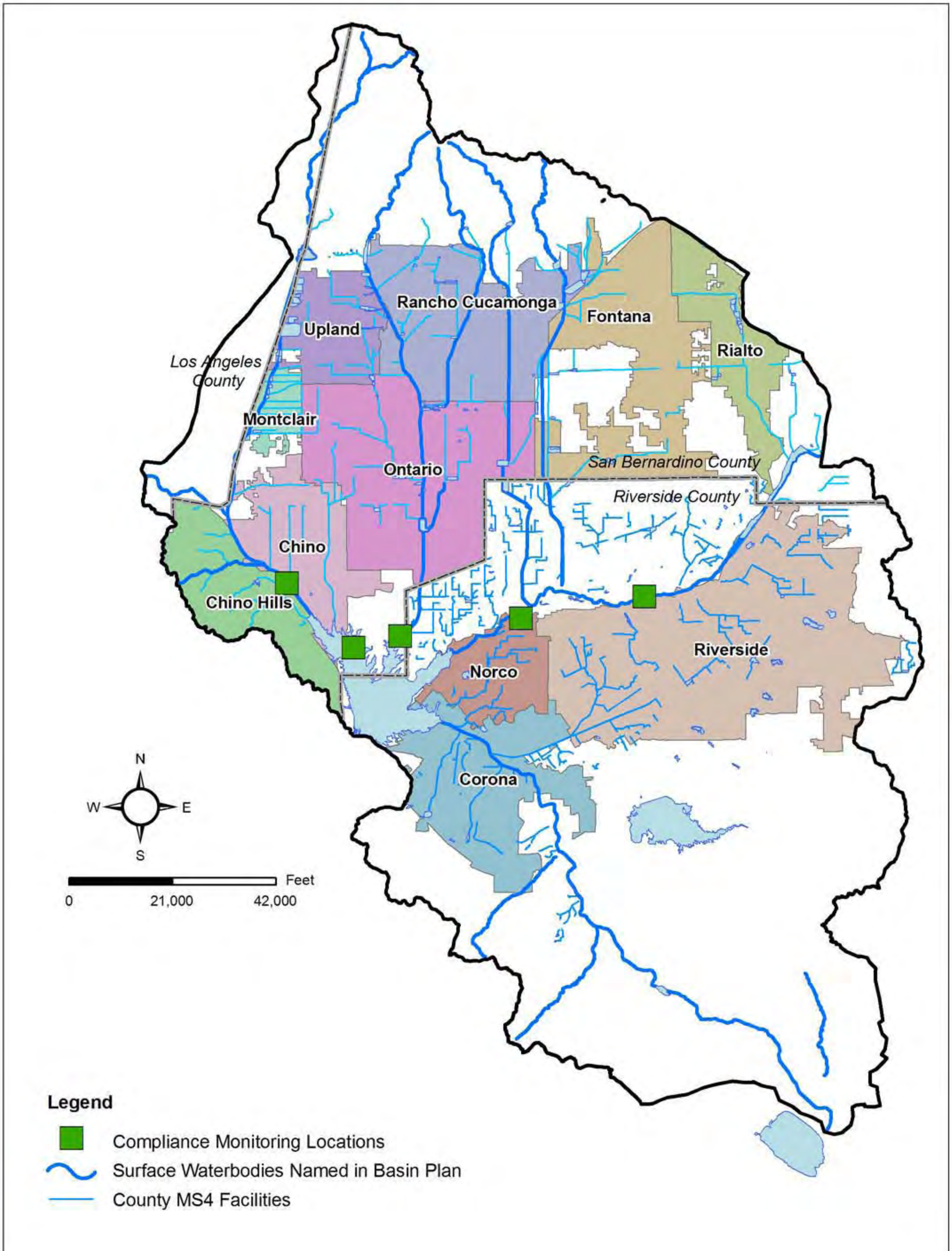


Figure 3-2. Jurisdictional Areas

Based on 2000 census data, the population of the MSAR watershed is approximately 1.4 million people. Much of the lowland areas are highly developed; however, a portion of the watershed remains largely agricultural - the area formerly known as the Chino Dairy Preserve. This area is located in the south central part of the Chino Creek Basin subwatershed. At the time of TMDL development the area contained approximately 300,000 cows (RWQCB 2005). As of January 2009, this number was down to about 138,500 (email communication, Ed Kashak, RWQCB, to Pat Boldt, representative of agricultural interests and MSAR Task Force member, December 8, 2009). In recent years, the cities of Ontario, Chino, and Chino Hills annexed the unincorporated portions of this area in San Bernardino County. The remaining portion of the former preserve, which is in Riverside County, was recently incorporated in the City of Eastvale (http://www.rcip.org/pdf_files/maps_09_24_03/lowres/Fig3_4Eastvale.pdf).

3.1.2 Major Subwatersheds

The MSAR watershed is divided into several major subwatersheds to provide a basis for evaluating compliance with TMDL urban wasteload allocations. These subwatersheds drain to the following watershed-wide compliance points as established in the watershed-wide monitoring program (see Section 2.4) (Figure 3-3; see Table 2-1):

- Chino Creek at Central Avenue (WW-C7) – No portion of this subwatershed is in Riverside County.
- Mill-Cucamonga Creek at Chino-Corona Road (WW-M5) – With the exception of a small area in Riverside County, drainage area is mostly in San Bernardino County.
- Santa Ana River at MWD Crossing (WW-S1) – Areas of both Riverside and San Bernardino Counties drain to this site.
- Santa Ana River at Pedley Avenue (WW-S4) - Areas of both Riverside and San Bernardino Counties drain to this site.
- Prado Park Lake (WW-C3) – Entire drainage area to this location is in San Bernardino County.

Another important subwatershed in the MSAR watershed is Temescal Creek. Temescal Creek is tributary to Reach 3 of the Santa Ana River. The RWQCB has not listed Temescal Creek as impaired by bacterial indicators and, therefore, no watershed-wide compliance monitoring location has been established on this waterbody. The confluence of Temescal Creek and the Santa Ana River Reach 3 occurs in Prado Basin, well downstream of the watershed-wide bacterial indicator TMDL compliance monitoring site at Santa Ana River at Pedley Avenue.

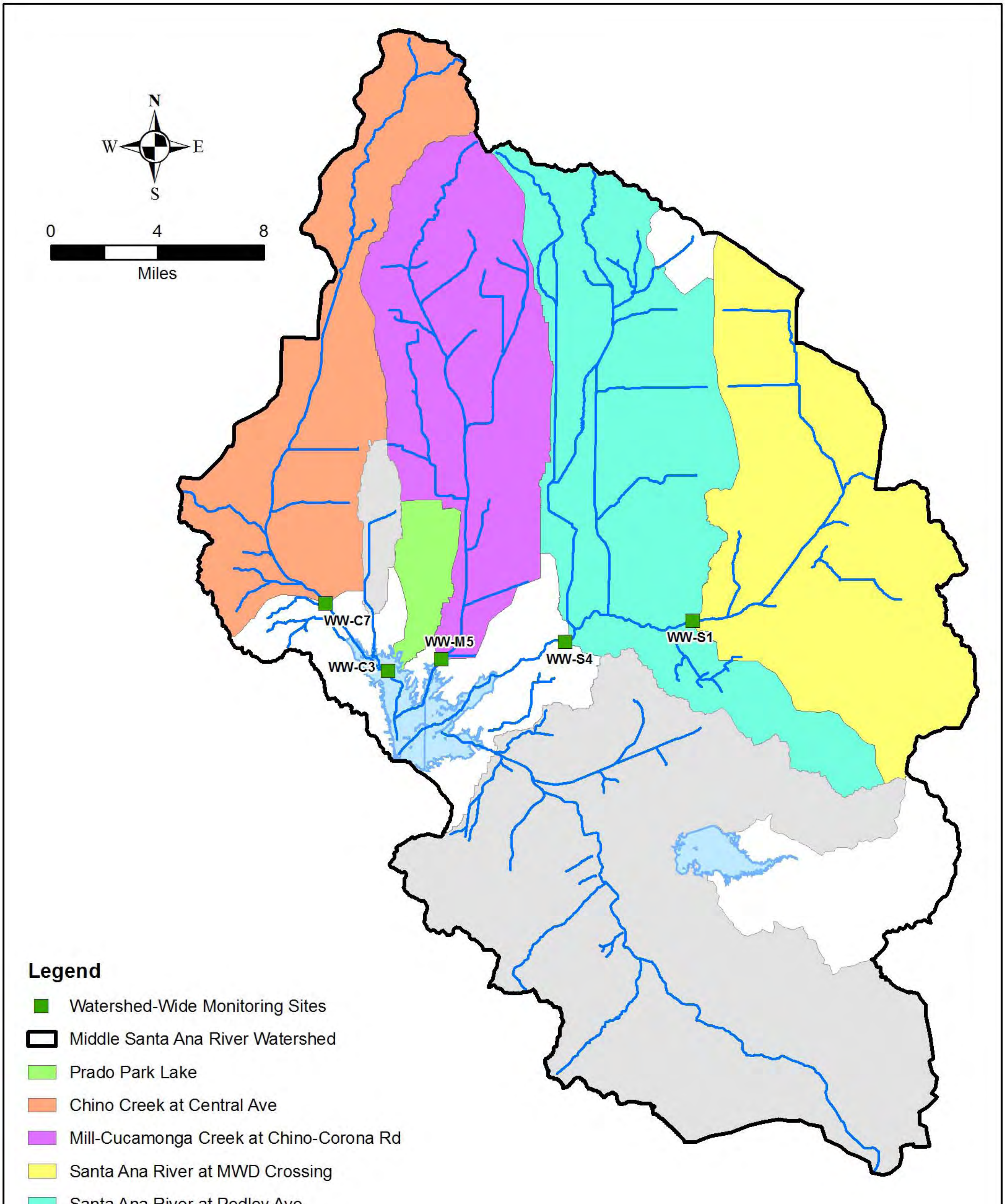


Figure 3-3. Major Sub-watershed Draining to TMDL Compliance Sites

Table 3-1. Jurisdictional area and percent land use in each of the major MSAR subwatersheds (areas outside of Riverside County included to show land use percentages of all areas draining to watershed-wide compliance sites).

Jurisdictions within MSAR Subwatersheds	Drainage Area (acres)	Agricultural	Commercial Institutional	Industrial	Infrastructure	Mixed Urban	Natural Vacant	Open Space Recreation	Residential	Water Wetlands
Chino Creek at Central Avenue (WW-C7)	**54,607**									
Chino	7,659	10%	15%	25%	5%	1%	4%	2%	38%	0%
Chino Hills	6,125	6%	7%	0%	3%	0%	42%	2%	40%	0%
Montclair	3,537	1%	24%	12%	5%	1%	4%	2%	51%	0%
Ontario	2,721	3%	16%	6%	0%	1%	3%	4%	67%	0%
Upland	5,161	0%	13%	17%	7%	0%	11%	1%	51%	0%
Unincorporated San Bernardino	13,714	2%	1%	1%	1%	0%	81%	1%	13%	0%
Claremont	3,011	0%	21%	2%	6%	0%	30%	8%	32%	1%
Pomona	6,707	0%	15%	10%	6%	0%	9%	3%	57%	0%
Unincorporated Los Angeles	5,972	0%	0%	0%	0%	0%	99%	0%	1%	0%
Mill-Cucamonga Creek at Chino-Corona Road (WW-M5)	**55,456**									
Chino	618	65%	0%	0%	2%	2%	26%	0%	5%	0%
Ontario	18,006	20%	7%	19%	16%	1%	13%	2%	22%	0%
Rancho Cucamonga	5,256	1%	10%	8%	6%	1%	11%	3%	60%	0%
Upland	4,871	2%	10%	5%	7%	5%	4%	4%	62%	1%
Unincorporated San Bernardino	13,860	0%	0%	0%	4%	0%	91%	0%	5%	0%
Eastvale	2,815	32%	1%	10%	3%	5%	28%	1%	20%	0%
Unincorporated Riverside	30	1%	0%	20%	59%	0%	19%	0%	1%	0%
Prado Park Lake (WW-C3)	**6,878**									
Chino	2,255	45%	4%	1%	14%	10%	18%	5%	1%	2%
Ontario	4,623	66%	2%	0%	3%	0%	6%	2%	21%	0%

Table 3-1. Jurisdictional area and percent land use in each of the major MSAR subwatersheds (areas outside of Riverside County included to show land use percentages of all areas draining to watershed-wide compliance sites).

Jurisdictions within MSAR Subwatersheds	Drainage Area (acres)	Agricultural	Commercial Institutional	Industrial	Infrastructure	Mixed Urban	Natural Vacant	Open Space Recreation	Residential	Water Wetlands
Santa Ana River at MWD Crossing (WW-S1)	**65,017**									
Fontana	4,486	1%	9%	1%	2%	0%	33%	1%	53%	0%
Rialto	11,490	0%	7%	13%	13%	4%	21%	1%	41%	0%
Riverside	26,442	3%	11%	7%	5%	2%	25%	4%	43%	0%
Unincorporated San Bernardino	5,867	4%	6%	12%	9%	1%	18%	3%	47%	0%
Jurupa Valley	8,772	7%	5%	10%	5%	0%	34%	11%	28%	0%
Unincorporated Riverside	7,155	7%	12%	1%	5%	3%	40%	22%	10%	0%
San Bernardino	804	1%	11%	2%	7%	1%	10%	2%	66%	0%
Santa Ana River at Pedley Avenue (WW-S4)	**89,253**									
Fontana	21,620	3%	9%	11%	8%	3%	25%	4%	37%	0%
Norco	141	4%	0%	0%	1%	0%	35%	7%	53%	0%
Ontario	3,819	0%	11%	59%	18%	0%	12%	0%	0%	0%
Rancho Cucamonga	10,457	1%	8%	13%	17%	6%	23%	1%	31%	0%
Riverside	12,990	14%	12%	4%	3%	1%	23%	2%	41%	0%
Unincorporated San Bernardino	19,047	0%	4%	12%	7%	1%	67%	0%	9%	0%
Eastvale	317	43%	1%	18%	29%	5%	3%	0%	1%	0%
Jurupa Valley	17,952	5%	5%	11%	4%	1%	25%	10%	39%	0%
Unincorporated Riverside	2,909	6%	2%	6%	10%	1%	23%	0%	52%	0%
Temescal Creek	**118,583**									
Corona	18,879	5%	9%	8%	7%	4%	22%	3%	42%	0%
Norco	2,372	4%	9%	4%	1%	1%	37%	4%	40%	0%
Riverside	11,998	15%	11%	2%	2%	2%	23%	1%	44%	0%
Unincorporated Riverside	85,333	4%	1%	2%	0%	2%	78%	1%	12%	0%
Lake Mathews	**24,671**									
Riverside	6	0%	49%	0%	0%	0%	0%	0%	51%	0%

Table 3-1. Jurisdictional area and percent land use in each of the major MSAR subwatersheds (areas outside of Riverside County included to show land use percentages of all areas draining to watershed-wide compliance sites).

Jurisdictions within MSAR Subwatersheds	Drainage Area (acres)	Agricultural	Commercial Institutional	Industrial	Infrastructure	Mixed Urban	Natural Vacant	Open Space Recreation	Residential	Water Wetlands
Unincorporated Riverside	24,664	6%	3%	0%	0%	2%	54%	2%	22%	11%
Other Drainages to Prado Basin	**39,842**									
Chino	8,440	47%	3%	4%	5%	1%	19%	6%	14%	1%
Chino Hills	7,626	0%	2%	1%	4%	3%	56%	5%	29%	0%
Corona	3,483	0%	7%	23%	8%	0%	30%	4%	28%	0%
Norco	6,328	4%	13%	1%	3%	2%	21%	1%	54%	1%
Ontario	2,778	20%	12%	2%	5%	0%	3%	1%	57%	0%
Rialto	4	0%	0%	0%	11%	0%	63%	0%	26%	0%
Riverside	139	0%	0%	0%	1%	0%	98%	0%	1%	0%
Unincorporated San Bernardino	127	11%	0%	0%	2%	0%	59%	23%	0%	5%
Unincorporated Los Angeles	0	0%	0%	0%	0%	0%	100%	0%	0%	0%
Eastvale	6,279	26%	1%	0%	4%	16%	19%	9%	25%	0%
Jurupa Valley	382	13%	0%	0%	0%	0%	26%	11%	50%	0%
Unincorporated Riverside	4,256	1%	1%	2%	13%	0%	46%	27%	6%	4%

The Temescal subwatershed is very large and significant portions of the upper part of the drainage area are hydrologically disconnected from the downstream areas (see also section 3.2), i.e. the Lake Elsinore and Lake Mathews subwatersheds are hydrologically disconnected from the downstream portion which drains to Prado Basin. Similarly the reach from Lee lake Water District to Lake Elsinore is disconnected as well.

3.1.3 Jurisdictions

Table 3-1 summarizes the jurisdictional area of each MS4-permitted city and unincorporated county area that drains to each of the MSAR watershed-wide compliance monitoring locations. Although this CBRP only applies to areas within Riverside County, the jurisdictional areas outside of Riverside County are included in Table 3-1 to illustrate the relative importance of Riverside and San Bernardino County MS4 programs to the watershed-wide compliance locations.

3.1.4 Land Use

Land use distribution has the potential to affect flow volume and bacterial indicator concentrations under dry weather conditions. Table 3-1 provides the land use distribution for each jurisdiction in each of the areas draining to the watershed-wide compliance monitoring locations.

Land use in the MSAR watershed includes a variety of categories as defined by the Southern California Association of Governments (SCAG 2005). Related categories were lumped together to reflect major types of land uses, e.g., agricultural or industrial related land uses. Figure 3-4 illustrates the resulting spatial land use pattern, at least as most recently available in the 2005 SCAG dataset. Residential land uses make up the greatest fraction of urbanized drainage area in the MSAR watershed (~50 percent). In some areas there is more agricultural land use than urban. Accordingly, compliance activities targeted at agricultural lands might provide the most significant water quality benefits. These compliance activities are not the responsibility of the MS4 program; they are the responsibility of the agricultural dischargers named in the TMDL.

3.2 Dry Weather Hydrology

Regular flows exist in many MSAR waterbodies during dry weather conditions. Sources of flow during dry weather include:

- Effluent from POTWs
- Turnouts of imported water by the MWD
- Groundwater inputs
- Well blow-offs
- Water transfers

- Other authorized discharges (as defined by WDRs issued by the RWQCB)
- Non-permitted discharges including Phase II MS4 discharges.

Each of these sources of DWF has a different pathway and potential to transport bacterial indicators to receiving waterbodies. Thus, it is important to understand the relative role of each of these categories of DWF.

Within the MSAR watershed, many MS4 drainage areas do not typically cause or contribute to flow at the compliance monitoring sites. DWF from these drainage areas is hydrologically disconnected from the TMDL receiving waterbodies, by either purposefully recharging groundwater in constructed regional retention facilities or through losses in earthen channel bottoms, where the recharge capacity of underlying soils exceeds dry weather runoff generated in upstream drainage areas (Figure 3-5).

Flow data was not available downstream of some portions of MS4 drainage areas; therefore it was necessary to approximate DWF from these areas to complete a water balance for each TMDL compliance monitoring site. Within the Chino Basin portion of the MSAR watershed, the Inland Empire Utilities Agency (IEUA) measures flow at a number of locations to quantify groundwater recharge for water supply benefit. For Riverside County MS4 drainage areas, this monitoring data is the geographically closest characterization of its type. Flow measurements, on days when DWF is predominantly from urban sources, suggest that DWF from urban sources occur at a rate of 100 gal/acre/day in the MSAR watershed, ranging from 20 to 280 gal/acre/day (Table 3-2). This is consistent with DWF generation rates developed to support the City of Los Angeles Integrated Resources Plan (2004), which estimated DWF rates from urban watersheds ranging from zero to 300 gallons/acre/day. Thus, it was reasonable to use a rate of 100 gal/acre/day to approximate urban sources of DWF from unmonitored MS4 outfalls that may be hydrologically connected to a TMDL waterbody.

The USEP flow measurements indicated that some tributaries have significantly greater DWF rates per acre of urbanized drainage area than would be expected solely from urban sources. In these cases, the presence of a non-urban source was determined to be responsible for the elevated DWF rates. At a few locations, field measured runoff equated to less than 100 gal/acre/day; therefore it was assumed that non-urban sources in these subwatersheds are negligible.

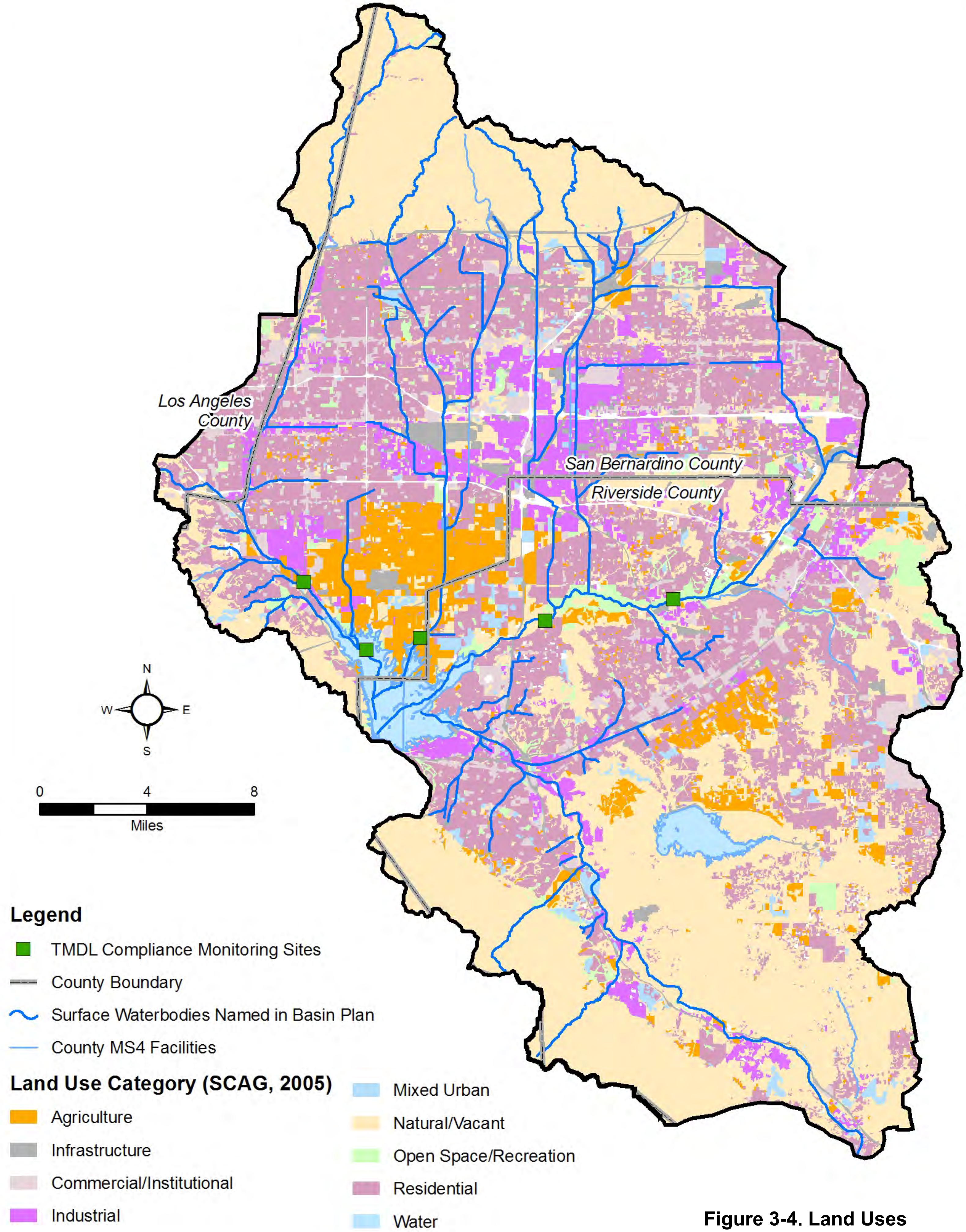


Figure 3-4. Land Uses

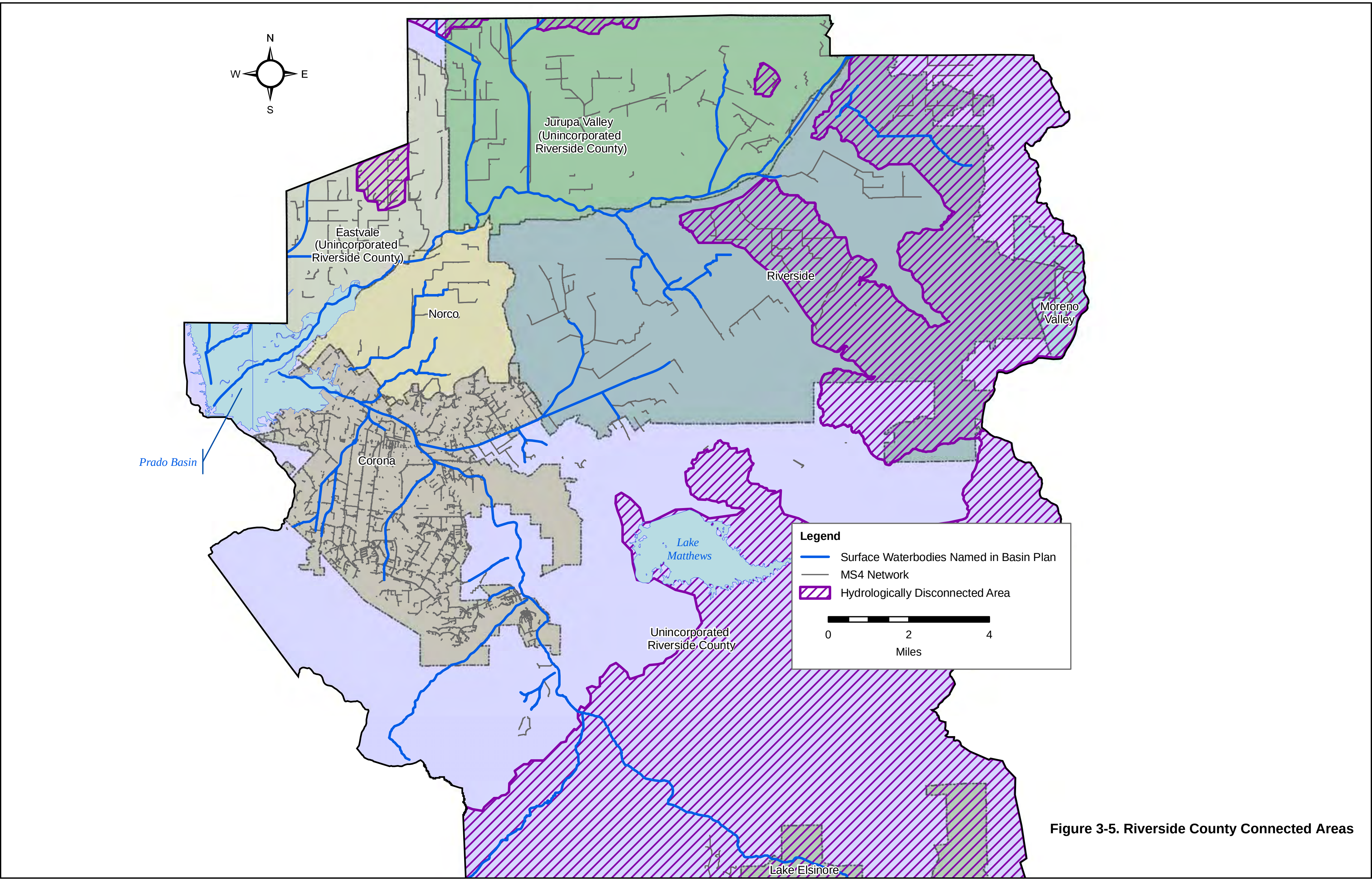


Figure 3-5. Riverside County Connected Areas

Table 3-2. Urban dry weather flow in MSAR watershed upstream of IEUA flow measurement locations

Location	Average Dry Weather Flow (cfs)	Urban Runoff Rate (gal/ac/day)
Grove Basin	0.04	111
West State Street Storm Drain	0.05	19
8th St. Storm Drain into 8th St.	0.17	82
West Cucamonga Inlet @ 8th St. B	0.41	92
Turner 1 Inlet from Cucamonga Cr	0.49	36
Deer Creek Drop Inlet @ Turner 4	1.58	110
Deer Creek @ 4th St. Overpass	1.06	105
Turner 4 - Guasti Creek	0.19	219
Lower Day Basin Forebay Storm Dr	0.02	63
San Sevaine Basin 5 Storm Drain	0.19	81
Victoria Basin Inlet	0.05	49
RP3 Basin Distribution Channel Inlet	0.32	53
Declez Channel at Live Oak	0.27	282
Declez Channel by School	0.16	98
	Average of all Sites	100

3.2.1 Mill-Cucamonga Creek

DWF in Mill-Cucamonga Creek consists of primarily effluent from the IEUA RP1 WRRF. Effluent from IEUA RP1 WRRF to Cucamonga Creek contributes ~27 cfs, ranging from 16 to 42 cfs (Table 3-3). A berm in the center of Cucamonga Creek keeps effluent separated from DWFs from MS4 outfalls, from the discharge location for about 1 mile to Chino Avenue.

MS4 drainage areas to Mill-Cucamonga Creek are predominantly within San Bernardino County, outside of the geographic planning area of this CBRP for Riverside County. A small portion of MS4 drainage area in currently unincorporated area of Eastvale may generate urban DWF that has the potential to reach Mill-Cucamonga Creek.

Table 3-3. Average daily effluent from POTWs in the MSAR watershed

Treatment Facility	Receiving Waterbody	Dry Season (cfs)
Riverside Water Quality Control Plant	Santa Ana River Reach 3	49
Colton/San Bernardino RIX	Santa Ana River Reach 4	59
Rialto WWTP	Santa Ana River Reach 4	10
IEUA RP1 WRRF Outfall 1	Cucamonga Creek	27
IEUA RP1 WRRF Outfall 2	Prado Park Lake	8
IEUA Carbon Canyon WRRF (CCWRF)	Chino Creek	9
Yucaipa Valley Water District	Santa Ana River Reach 4	6
Lee Lake WWTP	Temescal Creek	0.9
Corona WWTP No.1 and No.3	Temescal Creek	5
Western Municipal Water District (WMWD) West Riverside WWTP	Santa Ana River Reach 3	7
	Totals	**181**

3.2.2 Santa Ana River at MWD Crossing

Continuous DWF occurs in the Santa Ana River at the MWD Crossing. The primary source of this DWF is a combination of treated effluent from the Rialto WWTP and San Bernardino/Colton RIX facility. Combined, these sources of effluent discharge approximately 70 cfs to Reach 4 of the Santa Ana River, upstream of Riverside Avenue (Table 3-3). There is typically no DWF in the Santa Ana River upstream of these plants. Additional sources of DWF, listed below, occur between these effluent discharges and the MWD Crossing compliance location.

In addition to the POTWs, DWF has been observed in outfalls from MS4 facilities along both sides of the Santa Ana River (USEP 2007-2008):

- The Highgrove Channel and Agua Mansa Channel outfall to the Santa Ana River upstream of University Wash. In a 2002 field survey, the Highgrove Channel was dry and the Agua Mansa Channel contained a small amount of DWF that could not be measured (Clark and Clem 2002). Assessments of DWF in the upcoming years would be needed to ensure these conditions still exist and are typical of dry weather conditions in the MSAR.

- The University Wash Storm Drain captures runoff from MS4 drainage areas in downtown Riverside. DWFs are retained either in Lake Evans in Fairmont Park or in the large open space downstream of the lake. These areas prevent DWFs from reaching the outfall to the Santa Ana River, as shown in Figure 3-5 (personal communication with Steve Clark, May 10, 2010).

- Box Springs Channel drains an urbanized subwatershed in the City of Riverside. DWF measured in this channel is approximately 3 cfs (average of USEP field measurements in 2007-2008) and may consist of either or both, nuisance flow from urban drainages in the City of Riverside and de minimus water from Riverside Public Utilities (RPU).

- Sunnyslope Channel drains a low-density residential subwatershed in an unincorporated area of Riverside County. The headwaters of this channel are natural canyons within the Jurupa Hills. Measurements of 2-5 cfs from the ~5,000 acre subwatershed suggest that DWF is influenced by rising groundwater. This conclusion is supported by the observation of flow from weep holes along the concrete channel wall. This DWF rate is comparable to a measurement of 3.1 cfs in a field survey by RCFC&WCD in 2002 (Clark and Clem 2002).

3.2.3 Santa Ana River at Pedley Avenue

The TMDL compliance monitoring site at Pedley Avenue (WW-S4) is approximately 5 miles downstream of the MWD Crossing TMDL compliance monitoring site. Between these TMDL compliance monitoring sites, the Riverside Water Quality Control Plant (RWQCP) discharges ~50 cfs of treated effluent to the Santa Ana River (Table 3-3). MS4 outfalls in this reach may be sources of DWF to the Santa Ana River. The most notable drainages with consistent DWF include:

- Anza Drain contributes nuisance runoff from urban drainages in the south side of the City of Riverside. Flow measurements conducted for the USEP showed median DWFs of 6 cfs. This value differs greatly from measurements taken during a single day field survey in 2002 by RCFC&WCD, which suggest that DWF flow is less than 1.5 cfs (Clark and Clem 2002). DWF in Anza Drain is influenced by rising groundwater that is caused by current operation of the Arlington desalter. RCFC&WCD is currently working with WMWD to develop an approach that would improve groundwater yield and eliminate losses to surface water.

- San Sevaine Channel DWF at the confluence with the Santa Ana River was highly variable during USEP sampling. In addition to nuisance flows (~1 cfs), there was a de minimus discharge of treated groundwater of approximately 7cfs from a pilot test by the Jurupa Community Services District during the 2007 dry season. In addition to urban DWF, there are intermittent turnouts from MWD’s transmission system to San Sevaine Channel at CB-13 and CB-18 for recharge in the San Sevaine and Jurupa Basins, respectively. These flows remain within San Bernardino County and do not reach the Santa Ana River.

- Urban DWF from the Magnolia Center storm drain does not typically reach the Santa Ana River (Clark and Clem 2002; personal communication with Steve Clark, May 10, 2010).

- Urban DWF from San Bernardino County jurisdictions in the Day Creek watershed are retained within the Riverside Basin. Therefore, all urban DWF reaching the Santa Ana River from the Day Creek subwatershed comes from Riverside County jurisdictions. USEP monitoring program flow measurements in Day Creek at

Lucretia Avenue, just upstream of the River Trails Park golf course ranged widely from 0.05 cfs to 7 cfs. A field survey in 2002 by RCFC&WCD estimated DWF at this location to be ~0.2 cfs (Clark and Clem 2002). Additional flow monitoring is warranted at this site to adequately characterize this variability. In addition to urban DWF, there are intermittent turnouts from MWD's transmission system to Day Creek at CB-15 for recharge in the Riverside Basin. These flows remain within San Bernardino County and do not reach the Santa Ana River.

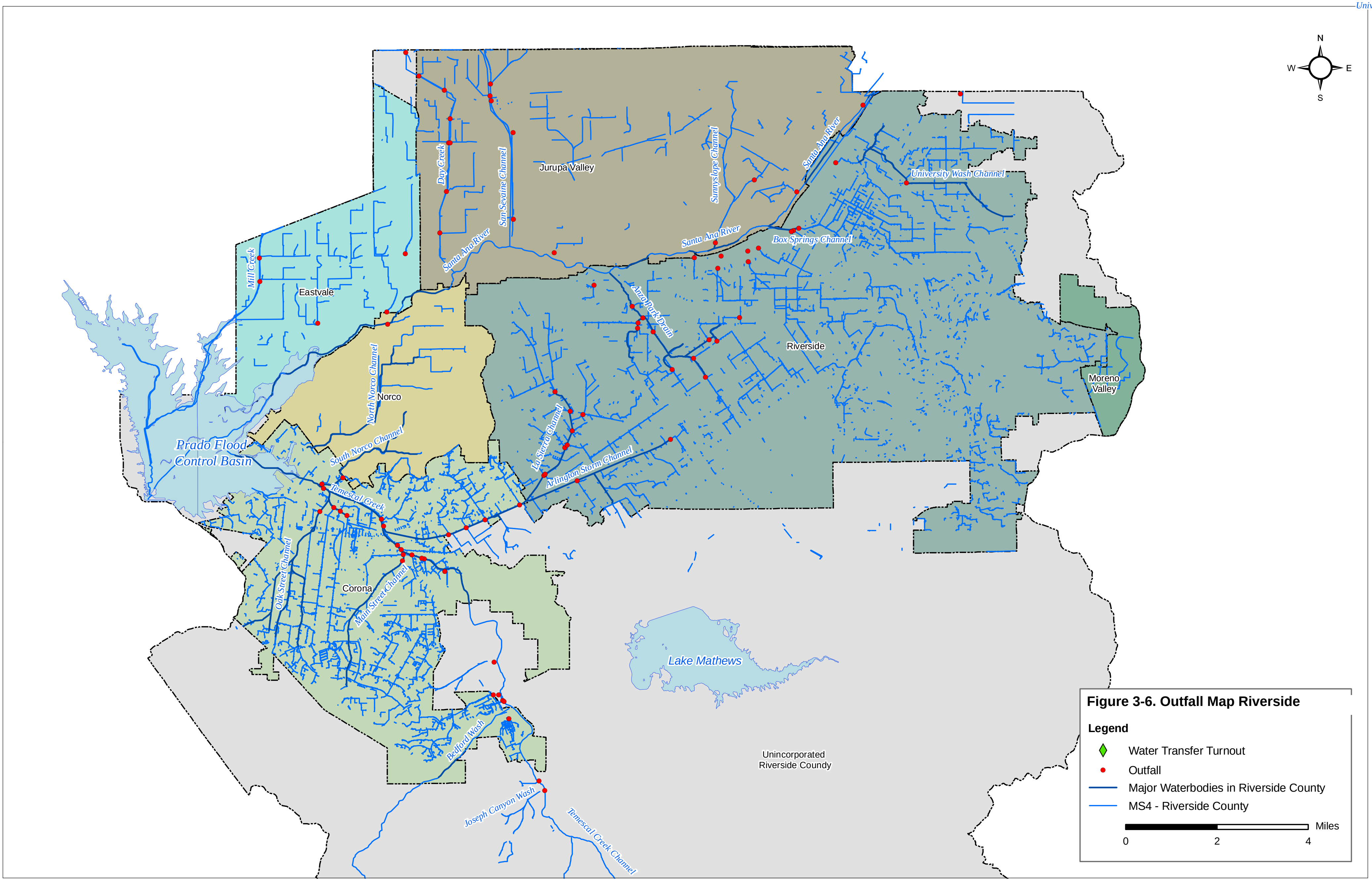
3.3 MS4 Facilities

This section describes the MS4 facilities within the major subwatershed areas draining to each of the watershed-wide compliance locations. Based on available MS4 facility data, Figure 3-6 illustrates the MS4 facilities including major outfalls to waterbodies for permittees in Riverside County. This figure illustrates the significant number of major outfalls that drain to each of the watershed-wide compliance monitoring locations.

Figure 3-7 provides an Index Map for subsequent detailed figures that depict key characteristics associated with the MS4 facilities located within each of the major MSAR subwatersheds. These figures include:

- Temescal Creek subwatershed (Figure 3-8)
- Mill-Cucamonga Creek at Chino Corona Road (Figure 3-9)
- Santa Ana River at MWD Crossing (Figure 3-10)
- Santa Ana River at Pedley Avenue (Figure 3-11)

The following sections provide more detailed descriptions of the primary MS4 characteristics and subwatershed features in each drainage area. The information on the physical characteristics of key waterbodies is provided as background to support the discussion regarding UAA opportunities in Section 5.2.5.



N
W
E
S
Jurupa Valley
Eastvale
Norco
Riverside
Moreno Valley
Corona
Prado Flood Control Basin
Lake Mathews
Unincorporated Riverside Coundy
Mill Creek
Day Creek
San Sevaine Channel
Sunnyslope Channel
Santa Ana River
University Wash Channel
Box Springs Channel
Anza Park Drain
North Norco Channel
South Norco Channel
La Sierra Channel
Arlington Storm Channel
Temescal Creek
Oak Street Channel
Main Street Channel
Bedford Wash
Joseph Canyon Wash
Temescal Creek Channel
Figure 3-6. Outfall Map Riverside
Legend
Water Transfer Turnout
Outfall
Major Waterbodies in Riverside County
MS4 - Riverside County
Miles
0
2
4

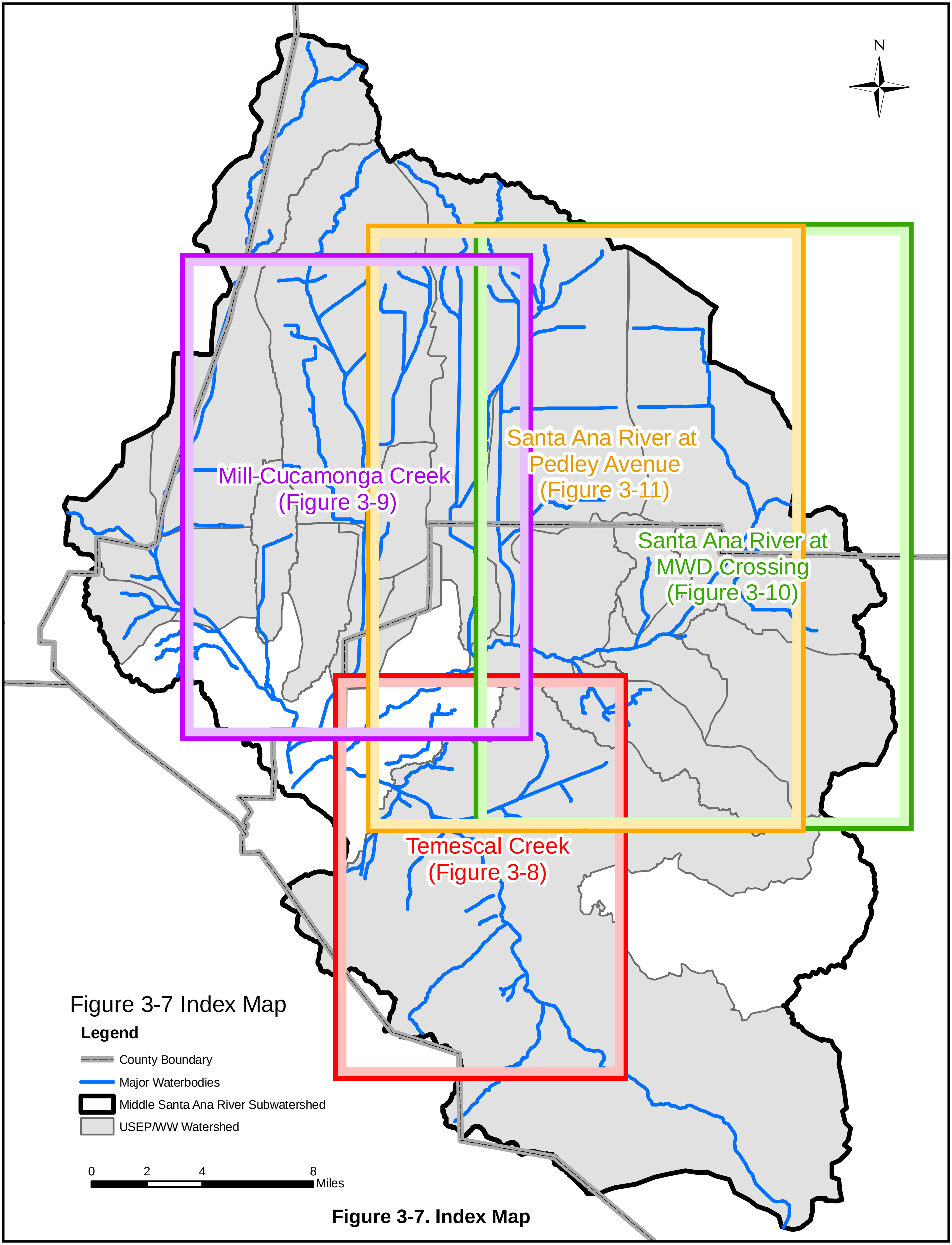


Figure 3-7. Index Map

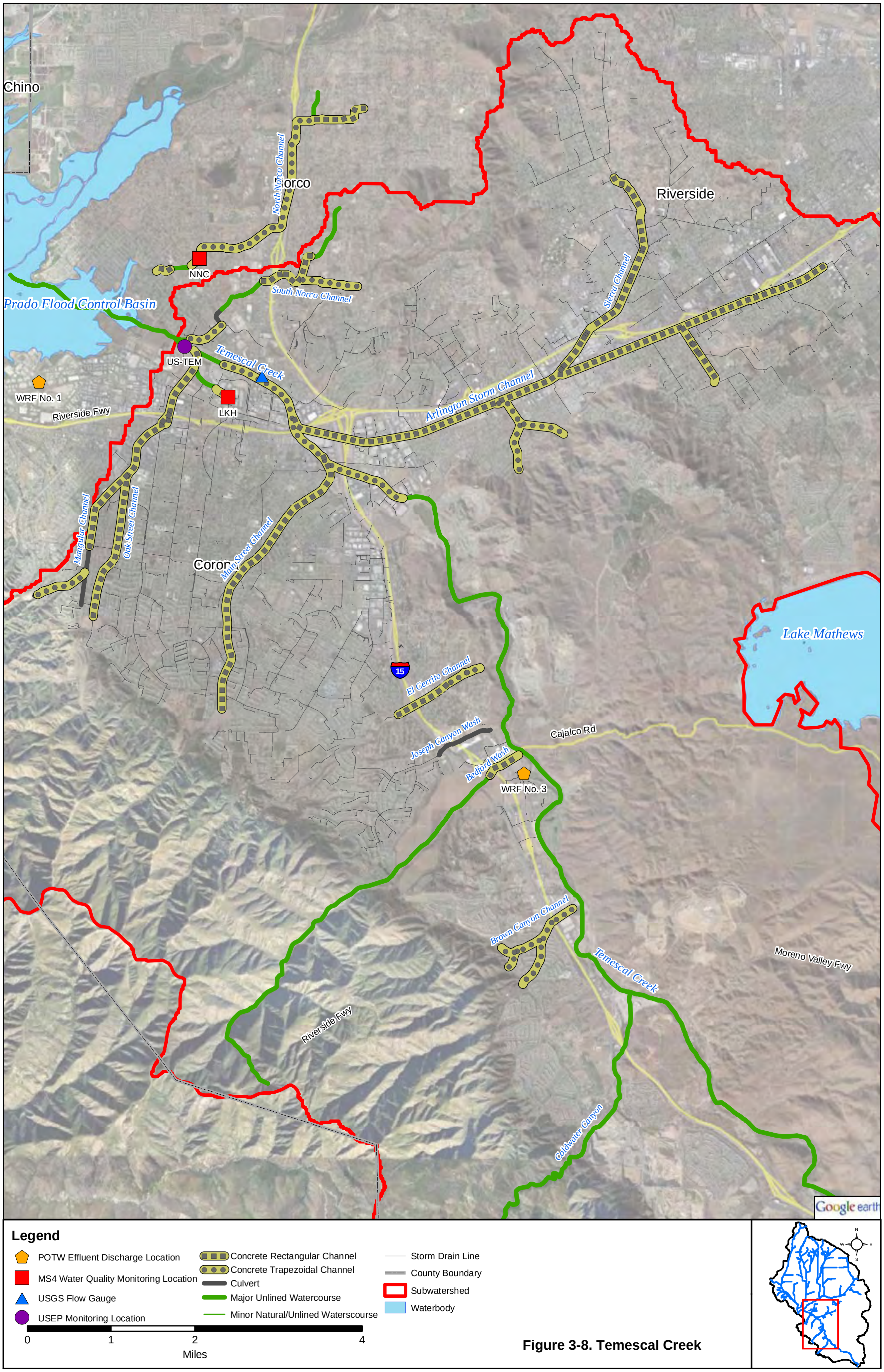


Figure 3-8. Temescal Creek

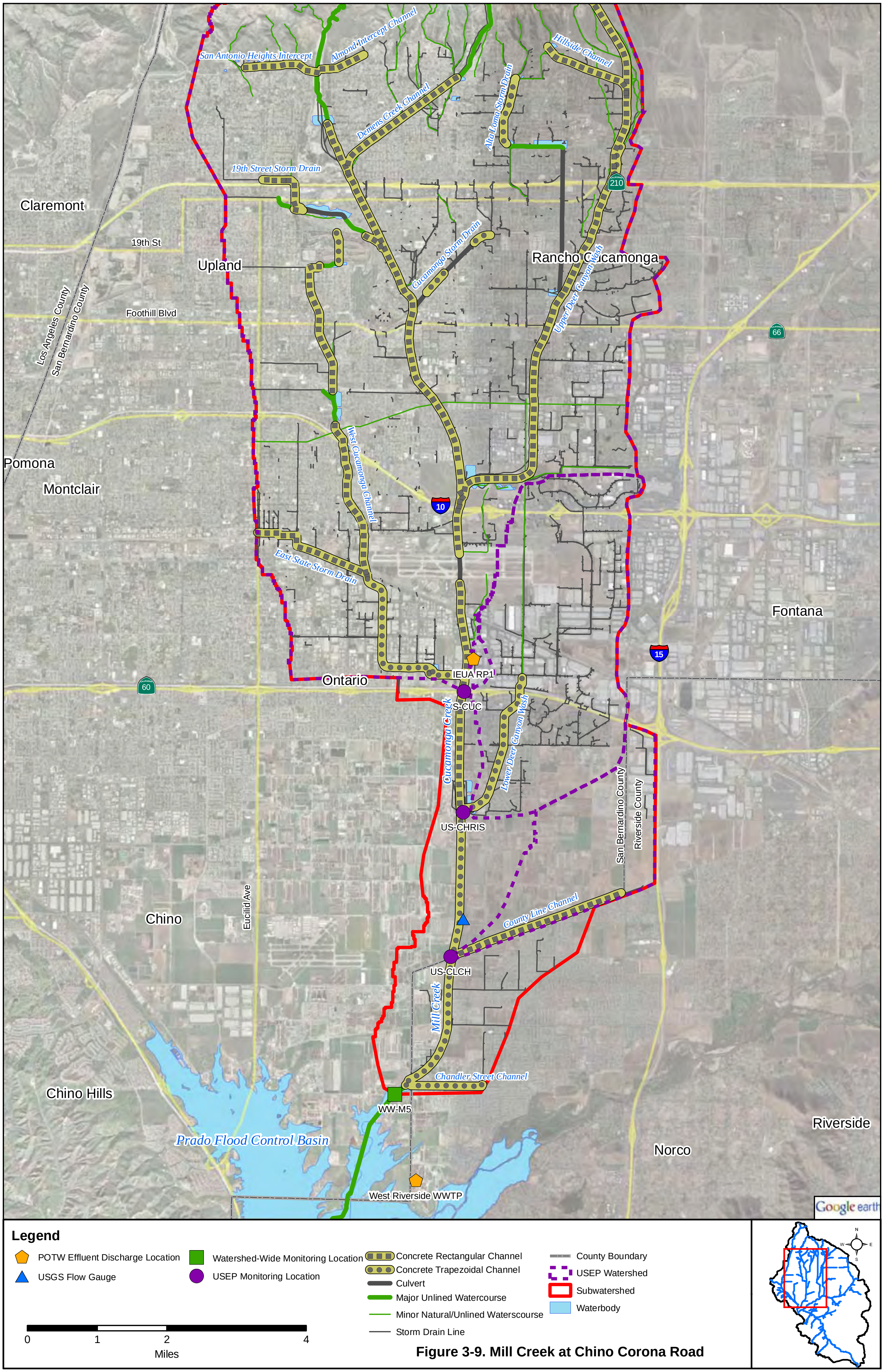


Figure 3-9. Mill Creek at Chino Corona Road

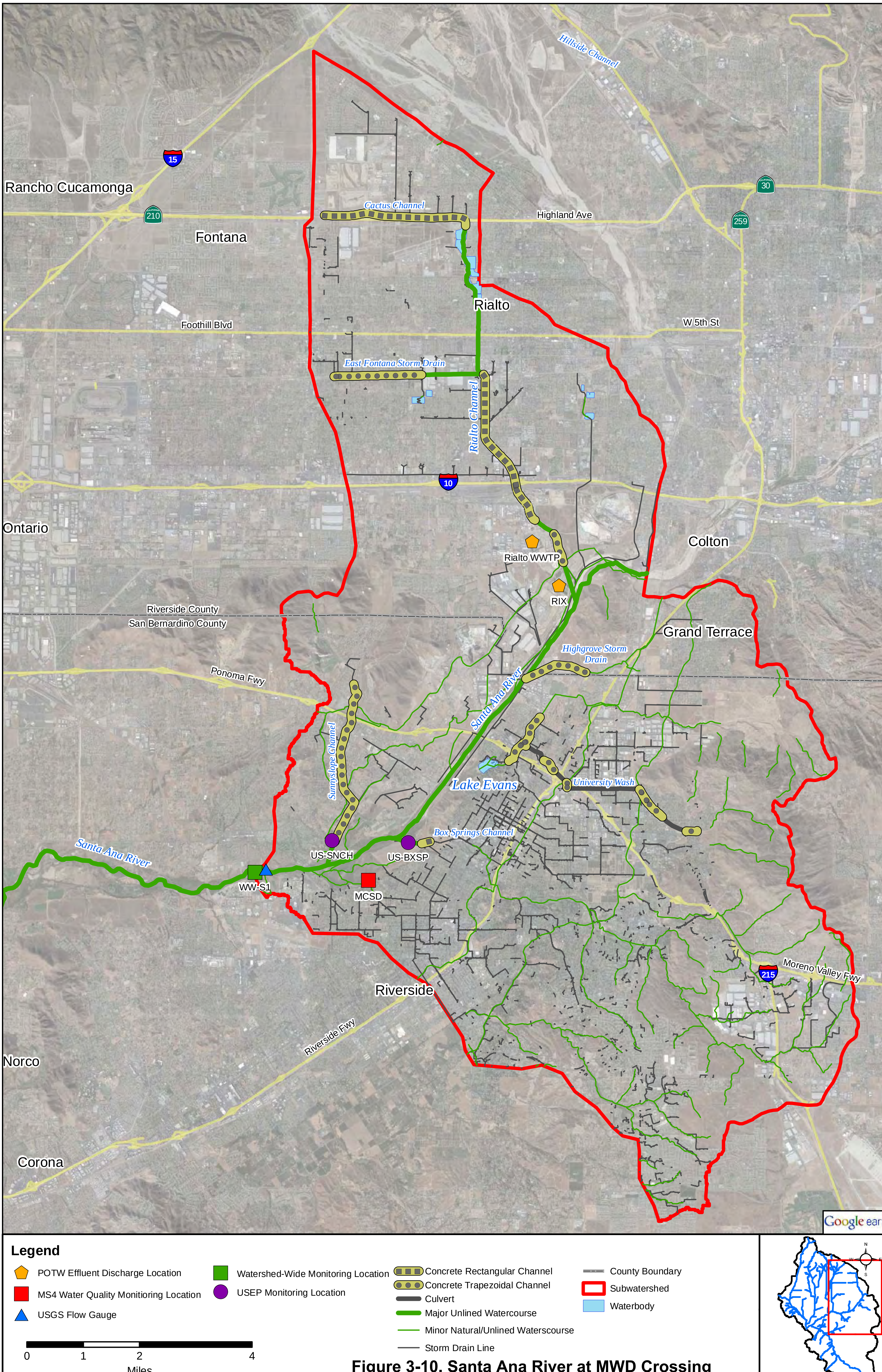


Figure 3-10. Santa Ana River at MWD Crossing

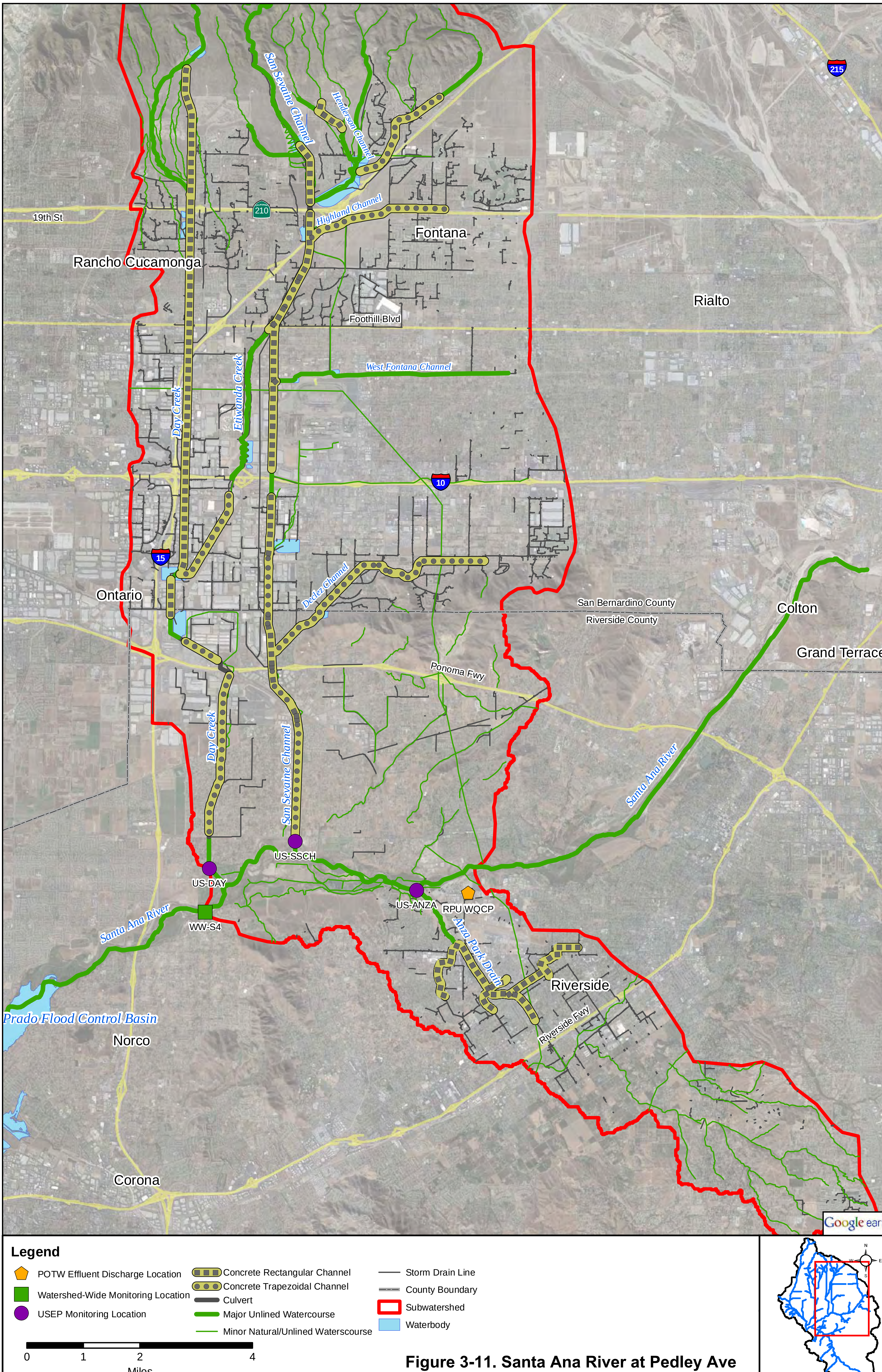


Figure 3-11. Santa Ana River at Pedley Ave

3.3.1 Temescal Creek Subwatershed

Temescal Creek extends from the Lake Elsinore outlet channel to Prado Basin. The subwatershed drains approximately 207 sq. mi. Although Lake Elsinore does drain to Temescal Creek, discharges would only be expected to occur during extreme hydrologic cycles. Downstream of Lake Elsinore, Temescal Creek can be subdivided into three segments based on channel characteristics. Table 3-4 describes the key waterbodies in the Temescal Creek subwatershed and describes the channel characteristics (Figure 3-8).

Under normal hydrologic conditions Temescal Creek contains intermittent flows from water transfers and POTW discharges occur during the dry season. Typically, only reaches 1 and 2 of Temescal Creek are hydrologically connected to Prado Basin, with most of the flow initiating from the small reservoir just south of Magnolia Avenue and the Arlington Channel.

3.3.2 Mill-Cucamonga Creek at Chino-Corona Road Subwatershed

The area encompassed by the Mill-Cucamonga Creek watershed-wide compliance site is 70 mi^2. Only a small portion of the lower part of the subwatershed receives runoff from Riverside County – the lower portion of Cucamonga Creek. In addition to the mainstem Cucamonga Creek, key tributaries include (Table 3-5, Figure 3-9):

- *Demens Creek in San Bernardino County* - This channel drains a 5.7 mi^2 subwatershed. It may be divided into two segments – one above and the other below the detention basins that capture flows from undeveloped canyon areas in the headwaters.

Upper Deer Creek in San Bernardino County - This channel drains an 18 mi^2 subwatershed. It may be divided into two segments – one above and the other below the detention basins that capture flows from undeveloped canyon areas in the headwaters.

Table 3-4. Channel characteristics of Temescal Creek and key tributaries

Reach	Segments	Description
Temescal Creek	Lake Elsinore Spillway to point upstream of Magnolia Ave.	~19 mi reach with natural characteristics; 14 outfalls identified as potential DWF sources
	Magnolia Ave. to downstream of Cota Street	~3 mi reach with trapezoidal and vertical concrete-lined banks
	Downstream of Cota Street	2.9 mi reach with natural characteristics
Arlington Channel	Headwaters to culvert section	Trapezoidal concrete-lined reach (~0.75 mi) transitions to culvert (~0.25 mi) reach
	Rectangular-lined segment west of La Sierra Ave to Temescal Creek confluence	~4.7 mi rectangular lined reach
La Sierra Channel	Headwaters to Arlington Channel confluence	Begins as culvert transitions to rectangular concrete-lined for 0.5 mi then to trapezoidal section; reverts to culvert then rectangular concrete-lined 1.5 mi
Main Street Channel	Headwaters to Temescal Creek confluence	~3.5 mi concrete-lined rectangular channel
Oak Street Channel	Headwaters to Temescal Creek confluence	~ 4 mi concrete-lined rectangular channel
Norco Channel	Headwaters to Temescal creek confluence	~ 3 mi rectangular concrete-lined and natural channel

Table 3-5. Characteristics of channels draining to the Mill-Cucamonga Creek watershed-wide compliance monitoring location

Reach	Segments	Description
Cucamonga Creek	Headwaters to Cucamonga Canyon Dam (not included on Figure 3-9)	Discharge from undeveloped canyon headwater area captured by Cucamonga Canyon Dam
	Below Cucamonga Canyon Dam to Hellman Avenue	14 mi concrete-lined reach; includes discharge from RP1 WRRF
	Hellman Ave. to Chino-Corona Rd	0.25 mi concrete-lined trapezoidal reach
	Chino-Corona Rd to Prado Basin	3.4 mi earthen bottom trapezoidal reach
Demens Creek	Headwaters to Detention Basin	Discharge from undeveloped canyon headwater area captured by detention basin
	Below Detention Basin to Cucamonga Cr. confluence	2.2 mi concrete-lined reach
Upper Deer Creek	Headwaters to Detention Basin	Discharge from undeveloped canyon headwater area captured by detention basin
	Below Detention Basin to Cucamonga Cr. confluence	3.6 mi concrete-lined reach
Lower Deer Creek (Chris Basin)	Headwaters to Chris Basin at Cucamonga Cr. confluence	2.1 mi concrete-lined reach
County Line Channel	Headwaters to Cucamonga Cr. confluence	2.6 mi concrete-lined reach
West Cucamonga Creek	Headwaters to Cucamonga Cr. confluence	8.2 mi combination of culvert and concrete-lined rectangular and trapezoidal reaches; upper reach of segment drains to 8th Street Basins
Cucamonga Storm Drain	Headwaters to Cucamonga Creek confluence	1.6 mi reach of concrete lined rectangular and culvert

Lower Deer Creek in San Bernardino County –– This waterbody drains a small subwatershed (~10 mi^2) entirely within the City of Ontario MS4 system. The SBCFCD owns and operates Chris Basin at the downstream end of Lower Deer Creek just upstream of the confluence of Lower Deer Creek with Cucamonga Creek. As a result of poor infiltration rates in the Chris Basin (due to soil characteristics), DWFs drain through the basin to Cucamonga Creek.

- *County Line Channel in Riverside and San Bernardino Counties* – This waterbody consists of a concrete-lined channel in the lower part of the subwatershed drains a small subwatershed (~6 mi^2). This channel drains subwatershed with mixed land use both north and south of the county line.

- *West Cucamonga Channel in San Bernardino County* – This channel is ~8.2 miles of a combination of concrete-lined rectangular and trapezoidal reaches; upper reach of this segment drains to 8th Street Basins.

In addition to the tributaries described above, the Cucamonga Storm Drain in San Bernardino County also discharges to Cucamonga Creek. Other potentially important storm drain facilities that discharge to tributaries to Cucamonga Creek include the Alta Loma Storm Drain and the East State Storm Drain.

3.3.3 Santa Ana River at MWD Crossing Subwatershed

The area upstream of this monitoring location encompasses the upper portion of the MSAR watershed (Figure 3-10). In addition to drainage within the MSAR watershed, this portion of the MSAR receives flows from Santa Ana River Reach 4, but typically only during wet weather. Within the MSAR watershed, water flowing to this location drains 101 mi^2, much of it in Riverside County. Within San Bernardino County, the primary tributary or source of water to Santa Ana River Reach 3 upstream of the MWD Crossing is the Rialto Channel (Figure 3-10). In Riverside County, key tributaries or sources of flow to Santa Ana River Reach 3 upstream of MWD Crossing include (Table 3-6, Figure 3-10):

- *High Grove Storm Drain in Riverside and San Bernardino Counties* – This drain has a trapezoidal concrete-lined segment at the headwaters that transitions to a natural segment. Approximately, 1.25 miles upstream of its confluence with the Santa Ana River, the channel is a trapezoidal lined segment.

- *University Wash in Riverside County* – This channel is a combination of culvert and trapezoidal concrete-lined segments (4.2 mi).

- *Box Springs in Riverside County* – Draining ~ 31 mi^2 area, this channel may be divided into two segments – an upstream engineered segment and a short natural segment at its confluence with the MSAR.

- *Sunnyslope Channel in Riverside County* - This channel drains an approximately 6 mi^2 area in unincorporated areas of Riverside County. It may be divided into two segments – an upstream engineered segment and a short natural segment at its confluence with the MSAR.

- *MS4 Outfalls Along Santa Ana River* – Several MS4 outfalls are located along the Santa Ana River in this area.

Table 3-6. Characteristics of channels in Riverside County draining to the Santa Ana River MWD Crossing watershed-wide TMDL compliance monitoring site

Reach	Segments	Description
High Grove Storm Drain	Headwaters to Santa Ana River confluence	2.8 mi concrete-lined trapezoidal reach except for 1 mi natural segment
University Wash	Headwaters to east of Santa Ana River; open channels are 1 mi east of Santa Ana River	Combination of 4.2 mi concrete-lined trapezoidal reach and 2 mi of culvert reaches
Box Springs	Headwaters to confluence with Santa Ana River	0.2 mi vertical, concrete-lined channel for entire length except last 0.5 mi prior to confluence with MSAR
Sunnyslope Channel	Headwaters to point where segment transitions from concrete-lined to natural channel (Rancho Jurupa Park)	3.0 mi reach with trapezoidal concrete-lined banks
	Upstream end of natural section (Rancho Jurupa Park) to Santa Ana River confluence	0.4 mi reach with natural banks and bottom; in 2007, section not hydrologically connected to MSAR during dry weather

3.3.4 Santa Ana River at Pedley Avenue Subwatershed

This subwatershed (126 mi^2, not including the portion of the Santa Ana River Reach 3 watershed upstream of the MSAR Reach 3 MWD Crossing watershed-wide TMDL compliance monitoring site) generally encompasses the portion of the MSAR watershed upstream of Prado Basin Dam and below the MSAR Reach 3 MWD Crossing TMDL compliance monitoring site. This drainage area receives flow from the portion of the MSAR above the MWD Crossing TMDL compliance monitoring site. In addition, flow is received from three key tributaries. The upper reaches of two of these tributaries are located in San Bernardino County (Table 3-7, Figure 3-11):

- *Anza Drain in Riverside County* - This subwatershed encompasses a ~ 21 mi^2 area. The Anza Drain may be divided into two segments – an upstream engineered segment and a short natural segment just above its confluence with the MSAR. The natural segment at the confluence receives effluent from the RWQCP prior to discharging to the MSAR. Surveys conducted by the RWQCP facility (reported by the Stormwater Quality Standards Task Force) have noted that recreational activity is relatively common in the area (as compared to other areas in the MSAR watershed).

Table 3-7. Characteristics of channels draining to the Pedley Avenue MSAR watershed-wide TMDL compliance monitoring site (Note: the upper portions of San Sevaine Channel and Day Creek are located in San Bernardino County)

Reach	Segments	Description
Anza Drain	Headwaters to Arlington Avenue	Vertical-walled, concrete-lined channel
	Arlington Avenue to confluence with MSAR	Channel with natural characteristics
San Sevaine Channel & Tributaries	Headwaters to San Sevaine Basins	Discharge from headwater area captured by San Sevaine Basins
	San Sevaine Basins to confluence with MSAR	11 mi concrete-lined reach from San Sevaine Basins to confluence with MSAR
	Highland Channel - Headwaters to confluence with San Sevaine Channel	2.5 mi concrete-lined trapezoidal reach
	Declez Channel - Headwaters to confluence with San Sevaine Channel	~2.5 mi concrete-lined rectangular segment and 2.2 mi concrete lined trapezoidal reach; lower portion including confluence with San Sevaine Channel is in Riverside County.
Day Creek & Tributaries	Headwaters to Day Creek Basins	Discharge from undeveloped areas captured by Day Creek Basins
	Day Creek Basins to south of 63rd St	11 mi concrete-lined reach - lower end of this reach is in Riverside County
	Limonite Avenue to Lucretia Avenue	0.6 mi earthen bottom trapezoidal channel – within Riverside County
	Lucretia Avenue to confluence with MSAR	Natural characteristics – within Riverside County
	Etiwanda Channel - Headwaters to concrete-lined segment	Discharge from undeveloped areas captured in detention basins
	Etiwanda Channel - Beginning of concrete-lined segment to confluence with Day Creek	8.5 mi concrete-lined for entire length except for short segment between Foothill Boulevard and the Etiwanda Conservation Basins on either side of I-10 Fwy

- *San Sevaine Channel* - This channel drains approximately 51 mi^2 and may be divided into two segments – a headwaters area that discharges to the San Sevaine Basins upstream of the MS4 (in San Bernardino County) and a lengthy engineered segment, the lower part of which is in Riverside County. Two important tributaries to San Sevaine Channel include the Highland Channel and Declez Channel. The Highland Channel enters San Sevaine in the upper part of its watershed in San Bernardino County. Declez Channel enters San Sevaine Channel in the lower part of the watershed in Riverside County, but the upper part of this channel is in San Bernardino County. Declez Channel is ~4.7 miles in length with a rectangular lined segment from the headwaters that transitions to a trapezoidal segment (except for a short culvert section) upstream of its confluence with San Sevaine Channel.

- *Day Creek/Etiwanda Channel* – The Day Creek drainage area encompasses an approximately 51 mi^2 area. It has one major tributary - Etiwanda Channel. The mainstem of Day Creek may be divided into four segments with varying characteristics and the Etiwanda tributary may be divided into two segments, a portion that is upstream of the MS4 (and in San Bernardino County) and an engineered downstream segment.

3.4 Baseline Water Quality

Water quality monitoring in the MSAR watershed to support TMDL implementation has been ongoing since 2007 at all five watershed-wide compliance monitoring locations. To date, this effort has included (see also Sections 2.4 and 2.5.1):

- Collection of 20 bacterial indicator samples during each dry season (April 1 – October 31), under dry weather conditions in 2007, 2008, 2009 and 2010.

- Collection of 11 bacterial indicator samples during each wet season (November 1 – March 31), under dry weather conditions in 2007, 2008, and 2009-2010.

- Collection of 4 bacterial indicator samples during and after a wet weather event in each of the wet seasons of 2007, 2008 and 2009.

- Collection of approximately 20 bacterial indicator samples during dry weather conditions in both dry and wet seasons from 13 USEP monitoring program locations in 2007-2008.

In addition to TMDL-related monitoring, sampling has been conducted by the RCFC&WCD to fulfill Riverside County MS4 permit monitoring requirements. The following sections summarize baseline water quality for bacterial indicators in the MSAR watershed. Detailed information is available in data reports prepared to support TMDL implementation: SAWPA (2009a) summarizes the findings from the 2007 dry season and 2007-08 wet season monitoring; SAWPA (2009b) and SAWPA (2009c) summarize the findings from the 2008 dry and 2008-2009 wet seasons, respectively; SAWPA (2009d) and SAWPA (2010c) summarize the results from the

2009 dry and 2009-2010 wet seasons; and SAWPA (2010f) summarizes the results from the 2010 dry season, respectively.

3.4.1 Watershed-wide Compliance Monitoring

Table 3-8 and Figure 3-12 present the geometric mean, median, and coefficient of variation of the *E. coli* concentrations from samples collected during dry weather in the dry and wet weather seasons at each of the compliance monitoring locations[7,8]. Although Prado Park Lake is not located within Riverside County, information on this waterbody is provided for informational purposes.

Generally, *E. coli* concentrations within the Santa Ana River are lower than in Chino Creek and Mill-Cucamonga Creek. *E. coli* concentrations in Prado Park Lake are also comparatively low. These summary statistics are presented to provide an overall view of water quality; actual measures of attainment of proposed *E. coli* water quality objectives are based on geometric mean calculations from samples collected over a period of no more than 30 days. Exceedances of *E. coli* water quality objectives expected to be adopted in the ongoing Basin Plan amendment process (see Section 1.2.2) occur regularly at all sites. In addition, exceedances of the TMDL urban wasteload allocations regularly occur.

Figures 3-13 through 3-17 illustrate the pattern in single sample and geometric mean results for *E. coli* over the 2007-2010 period for all five compliance monitoring sites. In general, the observed overall dry weather season geometric mean *E. coli* concentrations at each watershed-wide TMDL compliance monitoring site declined over the period from 2007-2009, but then increased in 2010 (dry season. Bacterial indicator concentrations remain well above the urban wasteload allocations at the Mill-Cucamonga Creek and Chino Creek compliance monitoring sites.

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[7] Similar data are available for fecal coliform, but are not presented in this document (they may be viewed in the SAWPA references provided above). It is expected that the Regional Board will adopt a Basin Plan amendment in spring 2011 replacing fecal coliform water quality objectives with *E. coli* objectives. Accordingly, all bacterial indicator summaries and analyses in this CBRP are based on *E. coli*.

[8] The wet season data collected under dry conditions is provided in this CBRP for informational purposes only. This CBRP only applies to dry weather conditions from April 1 – October 31.

Table 3-8. Summary statistics for *E. coli* levels (cfu/100 mL) and data variability by sample location during dry weather conditions in the dry and wet seasons (2007-2010)

Site	Dry Season				Wet Season			
	N	Geometric Mean	Median	Coefficient of Variation[1]	N	Geometric Mean	Median	Coefficient of Variation[1]
Prado Park Lake (WW-C3)	57	80	80	0.25	28	184	120	0.19
Chino Creek at Central Ave (WW-C7)	55	394	370	0.13	27	227	210	0.21
Mill-Cucamonga Creek at Chino-Corona Rd (WW-M5)	56	877	770	0.11	26	198	225	0.23
Santa Ana River at MWD Crossing (WW-S1)	58	149	140	0.12	23	90	90	0.26
Santa Ana River at Pedley Ave (WW-S4)	55	149	140	0.14	26	95	120	0.17

[1] - Coefficient of variation was calculated using natural log-transformed data

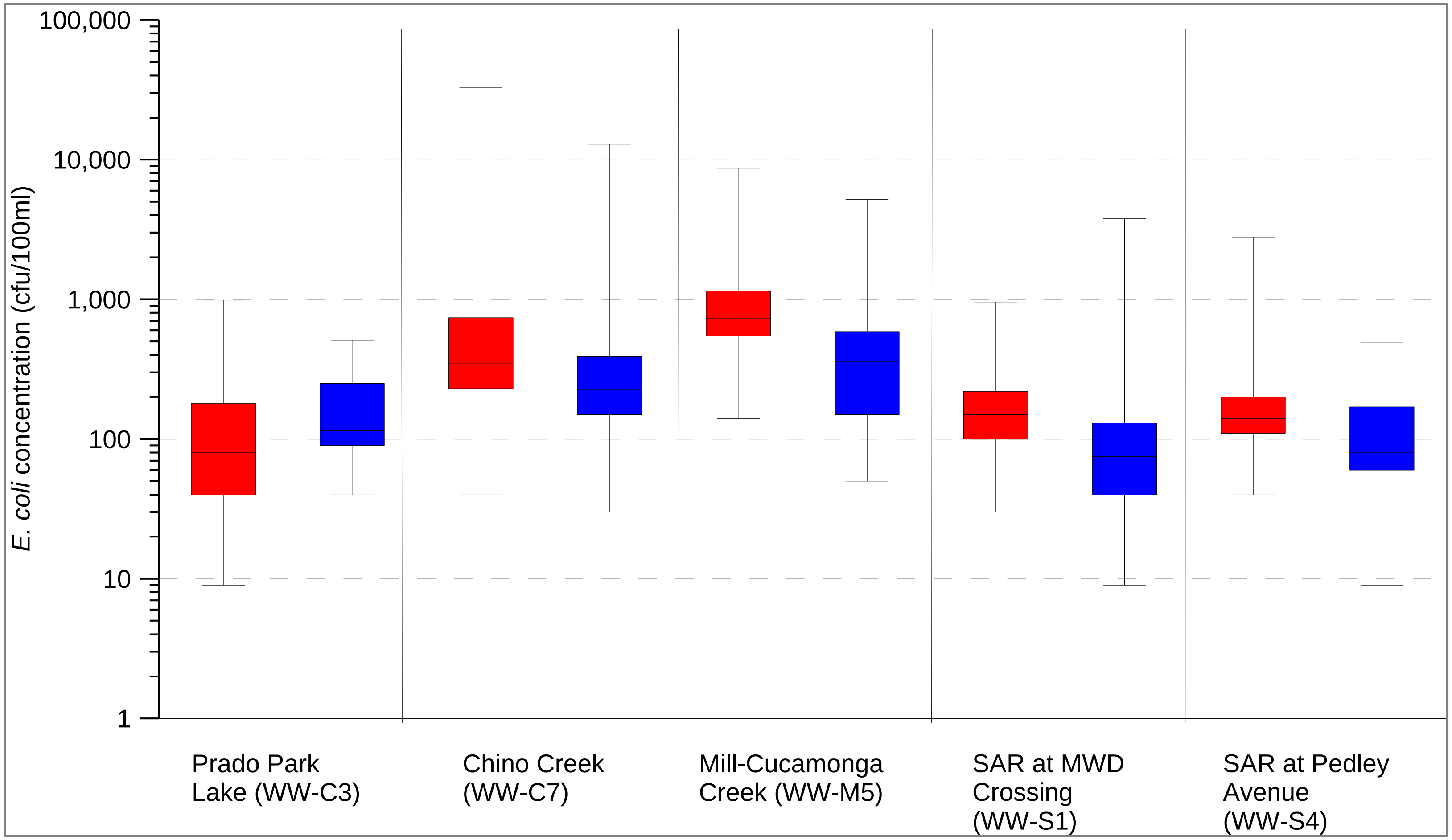


Figure 3-12. Box-Whisker Plots of *E. coli* levels in samples collected under dry weather conditions during the dry season (red) and wet season (blue) at MSAR watershed-wide TMDL compliance monitoring sites

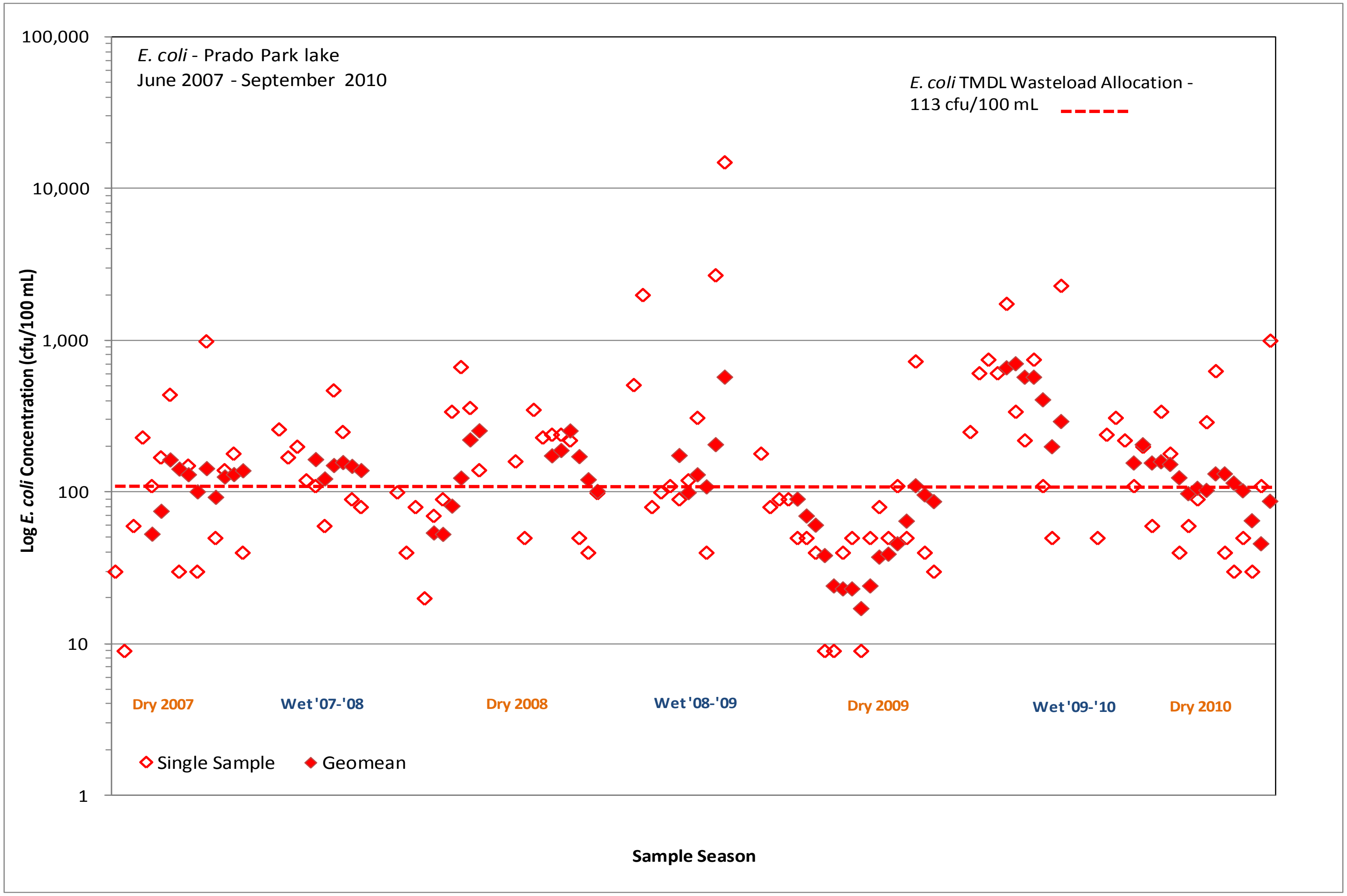


Figure 3-13. Time series plot of *E. coli* single sample results and geometric means for samples collected from Prado Park Lake (WW-C3, 2007-2010). Geometric mean was calculated only if five samples were collected during the previous five weeks.

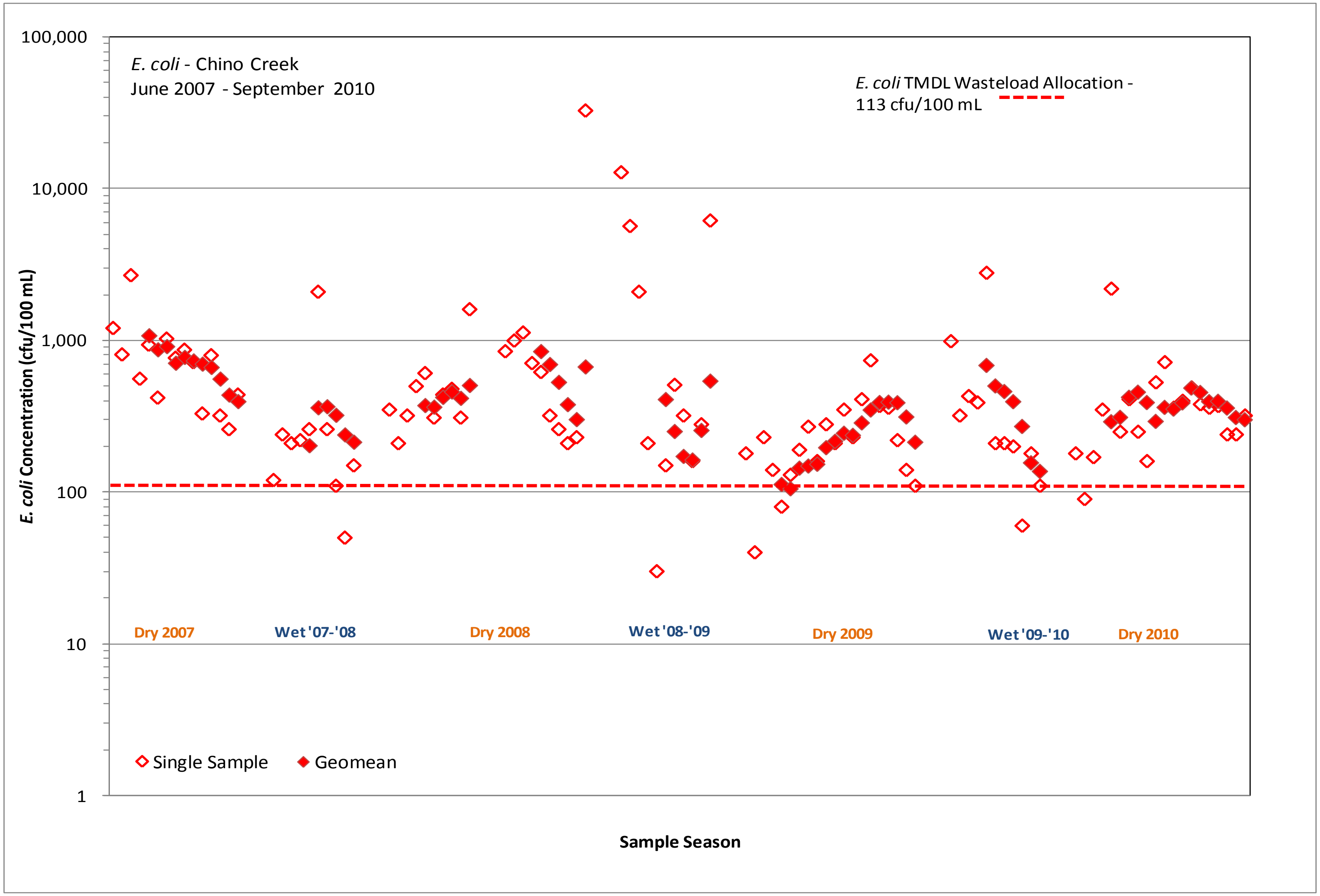


Figure 3-14. Time series plot of *E. coli* single sample results and geometric means for samples collected from Chino Creek (WW-C7, 2007-2010). Geometric mean was calculated only if five samples were collected during the previous five weeks.

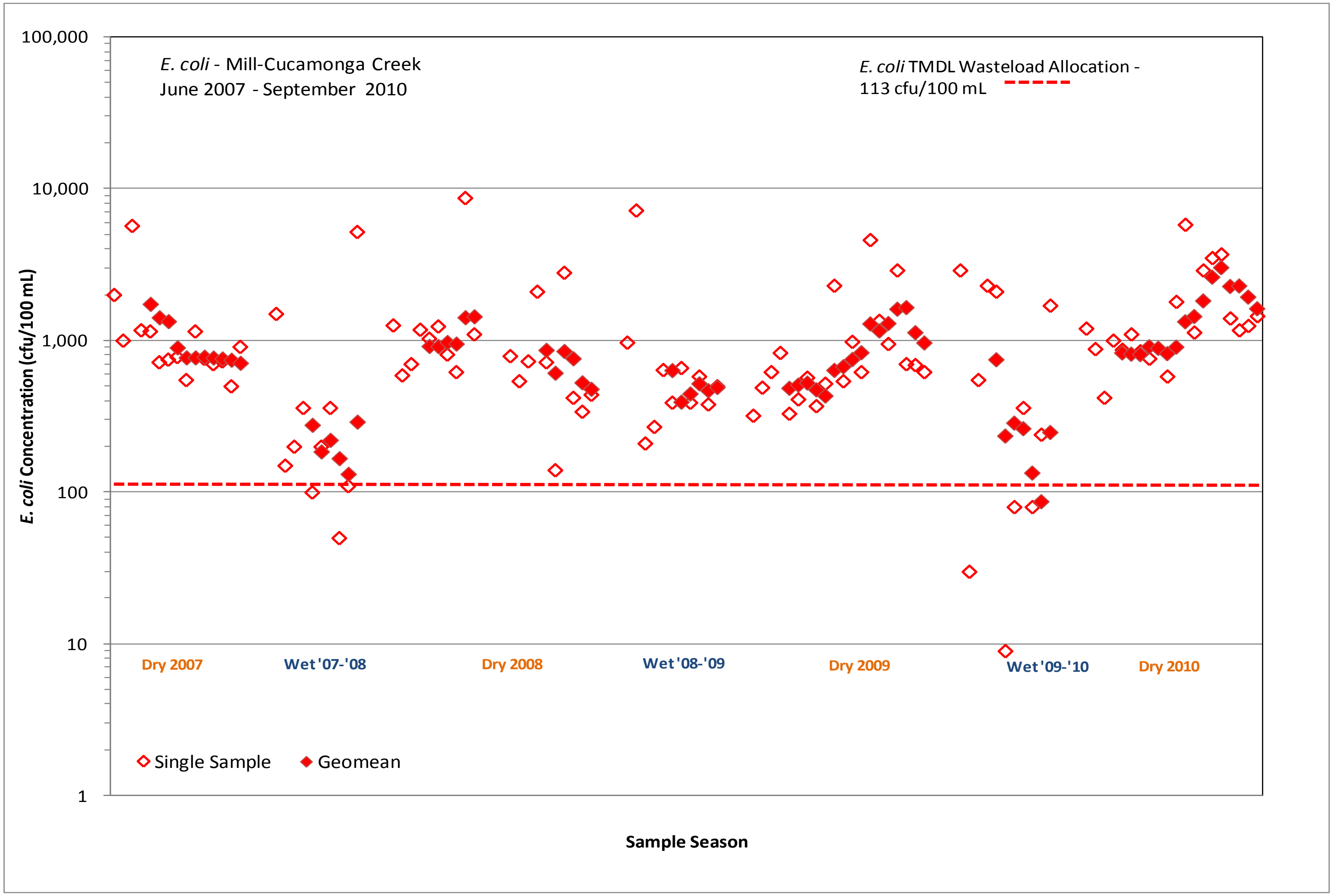


Figure 3-15. Time series plot of *E. coli* single sample results and geometric means for samples collected from Mill-Cucamonga Creek (WW-M5, 2007-2010). Geometric mean was calculated only if five samples were collected during the previous five weeks.

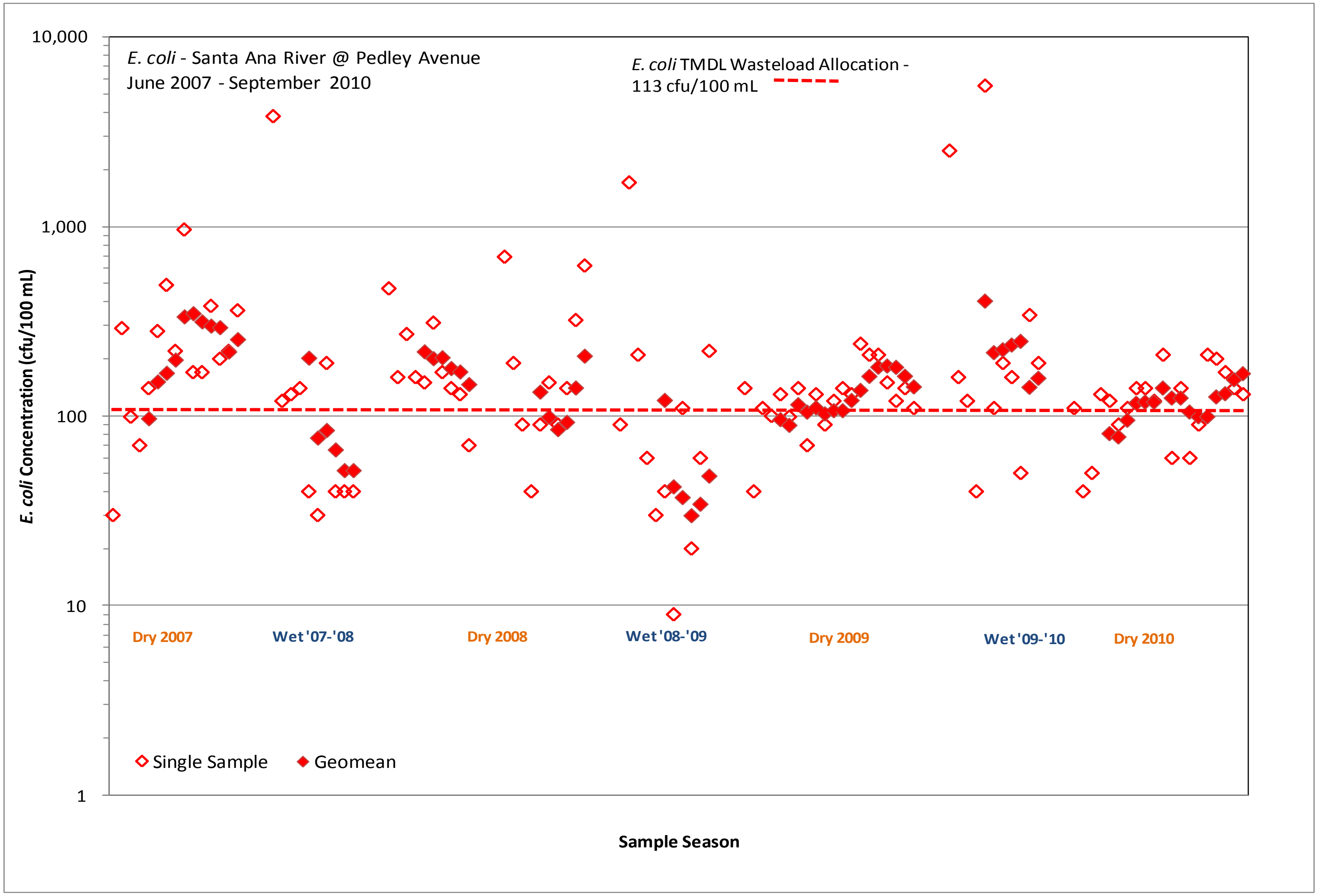


Figure 3-16. Time series plot of *E. coli* single sample and geometric mean results for samples collected from Santa Ana River @ Pedley Avenue (WW-S4, 2007-2010). Geometric mean was calculated only if five samples were collected during the previous five weeks.

Figure 3-17. Time series plot of *E. coli* single sample and geometric mean results for samples collected from Santa Ana River @ MWD Crossing (WW-S1, 2007-2010). Geometric mean was calculated only if five samples were collected during the previous five weeks.

Table 3-9 summarizes the frequency of compliance with single sample and geometric mean Basin Plan REC-1 water quality objectives proposed for *E. coli (*235 cfu/mL for single sample and 126 cfu/mL for geometric mean) during dry weather conditions in the dry season 2007-2010. At some locations there has been an improvement in compliance frequency since data collection began in 2007, e.g., as observed at the Santa Ana River watershed-wide compliance monitoring locations.

Table 3-9. Compliance frequency for *E. coli* under dry weather conditions during the 2007 -2010 dry seasons (as compared to proposed Basin Plan objectives for *E. coli*)

Site	Single Sample Criterion Exceedance Frequency (%)				Geometric Mean Criterion Exceedance Frequency (%)			
	2007	2008	2009	2010	2007	2008	2009	2010
Prado Park Lake	20%	30%	5%	5%	64%	50%	0%	6%
Chino Creek	100%	85%	35%	55%	100%	100%	88%	100%
Mill-Cucamonga Creek	100%	95%	100%	95%	100%	100%	100%	100%
SAR @ MWD Crossing	40%	15%	5%	30%	91%	58%	44%	63%
SAR @ Pedley Ave.	27%	25%	5%	5%	82%	75%	44%	19%

3.4.2 Urban Source Evaluation Plan Monitoring

The USEP monitoring program (2007-2008) analyzed bacterial indicator levels and sources (using microbial source tracking [MST] tools) to characterize key urban MS4 facilities in Riverside and San Bernardino Counties. The MSAR Task Force used the 2007-2008 USEP data results to prioritize steps for mitigating controllable urban sources of bacterial indicators within the MSAR watershed. High priority sites included those where:

- Magnitude and frequency of bacterial indicator exceedances was high;
- Microbial source tracking analysis indicated presence of human sources of bacterial indicators relatively frequently;
- Site is in an area, or is close to an area, where water contact recreational activities are likely to occur; and
- Observed bacterial indicator exceedances and presence of human bacterial indicator sources occur during periods when people are most likely to be present, e.g., during warm months and dry weather periods.

In contrast, the lowest priority sites for urban dischargers would be those where the bacterial indicator exceedance frequency and magnitude is low, human or other urban sources, e.g., dogs, are not present, and the site is not used for water contact recreation, e.g., the site is a concrete-lined, vertical-walled flood control channel.

A complete summary of USEP monitoring results may be found in SAWPA (2009a). Compliance with Basin Plan objectives was evaluated using geometric mean and single sample results (Table 3-10). Geometric means of bacterial indicator levels were calculated only when at least five sample results were available from the previous five week period. Bacterial indicator levels frequently exceeded water quality objectives at most of the sampling locations. Despite this commonality, the range of bacterial indicator levels varied significantly among sites (Figure 3-18).

MST analyses detected bacterial indicators originating from human sources at some sites. The detection frequency of bacterial indicators originating from human sources indicated that some tributaries to impaired waterbodies could pose a greater risk of contributing harmful pathogens to downstream waters than others (Table 3-11). Sites were ranked based on three factors:

- Frequency of exceedances of water quality objectives (R_F)
- Magnitude of bacterial indicator concentration (R_C)
- Number of detections of human source bacteria (R_D)

From these ranks, a single normalized index referred to as a Bacterial Prioritization Score (BPS) was calculated using the following equation:

$$BPS = \frac{R_F * R_C * R_D}{MAX_{R_F * R_C * R_D}}$$

Table 3-12 shows the relative ranks and computed BPS for each of the subwatersheds represented by USEP monitoring locations. These BPS values are being used as the basis for prioritizing TMDL implementation activities within each of the areas draining to watershed-wide compliance monitoring locations. This analysis shows that highest priority drainage areas within larger subwatersheds are Box Springs and Lower Deer Creek (Chris Basin). In contrast, drainage areas that appear to be of low priority include Sunnyslope Channel and Carbon Canyon Creek.

The source of human bacteria in the Box Springs channel was determined to come from an illicit connection from a Riverside Community College restroom. This illicit connection was corrected in May 2008, as described in section 3.4.4 below.

Table 3-10. Compliance frequency based on proposed *E. coli* water quality objectives at USEP monitoring program sites during dry weather

USEP Site	Single Sample Criterion Exceedance Frequency (%)		Geometric Mean (cfu/100 mL)				Geomean Criterion Exceedance Frequency (%)
	Dry Season	Wet Season	Dry Season 2007 (7/14 – 8/11)	Dry Season 2007 (9/1 – 9/29)	Wet Season 2008 (1/19 – 2/16)	Wet Season 2008 (1/26 – 2/23)	
Anza Drain	80%	25%	380	638	177	341	100%
Box Springs Channel	89%	75%	1,149	4,793	655	939	100%
Carbon Canyon Cr.[1]	20%	25%	44	84	200	177	50%
Chris Basin[1]	80%	100%	1,758	429	1,530	1,447	100%
County Line Channel[2]	80%	50%	1,194	n/a	n/a	n/a	100%
Cucamonga Creek[1]	50%	38%	74	262	176	356	50%
Cypress Channel[1]	100%	100%	4,745	1,981	n/a	n/a	100%
Day Creek[2]	71%	60%	n/a	n/a	n/a	n/a	n/a
San Antonio Channel[1]	78%	56%	n/a	718	2,085	1,394	100%
SAR @ La Cadena[2]	100%	50%	n/a	n/a	n/a	n/a	n/a
Sunnyslope Channel	20%	33%	165	204	72	207	75%
San Sevaine Channel[2]	75%	83%	n/a	n/a	n/a	n/a	n/a
Temescal Cr.	89%	43%	491	3,127	162	143	100%

[1] – Site in San Bernardino County
[2] – Site receives DWF from both counties

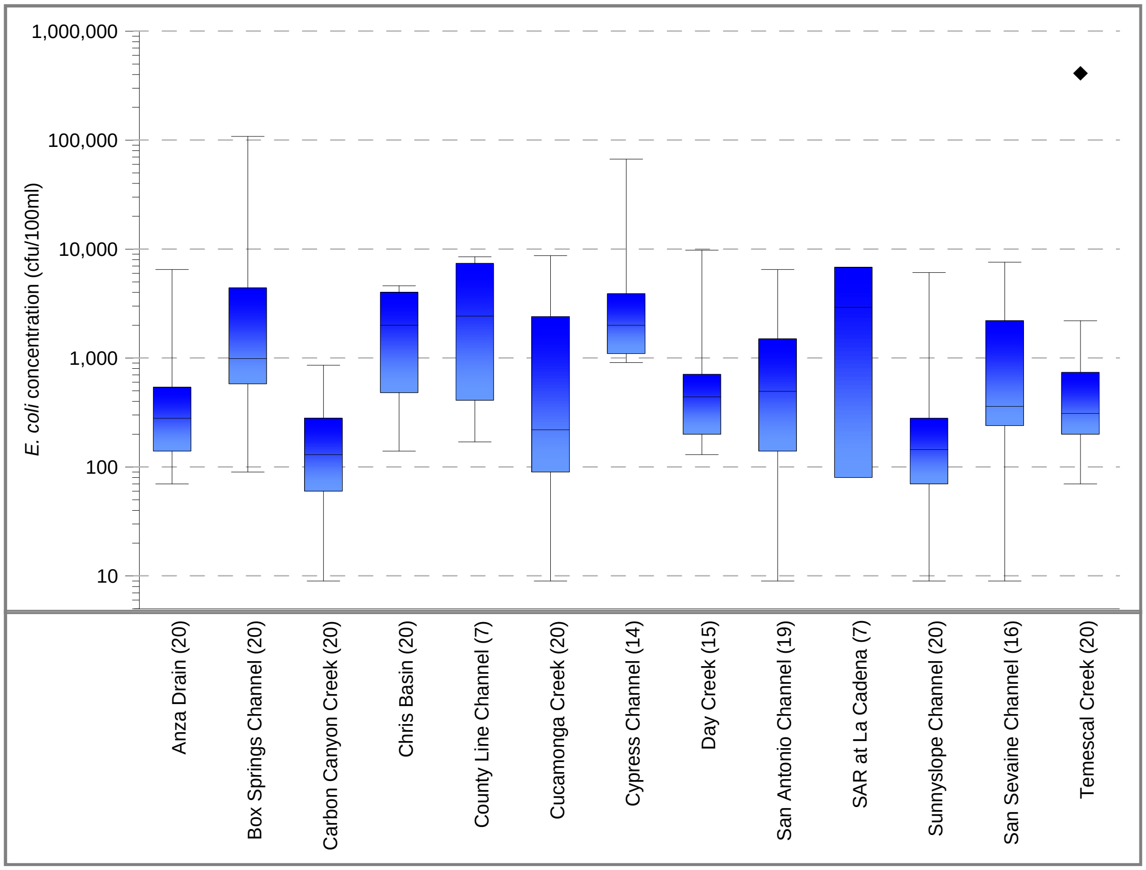


Figure 3-18. *E. coli* levels at USEP monitoring program sites during dry weather conditions

Table 3-11. Summary of human source bacteria detections at USEP monitoring program sites

USEP Site	N	Number of Detections of Human Sources (Maximum N = 20)	Frequency of Detection
Anza Drain	20	1	5%
Box Springs Channel	20	18	90%
Carbon Canyon Creek[1]	20	0	0%
Lower Deer Creek (Chris Basin) [1]	20	5	25%
County Line Channel[2]	7	0	0%
Cucamonga Creek[1]	20	1	5%
Cypress Channel[1]	14	1	7%
Day Creek[2]	15	1	7%
San Antonio Channel[1]	19	3	16%
San Sevaine Channel[2]	7	3	43%
Santa Ana River at La Cadena[2]	20	3	15%
Sunnyslope Channel	16	2	13%
Temescal Creek	20	1	5%

[1] – Site in San Bernardino County
[2] – Site receives DWF from both counties

Table 3-12. Bacteria Prioritization Score for USEP monitoring program sites

Site	Relative Rank of Bacterial Indicator Water Quality			Normalized BPS
	Frequency of Single Sample Exceedance (R_F)	Magnitude of Exceedance (R_C)	Proportion of Human Detect (R_D)	
Box Springs Channel	11	13	13	100
Chris Basin Outflow[1]	12	11	11	78
Cypress Channel[1]	13	12	7	59
San Antonio Channel[1]	6	9	10	29
Santa Ana River @ La Cadena[2]	5	8	12	26
San Sevaine Channel[2]	10	4	8	17
Day Creek[2]	8	6	6	15
County Line Channel[2]	9	10	1	5
Cucamonga Creek[1]	3	7	3	3
Anza Drain	4	5	3	3
Temescal Creek	7	2	3	2
Sunnyslope Channel	1	3	9	1
Carbon Canyon Creek[1]	1	1	1	0

[1] – Site in San Bernardino County
[2] – Site receives DWF from both counties

3.4.3 NPDES Monitoring Activities

Monitoring activities conducted by the Riverside County stormwater program in the MSAR watershed predominantly focus on sampling wet weather conditions. However, DWF samples have been collected from three locations in Riverside County:

- Magnolia Center storm drain in the City of Riverside;
- North Norco Channel at 2nd Street in the City of Norco; and
- Line K storm drain in the City of Corona.

Table 3-13 shows *E. coli* concentrations from dry weather sampling events for the period of 2005 through 2010. Generally, dry weather *E. coli* concentrations are higher than in receiving waterbodies. However, it is important to note that DWFs from the Magnolia Center storm drain (where sample collection was most frequent) are typically recharged within the floodplain of the Santa Ana River and, therefore, not hydrologically connected to the Santa Ana River. Data from the other Riverside County monitoring sites shows that DWFs do not occur very often at these sites (blanks mean no sample was collected because the site was dry.

Table 3-13. Results of MS4 program monitoring for *E. coli* during dry weather in Riverside County from 2005 to 2009 (MPN/100 mL)

Date	Magnolia Center Storm Drain	N. Norco Channel at 2nd Street	Corona NPDES Site (Line K near Harrison)
3/30/2005	130	40	--
6/13/2005	1100	--	--
2/9/2006	500	--	--
5/30/2006	600	--	--
8/23/2006	2400	--	5000
12/7/2006	7	--	--
5/15/2007	500	--	3000
9/26/2007	130	--	--
3/20/2008	700	--	--
6/24/2008	200	--	8000
11/19/2008	200	--	--
4/1/2009	200	--	200
6/16/2009	5000	--	--

Note: No dry weather samples collected at University Wash Channel monitoring site

3.4.4 Special Water Quality Studies

Data collected by the USEP monitoring program showed that DWFs in Box Springs Channel contained a persistent source of human *Bacteroides*, a molecular marker used to determine if human source bacteria are present in samples. RCFC&WCD initiated an IC/ID investigation in January 2008 to attempt to track down this persistent source. Coincidentally, during the same time, the City of Riverside was also reviewing plans to replace a sewer line running near Box Springs Channel. While performing dye tests on lateral sewer lines, the City discovered that a single restroom toilet located in the Sam Evans Sports Complex on the Riverside Community College Riverside Campus was inadvertently connected to a storm drain pipe rather than a sewer line. It is likely that the error occurred when the restroom was originally constructed. To correct the problem, the cross-connected toilet was removed in May of 2008 and the sewer lateral was later capped to prevent any accidental recurrence.

Subsequent sampling in February 2009 indicted that bacterial concentrations were lower than recorded the previous summer. In addition, two separate samples analyzed by the Orange County Water District were both negative for the presence of *Bacteroides*. However, in September of 2009, another sample collected from Box Springs Channel did indicate the probable presence of low levels of human bacteria. The City of Riverside and the RCFC&WCD believe the primary source of bacterial contamination in Box Springs Channel was eliminated through this special study. Future sampling may be necessary to further evaluate this waterbody.

Section 4
Existing Urban Source Control Program

4.1 Introduction

This section documents existing MS4 permit activities that have been implemented by the Riverside County MS4 permittees. Emphasis was on non-structural and structural BMP actions implemented or completed since January 1, 2005 (year of MSAR Bacterial Indicator TMDL adoption) that are providing water quality benefits to the MSAR watershed.

4.2 Non-Structural BMPs

This section describes all completed non-structural BMP program activities implemented by Riverside County MS4 permittees since adoption of the MSAR Bacterial Indicator TMDL by the RWQCB in 2005. Program areas evaluated for the potential to reduce bacterial indicators under dry weather conditions include:

- Water Quality Management Plan Implementation
- Public Education and Outreach Targeting Bacterial Indicators
- Ordinance Adoption
- Inspection and Enforcement activities
- Illicit Discharge/Spill Response
- Street Sweeping
- MS4 Facility Inspection and Cleaning Programs
- Water Conservation Programs

4.2.1 Water Quality Management Plan Implementation

WQMPs are prepared for new development or significant redevelopment projects classified as category or priority projects. This section examines WQMPs completed for projects which have resulted in the implementation of BMPs expected to reduce contributions of bacterial indicator loads above and beyond what would have been expected from the area if the project had not been implemented.

Using WQMP records provided by the Riverside County MS4 area-wide program, projects were screened for those approved after 2005 and designated as “significant redevelopment” projects. The presumption is that for existing developments, stormwater management controls were not designed to today’s standards and therefore some degree of runoff (e.g., from over-irrigation) likely occurred under dry weather conditions prior to redevelopment. With significant redevelopment of the project site, an approved WQMP would require implementation of site design, source control, and/or structural control BMPs to address pollutants of concern by reducing runoff or treating runoff. New development projects completed since 2005 were not included in this analysis because these projects replace previously undeveloped land that likely did not generate any runoff under dry weather conditions. Table 4-1 describes the number of approved WQMPs for significant redevelopment projects and the total project development area in each Riverside County jurisdiction. A brief description of the type of BMPs implemented for each project is provided.

Table 4-1. Summary of WQMPs approved for significant redevelopment projects, Riverside County, 2005-2009

Jurisdiction	No. of Projects	Total Acres	Description
Corona	1	1.2	Infiltration trench BMPs incorporated into this project
Norco	2	2.4	Two significant redevelopment projects included two BMPs: media filter drain inserts and vegetative swales
City of Riverside	NA	NA	NA: Provided data lacked sufficient information to determine project type and acreage
Riverside County	4	8.5	Projects included infiltration and bioswale BMPs
Total	**7**	**12.1**	

4.2.2 Public Education and Outreach

The MS4 permittees collectively participate in public education and outreach efforts that promote stormwater pollution prevention. Although outreach events may not specifically focus on reducing bacterial indicator levels, events which highlight the elimination or reduction of debris or pollutants from entering the MS4 or runoff under dry weather conditions have the potential to reduce bacterial indicator levels.

The permittees implement the following specific public education BMPs and activities to reduce pathogen sources:

- *What's the Scoop* and *After the Storm* brochures address the need to pick up animal waste and to dispose of it properly;
- Through a partnership between Riverside and San Bernardino Counties, the RCFC&WCD sponsored a 1-hour episode of a PBS show for kids called *Curiosity Quest*. The episode focused on many of the impacts that residential activities can have on stormwater including improper pet waste disposal;
- A school activity book and *Fancy Fin* presentation discuss the proper disposal of pet waste;

- The *Keep Our Water Clean* DVD addresses the topic of the proper disposal of pet waste and the negative impacts to County waterways;

- The *Only Rain Down the Storm Drain* adult stormwater presentation discusses proper disposal of pet waste and includes a DVD showing how significant this problem can be. The film illustrates how waterways are impacted if pet waste is not recovered. In the DVD film, a small yellow duck represents bacteria in an unrecovered pet waste pile. The film continues to follow the duck, and other ducks, as it moves to the storm drain and finally to a receiving water;

- Construction, municipal, industrial/commercial and new development training focuses on the need to address pathogen sources within the watershed;

- RCFC&WCD contracts with S. Groner and Associates to distribute pet waste information in pet stores, veterinarian clinics, kennels and pet grooming facilities;

- Coordination with Riverside County Animal Control Department and private "no kill" pet shelters occurs to distribute *What's the Scoop* and *After the Storm* brochures to families adopting pets at these shelters;

- Distributed the Landscape and Gardening brochure;

- Distributed the newly completed *Tips for Maintaining a Septic Tank System* brochure (information is also included in the County's *Septic Tank Guide Booklet*);

- Participation in the Santa Ana River watershed clean-up event;

- Pollution Prevention Week is recognized in an information flyer and is released every September. Along with other useful BMP guidelines, the flyer has an article that specifically addresses pet waste titled *What's the Scoop…Tips for a Healthy Pet and A Healthier Environment*;

- The Earth Day flyer, released every April, offers user-friendly suggestions for reducing the use of chemicals, considering integrated pest management in gardening, and understanding the problems that can result with unrecovered pet droppings;

- The *Environmental Calendar* reminds residents to always pick-up animal waste due to the harmful effects that bacteria cause in local waters; and

- RCFC&WCD does not allow the disposal of pet waste or other trash within its facilities. Signage has been installed at access gates to discourage illegal dumping and encourage the reporting thereof. At the start of the program, RCFC&WCD purchased "Dogipots" (containers that hold pet waste bags) and installed them in County Parks. Upkeep and additional purchases of Dogipots are the responsibility of County Park staff. RCFC&WCD also purchased pet leash tags with the stormwater 800 Toll Free number and the *Only Rain Down the Storm Drain* message imprinted.

Information for public education and outreach events such as those mentioned above are collected on a County-wide basis. RCFC&WCD collects this information for reporting in its Annual Report. Most of the recorded events educate the public on general stormwater pollution prevention by providing information at public events (Table 4-2). The number of "impressions" is an estimated number of persons contacted through personal communication, audience attendance, or brochure distribution.

4.2.3 Ordinance Adoption

MS4 permittees have adopted ordinances which provide legal authority to control non-permitted discharges from entering MS4 facilities. In addition, some permittees have adopted ordinances which directly reduce the volume of runoff under dry weather conditions, e.g., water conservation ordinances. These ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. The Cities of Corona, Norco, and Riverside have adopted stormwater ordinances which provide the legal authority to prevent the following types of discharges to MS4 facilities:

- Sewage to MS4 facilities
- Wash water resulting from hosing or cleaning of gas stations and other types of automobile stations
- Discharges resulting from the cleaning, repair, or maintenance of equipment, machinery or facilities, including motor vehicles, concrete mixing equipment, and portable toilet servicing
- Wash water from mobile auto detailing and washing, steam and pressure cleaning, and carpet cleaning
- Water from cleaning of municipal, industrial, and commercial areas including parking lots, streets, sidewalks, driveways, patios, plazas, work yards and outdoor eating or drinking areas, containing chemicals or detergents and without prior sweeping
- Runoff from material storage areas or uncovered receptacles that contain chemicals, fuels, grease, oil or other hazardous materials
- Discharges of runoff from the washing of toxic materials from paved or unpaved areas
- Discharges from pool or fountain water containing chlorine, biocides, or other chemicals; pool filter backwash containing debris and chlorine

Table 4-2. Public education and outreach activities for Riverside County MS4 Program, 2005-2009 (IMP = Impressions)

Jurisdiction	2005		2006		2007		2008		2009		Comments
	No. of Events	No. of IMPs	No. of Events	No. of IMPs	No. of Events	No. of IMPs	No. of Events	No. of IMPs	No. of Events	No. of IMPs	
Corona	1	1,500	3	1,160	7	1,310	1	400	2	500	Outreach events included health and safety fairs, Corona Public Works Day, and water conservation events.
Norco	0	0	1	360	0	0	0	0	1	100	Outreach events included a community festival and equestrian event.
Riverside	6	2,800	2	1,460	5	530	3	800	7	750	Outreaches included events such as cleanup days, Humane Society events, community park revitalization efforts, Special Olympics, 5K run/walk event, and safety fairs.
County of Riverside	1	2,276	7	8,366	8	2,812	13	10,153	14	13,046	Outreach events included youth related events, July 4th celebrations, and senior events,
RCFC&WCD	16	NR	12	8,220	20	3,163	20	4,880	13	3,860	Outreach events included water festivals, recycling programs, school presentations, community festivals, health fairs, and home & garden expos.
Total	**24**	**6,576**	**25**	**19,566**	**40**	**7,815**	**37**	**16,233**	**37**	**18,256**	

NR = Not recorded

- Pet waste, yard waste, debris, and sediment
- Restaurant or food processing facility wastes such as grease, floor mat and trash bin wash water, and food waste

The County of Riverside has adopted a similar stormwater ordinance but it does not address sewage issues since the County does not operate a POTW or associated sewage collection system. The RCFC&WCD does not have an adopted stormwater ordinance since it relies on the combined authority of the city and county permittees.

In addition to the legal authority described above to prevent illicit discharges to the MS4, the Riverside County permittees in the MSAR watershed have adopted additional ordinances, as appropriate, (e.g., water conservation, manure management and disposal) which have the potential to reduce bacterial indicator loading to impaired waters. These are described, as appropriate in the following sections:

4.2.3.1 City of Corona

The City of Corona established water conservation ordinances in 2009 (Ordinances 2962 & 2996), and a landscape ordinance (Ordinance 2949) in 2008. When fully implemented, these ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. The ordinances specifically identify:

- Activities which may be prohibited during times of water shortage emergencies, including:
  - Allowing water to leave a property by drainage onto adjacent properties or public or private roadways or streets due to excessive irrigation and/or uncorrected leaks
  - Failure to repair water leaks
  - Use of water for wash down of sidewalks, driveways, parking areas, tennis courts, patios or other paved areas (except to alleviate immediate safety or sanitation hazards)
- Enforcement provisions in order to ensure compliance, including fines and penalties
- Other restrictions to include washing automobiles, trucks, trailers and other mobile equipment only on specific days of the week or halting the activity completely
- Revisions to the landscape requirements for residential, commercial, and industrial development projects to reflect revisions to the City's landscape design guidelines (see Section 4.2.8 Water Conservation Programs)

4.2.3.2 City of Norco

The City of Norco is a unique jurisdiction which includes a large number of animal keeping properties that may be a source of bacterial indicators. In May 2008, the Norco City Council approved Ordinance No. 889, which amended the Norco Municipal Code, to include manure management and disposal. This Ordinance establishes minimum requirements for residential maintenance of animal keeping properties and provides the City authority to impose penalties and fines if properties are not properly maintained. For example, manure is required to be removed from properties either through participation in the City's manure collection program or a "self-haul" permit is required. Inspection forms for residential properties that require stormwater compliance have been created and are being utilized. Information obtained from the inspection forms is being tracked in a database.

4.2.3.3 City of Riverside

In November 2009, the Riverside City Council approved a Water Efficient Landscape Ordinance for all new construction within the City. The City is in the process of developing a Water Conservation Ordinance through the Water Division of RPU (planned for adoption in 2010). RPU already administers residential rebate programs to incentivize water conservation, e.g., distribution of high efficiency sprinkler nozzles, rebates for weather based irrigation controllers, rotating sprinkler nozzles, and artificial turf. These ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters

4.2.3.4 County of Riverside

In 2009, the County updated Ordinance 859.1 and 859.2 to include Water Efficient Landscape elements. The purpose of these updates is:

- To establish provisions for water management practices and water waste prevention;
- To establish a structure for planning, designing, installing, maintaining, and managing water efficient landscapes in new and rehabilitated projects;
- To reduce the water demands from landscapes;
- To assure the attainment of water efficient landscape goals by requiring that landscapes not exceed a maximum water demand of 70 percent of its reference evapotranspiration or any lower percentage as may be required by state legislation, whichever is stricter;
- To eliminate water waste from overspray and/or runoff;
- To achieve water conservation by raising the public awareness of the need to conserve water through education and motivation to embrace an effective water demand management program; and

- To implement the requirements of the California Water Conservation in Landscaping Act 2006 and the California Code of Regulations Title 23, Division 2, Chapter 2.7.

In addition to adopting ordinances to provide legal authority to control non-permitted discharges, some permittees have adopted water conservation ordinances which directly reduce the volume of runoff under dry weather conditions. These ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. Table 4-3 summarizes the jurisdictions which have established legal authority to manage outdoor water use. Ordinance prohibitions include failure to repair water leaks, use of water to wash any impervious surface, and irrigation water from flowing off a property.

Table 4-3. Existing water conservation ordinances within the Riverside County MSAR watershed

Jurisdiction	Ordinance Name	Applicability	Key Prohibitions
City of Corona	Water Conservation	City of Corona	• Any irrigation water leaving the property • Failure to repair a water leak • Use of water to wash any impervious surfaces
City of Norco	Water Conservation	City of Norco	• Failure to repair a water leak
City of Riverside	Water Efficient Landscaping and Irrigation	City of Riverside customers with greater than 1 acre of landscaping	• Any irrigation water leaving the property
Western Municipal Water District	Water Conservation	City of Riverside and portions of unincorporated Riverside County	• Any irrigation water leaving the property • Scheduling of spray irrigation between the hours of 8:00 am and 8:00 pm • Failure to repair a water leak • Use of water to wash any impervious surfaces

In addition to local water conservation ordinances, recently adopted Assembly Bill 1881 (AB 1881) requires co-permittees to update landscape ordinances. The bill also requires the local agencies to adopt the State Model Water Efficient Landscape Ordinance 53 or prepare one that is as effective as the State Model by January 2010. The proposed state model ordinance applies to landscape requiring a building or landscape permit, plan check or design review.

4.2.4 Inspection and Enforcement Activities

MS4 permittees conduct inspections of commercial and industrial facilities as part of municipal NPDES programs to assess compliance of facilities with local stormwater ordinances and, where applicable, potential noncompliance with California's General Permit for Storm Water Discharges Associated with Industrial Activities. In evaluation of these programs for water quality benefits, restaurant inspections are of particular interest since restaurant activities are potential sources of indicator bacteria.

Riverside County MS4 permittees implement a Commercial/Industrial Compliance Assistance Program (CAP) to conduct focused outreach to restaurants, automotive repair shops and certain other commercial and industrial establishments to encourage implementation of stormwater BMPs and facilitate consistent and coordinated enforcement of local stormwater quality ordinances. Site visits include use of survey checklists to document stormwater management practices for each facility. CAP has a specific compliance survey for food facilities verifying that:

- Oil and grease wastes are not discharged onto a parking lot, street or adjacent catch basin
- Trash bin areas are clean; bin lids are closed, not filled with liquid, and bins have not been washed out into the MS4
- Floor mats, filters and garbage containers are not washed in adjacent parking lots, alleys, sidewalks, or streets and that no wash water is discharged to MS4s
- Parking lot areas are cleaned by sweeping, not by hosing down, and that facility operators use dry methods for spill cleanup

The City of Corona has implemented enforcement activities related to its water conservation ordinance. Since October 2009, the city has completed 386 free landscape audits at residences throughout the city. Audits include the following activities:

- Irrigation timers are set per the City watering guidelines (3 days per week, 20 minutes maximum per station)
- Valves are checked to ensure operability
- Sprinkler heads are checked and adjusted to ensure efficiency
- Water meter is checked for leaks
- Additional recommendations for water savings are made

Implementation of the water conservation ordinance also results in inspectors going out into the community to address complaints regarding potential violations of ordinance provisions. Since October 2009, the following complaints or inquiries have been received:

- 145 calls about watering during restricted hours
- 26 broken sprinkler calls
- 23 reports of washing down sidewalks
- 6 reports of water spraying on sidewalks

- 81 general inquiries about water conservation
- 56 calls regarding overwatering
- 46 wasting water reports
- 59 water leak/leaking sprinkler issues
- 64 reports of watering on wrong days

4.2.5 Illicit Discharge/Spill Response

Riverside County permittees implement programs to reduce illicit discharges and prevent spills from reaching MS4 facilities. Events which involve the discharge of sewage have the potential to result in significant bacterial indicator inputs to the MS4. Permittees collaborated with the sewering agencies to develop a Unified Sanitary Sewer Spill Response Procedure in 2005 (updated in 2008) for containing and cleaning effluent to address sanitary sewer overflows. The procedure was developed in response to a MS4 permit requirement for sewering agencies and permittees to develop and strengthen interagency response procedures and enhance communication among permittees, sewering agencies, and the RWQCB.

Riverside County permittees annually record notifications or complaints regarding illicit discharges and maintain a database of these incidents and specific response actions taken. Initial calls of complaints often are received by the County and then forwarded to individual jurisdictions for follow-up action. The discharge database includes the following information:

- Discharge type
- Discharge description and estimated quantity of material discharged
- Response action

A review of database records for the period 2005-2009 shows that discharge or spill events were mostly related to sewage overflows. Table 4-4 summarizes the total number of reported incidents and estimated quantity of discharge cleaned. The total volume handled during spill response activities represents discharges prevented from potentially entering MS4 facilities.

Table 4-4. Illicit Discharge Spill Response, Riverside County MS4 Program, 2005-2009

Jurisdiction	2005		2006		2007		2008		2009	
	Incidents	Quantity (gal)	Incidents	Quantity (gal)	Incidents	Quantity (gal)	Incidents	Quantity (gal)	Incidents	Quantity (gal)
Corona	2	7,600	1	4,700	4	95,800	3	3,900	6	2,900
Norco	0	0	0	0	0	0	1	1,000	0	0
Riverside	27	2,084,000	5	4,100	3	1,300	9	4,800	7	6,500
County of Riverside	0	0	0	0	0	0	0	0	2	5,500

4.2.6 Street Sweeping

Street sweeping removes debris, which has been shown to contain bacterial indicators. Bacterial indicators become entrained in urban runoff, which is then discharged to the MS4. While the benefits of street sweeping are assumed to be most closely associated with wet weather runoff which has the greatest capacity to flush unswept debris into the storm drain, there is recent evidence that DWFs along curbs have the potential to mobilize significant numbers of bacterial indicators (Skinner et al. 2010; Ferguson 2006). It should be noted that street sweeping activities are only performed on streets with curb and gutter. In uncurbed streets, a portion of accumulated sediment is conveyed to shoulders by wind or runoff and is therefore not commonly found within the path of any DWF.

Table 4-5 summarizes the quantity of debris collected by street sweeping programs for each jurisdiction. The following sections provide a qualitative description of street sweeping program activities within permittee jurisdictions, as reported in the Annual Progress Reports.

Table 4-5. Debris collected (tons) from street sweeping, Riverside County, 2005-2009

Jurisdiction	2005	2006	2007	2008	2009	Comments
Corona	-	2,772	2,845	2,796	2,904	
Norco	-	-	294	361	345	
Riverside	-	-	4,990	NR	2,885	NR: not reported
County of Riverside	-	-	1,753	NR	1,672	NR: not reported

(-): In 2005 and 2006, not all jurisdictions reported this measurement
Source: Riverside County Annual Progress Reports, 2005 to 2009

The City of Corona prioritizes street sweeping based on a number of factors including land use or complaint history. Generally, streets in residential areas with curb and gutter are swept two times per month while street medians and intersections are swept one time per month. Areas are ranked as low, medium, or high based on the following:

- Low - Low density residential areas; areas with no prior history of illegal dumping, problems and/or complaints
- Medium - Medium density residential areas; areas with modest amount of landscaping, collector streets; storm drain facilities with few complaints, problems or history of an isolated incident that occurred in the past with no visible reoccurring pattern
- High - High density residential, commercial and industrial areas; areas with significant amount of landscaping; major arterial, primary and secondary streets; facilities that discharge directly to receiving waters and are classified under the "Medium" category

The City of Riverside implements a bi-weekly street sweeping program for streets with curb and gutter to reduce the discharge of pollutants and trash that would enter MS4 facilities from public areas such as parks and streets. The street sweeping program is coordinated with Parking Services to better enforce "No Parking for Street Sweeping" requirements. Fine enforcement has resulted in fewer vehicles remaining parked along the street during scheduled and posted street sweeping time; allowing for more effective sweeping coverage and greater removal of debris along streets and gutters. In 2007-2008, two new more efficient sweepers were purchased.

Unincorporated Riverside County streets with curb and gutter are swept on average two times per month. For established neighborhoods within a Landscape Lighting and Maintenance District, street sweeping is performed twice a month. Other service areas within the County are swept on an as needed basis.

4.2.7 MS4 Facility Inspection and Cleaning Programs

The MS4 permittees implement MS4 facility inspection and cleaning programs to satisfy minimum facility maintenance requirements contained in their MS4 permits. The debris that builds up in MS4 facilities has the potential to become a significant bacterial indicator reservoir that can be mobilized when water moves through. While wet weather flows would be most likely to mobilize this debris and associated bacterial indicators, steady DWFs through the facility also have the potential convey bacterial indicators into receiving waters.

The Riverside County permittees annually document the length and percent of pipeline and channel facilities inspected in the Annual Report (see Tables 4-6 and 4-7). Table 4-8 summarizes the amount of debris removed annually from MS4 facilities from 2005 to 2009. In addition, the Riverside County permittees also have conducted site-specific MS4 cleanup efforts in the MSAR watershed. These efforts are summarized below.

4.2.7.1 City of Corona

The City of Corona conducts annual cleanup events and has implemented efforts to address transient encampments in the Prado Basin:

- *Temescal Creek Cleanup Event:* - Since 2005, the City of Corona has conducted annual volunteer trash and debris removal events in Temescal Creek. These events are held in coordination with various agencies and in conjunction with the Inner-Coastal Watershed Cleanup Day. Dates and volunteer efforts resulting in debris removed from the Temescal Creek are summarized below:

Table 4-6. Linear feet of pipe and percent of pipe inspected, Riverside County MS4, 2005 - 2009

Jurisdiction	Linear Feet (LF) or Miles (mi) of Pipe Inspected					Percent Pipe Inspected				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Corona	43,310 LF	45,490 LF	47,550 LF	39,204 LF	47,360 LF	6	6	6	5	6
Norco	16,100 LF	16,900 LF	17,000 LF	17,000 LF	17,000 LF	80	80	62	62	80
City of Riverside	0	ND	ND	ND	ND	0	ND	10	10	10
County of Riverside	ND	ND	ND	All [2]	6,150 LF	ND	80	80	100	82
RCFC&WCD	ND	ND	All [2]	All [2]	All [2]	100	100	100	100	100

[1] ND: No data shown
[2] All components that can be visually inspected
Source: Riverside County Annual Progress Reports, 2005 to 2009

Table 4-7. Linear feet of channel and percent of channel inspected, Riverside County MS4, 2005 - 2009

Jurisdiction	Linear Feet (LF) or Miles (mi) of Channel Inspected					Percent Channel Inspected				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Corona	21,536 LF	21,536 LF	22,855 LF	22,861 LF	23,258 LF	100	100	100	100	100
Norco	4,400 LF	4,400 LF	4,000 LF	4,400 LF	4,400 LF	100	100	80	100	100
City of Riverside	199,000 LF	199,000 LF	ND	ND	ND	100	100	100	100	100
County of Riverside	ND	ND	ND	ND	57,855 LF	ND	92	92	100	95
RCFC&WCD	133 mi	59 mi	160 mi	103 mi	95 mi	100	100	100	100	100

[1] ND: No data shown
Source: Riverside County Annual Progress Reports, 2005 to 2009

Table 4-8. Debris (tons) collected from MS4 facilities, Riverside County permittees, 2005-2009

Jurisdiction	2005	2006	2007	2008	2009	Comments
Corona	-	-	64	117	119	
Norco	-	-	16	16	14	
City of Riverside	-	-	3,381 cy	7,000 cy	2,200 cy	Debris cubic yards (cy)
County of Riverside	-	-	15	NR	24	NR, not recorded
RCFC&WCD	-	673	600	1,200	1,100	Debris collected (tons)
	-	45,146	50,000	57,000	24,000	Sediment collected (cubic yards)

(-): In 2005 and 2006, not all jurisdictions reported this measurement
Source: Riverside County Annual Progress Reports, 2005 to 2009

  - May 21, 2005 - 80 volunteers; quantity unknown
  - October 28, 2006 - 30 volunteers; 2 tons of debris
  - October 18, 2008 - 300 volunteers; 50 tons of debris
  - October 17, 2009 - 100 volunteers; 23 tons of debris

- *Prado Basin Transient Encampment Abatement* - Since a portion of the Prado Basin is located within the City of Corona jurisdiction, in 2003 the City initiated meetings to strategize removal of transient encampments within the Prado Basin. Since 2006, this program has resulted in removal of debris from Prado Basin: 197 tons, 4 tons, and 8 tons of debris removed in 2006, 2007 and 2008, respectively.

4.2.7.2 City of Norco

In addition to the inspecting MS4 facilities, the City of Norco implements BMPs to reduce the likelihood of erosion-based pollutants by allowing alternative trail materials to be installed across driveway approaches within the horse trail. The City also has replaced many of the drop inlets located within horse trails with curb opening catch basins. Use of these alternative materials and drainage features reduces the potential for horse manure mobilization from roadside horse trails to MS4 systems.

4.2.7.3 City of Riverside

Annually, prior to the rainy season, the City's Public Works Department clears drainage areas near dirt roads to remove illegal dumping, debris, and weeds that may block drainage paths. This cleaning activity reduces the potential for in-stream source of bacteria indicators by removing materials that may provide habitat for bacteria colonies to survive and grow.

4.2.7.4 County of Riverside

The County utilizes various departments including the Transportation Department, Code Enforcement Department, County Environmental Health, RCFC&WCD, Building and Safety Department and Waste Management Department to inspect MS4 facilities and respond to complaints of illegal dumping. In addition, Riverside County implements community cleanup events throughout the region. These activities reduce the potential for in-stream source of bacteria indicators by removing materials that may provide habitat for bacteria colonies to survive and grow.

4.2.8 Water Conservation Programs

The Cities of Corona and Riverside have adopted ordinances to increase water conservation (see also Section 4.2.1). These ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. As part of the implementation of these ordinances, the cities initiated programmatic activities to support ordinance implementation.

4.2.8.1 City of Corona

The City of Corona has established landscape design guidelines for commercial and industrial developments in 2008. The purpose of the guidelines is to:

- Ensure a high level of resource conservation including water conservation, groundwater recharge, and green waste reduction;
- Promote improved water use management and water conservation through the use of water-efficient landscaping, limited use of turf grass, and aggressive use of water conserving irrigation technology and management;
- Eliminate water waste from irrigation overspray; and
- Reduce the water demands from landscapes without a decline in the landscape quality or quantity.

Additionally, the Corona Department of Public Works is a signatory to the California Urban Water Conservation Council's (CUWCC) Memorandum of Understanding, and is working toward compliance with the CUWCC's Best Management Practices. Program activities include:

- *Landscape Audit* – Provide free irrigation system check and develop customer irrigation schedule based on precipitation rate, local climate, irrigation system performance, and landscape conditions;
- *Landscape Partners* – Establish partnership with local landscape suppliers for customers to purchase water saving devices at discounted prices;
- *Rebate Program* - Implementation has included past programs such as:

  - Turf Removal (Pilot Program) – $1 per square foot to remove turf lawn and install water-friendly landscaping;
  - Weather Based Irrigation Controllers – $200 per controller for irrigable area less than one acre;
  - Rotating Nozzles – $4 per nozzle with pressure regulating head to guarantee performance; and
  - Synthetic Turf – $0.90 per square foot to replace irrigated lawn area.
- *Weather-based Irrigation Programs*
  - Completed pilot program for the installation of 37 weather-based irrigation controllers in 2009 on residential lots of 10,000 square feet or larger. Controllers reduce urban runoff by reducing the amount of water applied to yards. In the first six months since the controllers have been installed, the pilot program has resulted in savings of 15.7 acre-feet of water.
  - Weather-based Irrigation Controller (WBIC) direct installation (expanded program for future implementation) – Collaborating with the Bureau of Reclamation (50 percent grant funded) to install 290 controllers for customers with landscape areas over 1,500 sq. ft.
- *Residential Parkway Landscape Conversion Program* – This program began in 2009 to support new City of Corona guidelines established for converting high water demand turf into water efficient landscaping, e.g., converting the parkway area between the curb and the sidewalk. Increased participation is expected in future years as water utility rates increase.

City of Corona has converted approximately one acre of Landscape Maintenance District high water demand landscaped areas, such as turf, to drought tolerant landscaping and decomposed granite, and has installed more efficient irrigation systems over the past year.

These design guidelines and water conservation BMPs will provide potential reduction in DWF that may have otherwise conveyed bacterial indicators to MS4 facilities and receiving waters.

4.2.8.2 City of Riverside

RPU currently administers numerous rebate programs to support water conservation efforts, including:

- Artificial Turf - Level of incentive is $1 per square foot, up to $1,000.
- Rotating Sprinkler Nozzles - Level of incentive is $4 per qualified nozzle, up to $100, not to exceed the purchase price of the new nozzles.

- WBIC - Level of incentive on qualified units is $200 per unit, or $25 per station on landscapes larger than one acre.
- Waterwise Landscaping Program - Customers can receive incentives of $0.40 per square foot of turf area that is replaced with waterwise landscaping. Customers can replace between 1,000 to 6,000 square feet of existing turf for a maximum rebate of $2,400. Rebate cannot exceed 50 percent of total documented materials cost.
- RPU is currently partnered with WMWD in a large landscape residential WBIC/rotator direct install program. RPU targets the top residential water users in the city and, if they meet the proper criteria, to install water saving irrigation equipment in their homes at no cost.
- RPU will begin an annual high efficiency sprinkler nozzle distribution program for residents via the website FreeSpinklerNozzles.com on July 1, 2010.

RPU currently administers, through MWD, rebates for all commercial entities using pressurized water saving devices such as a pressurized waterbroom to clean sidewalks and work areas.

These water conservation BMPs will provide potential reduction in DWF that may have otherwise conveyed bacterial indicators to MS4 facilities and receiving waters.

4.3 Structural BMPs

This section describes relatively large-scale projects that include structural BMPs that reduce urban runoff under dry weather conditions that have been completed since January 1, 2005 or are already planned for completion by December 31, 2015. Structural BMPs will provide potential reduction in DWF that may have otherwise conveyed bacterial indicators to MS4 facilities and receiving waters.

Few large scale structural BMPs have been implemented since 2005 in Riverside County. An example of one such project is the County Line Channel project which was completed in 2007 primarily as a flood control facility in the Chino-Corona Agricultural Preserve area. The channel provides 100-year flood protection to existing public roads, utilities, new development, and agricultural operations by collecting overland sheet flows from the City of Ontario and County of San Bernardino portions of the watershed and discharges the flows into the Cucamonga Creek Channel. It was co-sponsored by RCFC&WCD, SBCFCD, and the City of Ontario. Grant funding was also provided by SAWPA.

The construction of the County Line Channel facility accommodated major storm drain laterals that convey stormwater and avoided the co-mingling of urban runoff with agricultural drainage that previously resulted in the inundation and overflowing of the dairy drainage systems within the project vicinity. While this project did not directly reduce bacterial indicators from urban areas, it did reduce the potential for conveying bacterial indicators from agricultural sources from impacting receiving waters in the Cucamonga Creek drainage area.

Riverside County permittees completed the BMP Siting Study for the Santa Ana Region Permit Area in 2005. This study identified candidate properties that could be retrofitted to include regional structural BMPs to capture dry and wet weather runoff. This study screened the candidate sites to prioritize implementation of potential projects. Further investigation of these potential sites will be necessary to determine their technical feasibility. Structural BMP retrofit opportunities identified in this study could be used to provide regional treatment solutions if it is determined there is a need to control DWF/bacterial indicators, and a regional structural BMP approach is determined to be the necessary approach (see also Section 5.2.4).

Section 5
Comprehensive Bacterial Indicator Reduction Program

5.1 Introduction

This section describes the CBRP program planned for implementation by the Riverside County permittees to achieve compliance with urban wasteload allocations under dry weather conditions. The CBRP program relies on a combination of ordinance adoption or revision, implementation of specific BMPs, a comprehensive inspection program (i.e., source evaluation program), development of UAAs, and where determined necessary, regional treatment (with options ranging from ultraviolet disinfection, natural treatment systems to diversions to POTWs). The recommended approach focuses both on the elimination of DWFs from MS4 facilities and reductions of urban bacterial indicator sources.

5.2 CBRP Elements

As discussed in CBRP Section 1.5.1, Section VI.D.1.c.i of the Riverside County MS4 permit lists the requirements for preparation of the CBRP. These requirements call for the inclusion of four key program elements. These elements and their corresponding reference in the CBRP are as follows:

- Ordinances – Element 1
- Specific BMPs - Element 2
- Inspection Criteria – Element 3
- Regional Treatment – Element 4

The following sections describe the CBRP program activities planned for implementation under each of these elements.

5.2.1 Element 1 - Ordinances

The CBRP requires the identification of specific ordinances that will be adopted during implementation that reduce the levels of indicator bacteria in urban sources. Two options for ordinance adoption are described in the sections below: Water Conservation and Pathogen Control.

5.2.1.1 Water Conservation Ordinance

A number of water conservation ordinances have been established in Riverside County jurisdictions to address outdoor water use efficiency (see Table 4-3). Most of these ordinances prohibit at least some outdoor water use activities that have the potential to create DWFs in the MS4. Specifically, prohibited activities range from those allowing runoff to leave a property from over-irrigation and washing of impervious surfaces to failure to repair leaks, or use of water to irrigate during daytime hours. Jurisdictions with less rigorous language could consider updating the nature and extent of prohibitions on outdoor water use. Such ordinances will provide potential reductions in DWFs that may convey bacterial indicators to MS4 facilities and receiving waters.

In November 2009, Senate Bill (SB) 7 was enacted, which requires water districts throughout California to improve water use efficiency. The bill requires a 20 percent reduction in potable water demand by 2020; an interim target of 10 percent reduction of statewide use is set for 2015. This reduction can be achieved by providing recycled water to offset a direct potable demand or by applying indoor/outdoor water use efficiency BMPs. Specific BMPs that would be implemented to achieve this goal are listed in each water purveyor's Urban Water Management Plan. However, quantification of expected potable water conservation from proposed projects is not required by SB 7. Therefore, if Riverside County permittees want to rely on implementation of SB 7 as a tool to reduce DWF, it will be important for jurisdictions to collaborate with water purveyors to ensure they incorporate outdoor water use efficiency BMPs as a key component to achieve the 10 and 20 percent potable water demand reduction targets for 2015 and 2020, respectively.

In addition to local water conservation ordinances and SB 7, recently adopted Assembly Bill 1881 (AB 1881) requires improved landscaping and irrigation practices on some types of new and significant redevelopment projects. Riverside County jurisdictions have already adopted landscaping and irrigation ordinances that are at least as stringent as the statewide guidelines developed to support implementation of AB 1881 (see Sections 4.2.3 and 4.2.8). Because AB 1881 applies only to new development and significant redevelopment projects, the water quality benefits expected from implementation of these new requirements are expected to initially be limited.

CBRP Implementation: Generally speaking, the permittees' ability to promote water conservation on their own is somewhat limited. Local water districts measure water use, set rates, and set water use policies, including fines for water waste. Local ordinances can complement these measures, but water district participation is critical to a successful water conservation program that also provides water quality benefits. Accordingly, CBRP activity in the area of water conservation will be coordinated to the MEP with water local water purveyors.

During CBRP implementation, the permittees will evaluate whether existing authority is adequate to manage DWFs to reduce bacterial indicator levels in receiving waters. In some cases it may be more appropriate to target DWFs through specific BMPs (see Element 2) rather than modify existing water conservation authority. Also, it may be determined that adequate authority exists, but enforcement levels need to be increased. All of these evaluations will be coordinated with water purveyors.

5.2.1.2 Bacterial Indicator Control Ordinance

Bacterial indicator control through ordinance development is a component of the Riverside County MS4 permit:

> *Riverside County MS4 Permit Section VIII.C* – "Within three (3) years of adoption of this Order, the Co-Permittees shall promulgate and implement ordinances that would control known pathogen or Bacterial Indicator sources such as animal wastes, if necessary."

With a permit adoption date of January 29, 2010, this MS4 permit requirement must be addressed by January 29, 2013. The permit language specifically mentions animal wastes but could address other bacterial indicator sources as well.

The City of Norco already has an established ordinance to address management and disposal of manure from animal keeping properties (see Section 4.2.3.2). This ordinance requires residents to maintain their animal keeping properties and provides the City of Norco authority to impose penalties and fines if properties are not properly maintained.

Many other municipalities have existing ordinances regarding pet waste but typically address this issue under general nuisance provisions and as a prohibited discharge (e.g., discharges not composed entirely of stormwater and which contains any pollutant, from public or private property). Typical ordinances make unlawful the failure to exercise due care or control over an animal such that solid waste is to allowed to be deposited on any public sidewalks, parks or other public property, or private property other than that of the owner.

CBRP Implementation: Existing ordinances do not establish specific requirements to properly dispose of pet waste with accompanying penalties for failure to comply. As part of CBRP implementation, the permittees will re-visit existing ordinances that address any type of animal waste and look at ways to enhance waste management requirements, compliance and enforcement. For example, a bacterial indicator control ordinance could specifically require owners/keepers of pets to properly dispose of pet waste that is deposited on any property, whether public or private. Proper disposal would be defined as placement of pet waste in waste receptacles or containers that are regularly emptied or to a sanitary sewage system for proper treatment. Penalties or fines could be also included.

In addition to the above recommendations, it is possible that during implementation of the inspection program (Element 3), additional ordinance needs may be identified that could be addressed through a bacterial indicator control ordinance. This potential will be evaluated continually during CBRP implementation.

5.2.2 Element 2 - Specific BMPs

The CBRP requires the identification of specific BMPs that will be implemented to reduce bacterial indicator levels in receiving waters. The following sections describe in no particular order the specific BMPs that have been incorporated into the CBRP. These BMPs range from programmatic activities that set the stage for other CBRP elements (e.g., DWF inspections) to specific activities that can reduce DWFs or control bacterial indicators at the source. Some of the recommended BMPs are also MS4 permit requirements, which will be noted as appropriate. In addition, some of these BMP activities may be coordinated between Riverside and San Bernardino County to streamline the level of effort required to implement the activity.

5.2.2.1 Transient Camps

Transient encampments near receiving waters or within MS4 facilities are often cited as a potential source for bacterial indicators and a reason for closure of these encampments. As this source of bacterial indicators is directly associated with human waste / human pathogens, this is a high priority source for control. It is not certain to what degree water quality is impacted by these encampments, especially under dry weather conditions. However, facilities for proper management of human and food wastes are typically not present at transient encampments. A difficulty in addressing transient encampments as a source of bacterial indicators is that they are transitory, existing for periods that may range from days to weeks. In some instances, sites may be used intermittently by transients. Two essential questions need to be evaluated prior to fully engaging in a process that involves eliminating transient camps that have the potential to impact water quality:

- *Locations of camps in relation to the MS4:* Transient encampments are commonly located under bridges, in channels, or near or adjacent to waterbodies within the flood control facility right-of-way or within a natural channel. RCFC&WCD owns and operates the vast majority of MS4 that can support transient encampments. Through annual inspections of its MS4, the RCFC&WCD identifies encampments within its MS4 that are a threat to public health and safety or downstream receiving waters. These encampments are relocated and cleaned through a coordinated program with local municipalities, social service providers and law enforcement.

  Encampments outside of MS4 rights-of-way may also provide a threat to water quality in some cases. To assist in source evaluations for specific MS4 facilities, the Riverside County permittees can conduct reconnaissance to identify locations for transient encampments that may have the highest potential to impact water quality as part of their source assessment program. As transient encampments are mobile, it is appropriate to conduct reconnaissance after source assessments indicates a potential human contamination in a MS4.

- *Water quality impact*: Once a transient encampment has been identified as part of an MS4 inspection or source assessment follow-up, an investigation can be conducted to examine to what degree transient activities, including illicit discharges, are impacting DWFs. It may be possible that such encampments are more of a wet weather concern. Such an investigation may include field observations of camp activities and water quality sampling upstream and downstream of selected camps located adjacent to waterbodies.

Based on the findings from the above activities, an evaluation of the potential benefits of enhancing existing transient encampment management strategies to focus on eliminating camps near waterbodies will be made. Specifically, this evaluation will look at the social, financial impacts of program enhancement relative to the water quality benefits achieved as compared to other bacterial indicator reduction strategies. This evaluation is needed prior to implementation since camp closure requires participation by multiple agencies, which will tax already limited resources, e.g., law enforcement, public works, environmental health, and social services.

If the decision is made to expand efforts to eliminate transient encampments to support CBRP implementation an area-wide model program will be developed to guide jurisdictional agencies. For example, The Center for Problem-Oriented Policing and the U.S. Department of Justice Office of Community Oriented Policing Services developed *Homeless Encampments* (2009 guidance document), which presents recommended steps for closing down transient camps. These steps are summarized as follows:

- Visit encampment to identify the number of occupants and any hazardous conditions - This initial step is critical as it provides information regarding what additional local resources (law enforcement, public works, social services) would be required to close the camp.
- Determine jurisdiction for multi-agency coordination – The exact location of the encampment determines which municipal entities and department should be involved.
- Arrange alternative shelter prior to removal of individuals from encampments to prevent legal challenges.
- Engage transient advocacy groups to explain what process will be followed and what alternative shelter arrangements are available; this will ease tensions and controversy prior to implementing camp closure activities.
- Understand jurisdictional laws regarding removal of transient/ property to prevent latter claims of violations of such laws.
- Provide and post written advance notice to camp occupants that they are trespassing, provide a deadline to vacate and remove all property, and identify location(s) of alternative shelter.
- Issue citations after passage of the first deadline and notify occupants that they are subject to arrest and property seizure if the camp is not vacated after a second deadline.
- Conduct arrests if occupants have not vacated and removed property by second deadline.

- Clean-up site after camp has been vacated, and remove and cut back foliage/natural cover as this action tends to remove incentive for the camps to be rebuilt in the same location; it also provides unobstructed views of the area.

- Inspect the site periodically to ensure camp is not reestablished.

- Post signage prohibiting establishment of encampments in the area.

Within the area under the jurisdiction of the Bacterial Indicator TMDL, the City of Corona and RCFC&WCD have implemented similar strategies to the one described above (also see Section 4.2.7.1). The City of Corona previously participated in a transient task force that consisted of the Public Works Department, Code Enforcement, and Corona Police Department FLEX Team (a unit specifically formed to address community-specific needs). The purpose of this joint effort was to seek out camps where there was indication of occupants engaged in activities other than loitering in areas of the City, including Prado Basin (e.g., activities such as sleeping and eating). Corona's strategy involved two basic scenarios:

- If an encampment was located and found to be occupied, the subjects were advised that they were trespassing and should leave the area removing all possessions in the process.

- If an encampment was observed to be unoccupied, notice was left advising of trespass and a timeframe was posted that provided opportunity for residents to remove their property. If the property had not been removed by the noticed date, local authorities would remove and dispose of the property.

The City of Corona Code Enforcement staff observed that it was very common to find in the vicinity of the encampments a "bathroom area" with evidence of human feces left on the ground. Unknown is to what degree these areas impact water quality during the dry season.

CBRP Implementation: The following activities will be implemented as part of this BMP:

- Identify locations of suspected transient encampments in receiving waters or MS4 facilities tributary to 303(d) listed waterbodies through the RCFC&WCD's ongoing MS4 inspections.

- Supplement with additional investigations, as necessary, to address MS4 source assessment results. Implement an investigation at one or more locations to evaluate potential contamination of DWF by human waste from transient camps.

- If transient camps are identified as a potential bacterial indicator source in DWFs, enhance existing programs for addressing transient encampments targeted for closing because of expected water quality impacts.

- As determined necessary, implement transient camp closures and follow-up activities to prevent re-establishment of closed camps in the same locations.

5.2.2.2 Illicit Discharge, Detection and Elimination Program (IDDE)

The MS4 permit for Riverside County requires the development of an IDDE program (MS4 permit section IX.D). This effort is to supplement ongoing MS4 permit implementation activities to eliminate illegal connections and illicit discharges to the MS4. The purpose of this program is to reduce or eliminate DWFs from entering the MS4 system by identifying and eliminating such flows through aggressive inspection and enforcement activities. Elimination or reduction of DWFs to the MS4 is one of the key CBRP strategies for reducing bacterial indicators in the MS4 (see CBRP Section 5.2.3).

The RWQCB recommends that the IDDE program be based on the IDDE Guidance Manual developed by the Center for Watershed Protection (CWP 2005). Key elements recommended by the CWP document include:

- Conduct a desktop analysis to delineate subwatersheds and compile mapping of the MS4 and major outfalls to better prepare for field investigations (Note: this analysis has generally been done as part of the development of this CBRP, e.g., see Sections 3.3 and Section 5.2.3).

- Conduct aerial image reviews and visual windshield surveys of small drainage areas to better understand the potential sources of DWFs.

- Walk the channels during dry weather conditions to develop an Outfall Reconnaissance Inventory (ORI). Development of the ORI includes the following activities:

    - Mark/designate major outfalls with an identification number and collect outfall information (e.g., size, type, condition, ownership).

    - Evaluate each outfall for presence, absence, or evidence of DWF. Where evidence of flow exists (staining, damp conditions at outfall), but none is observed, the discharge may be intermittent and difficult to observe during typical working hours; observations may be required on weekend or early morning/evening hours.

    - Collect flow measurements and make visual observations (e.g., odor, color, turbidity) where flow is observed.

    - Collect samples at outfalls; analyze for parameters of interest, e.g., bacterial indicators, surfactants to indicate presence of sanitary sewage or wash waters; human source Bacteroides to identify presence of human bacterial indicator sources, or nutrients (phosphorus) as an indicator of lawn irrigation discharges.

- Analyze data from the ORI and prioritize the outfalls for further investigation.

- Track the discharged flow to the source(s), e.g., systematically moving upstream from the flowing outfall into the MS4 network. Figure 5-1 illustrates an example MS4 network schematic. Preparing local maps for this step can help ensure a systematic approach to finding the source (s) of DWF.

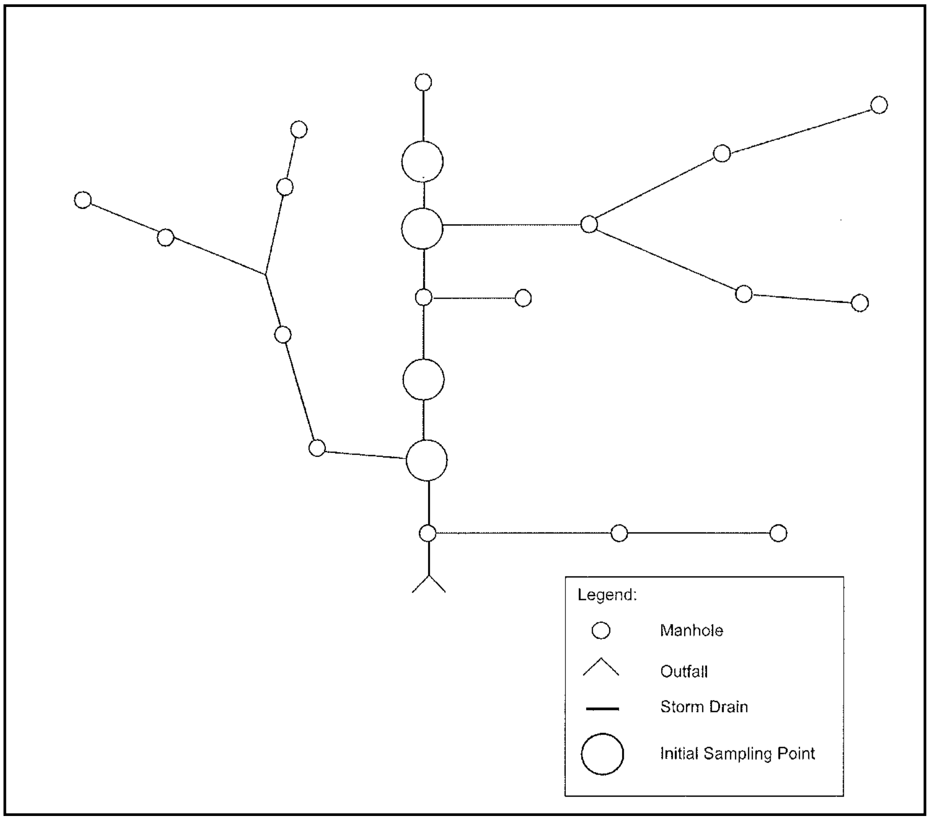


Figure 5-1. MS4 Network with Key Sampling Points along Trunk (IDDE Guidance Manual, CWP 2005)

Typical inspection activities could include:

- Review MS4 maps to identify trunk (major diameter pipes leading to the outfall) and branches.

- Identify locations for inspection.

- Inspect locations to:

  - Make visual observations to see if there is DWF and to record flow characteristics, e.g., color or odor.

  - Collect water quality samples for selected parameters.

- Continue systematic inspections to attempt to narrow down the source of the flow to a particular section of trunk or branch.

- Further investigate localized trunk or branch with methods such as dye testing, video, or smoke testing to determine exact source of flow.

CBRP Implementation: Riverside County permittees will develop the IDDE Program as required by the MS4 permit. Development of this program is key to the implementation inspection program under CBRP Element 3 (see Section 5.2.3).

5.2.2.3 Street Sweeping

Trash and other materials accumulated in streets and within MS4 facilities may provide a habitat and food source for bacterial indicators. DWF in street gutters, drains, and catch basins keeps these facilities damp, which supports bacterial indicator survivability. Biofilms may develop under these types of conditions within catch basins, along street gutters, or within flood control channels (e.g., see Skinner et al., 2010; Fergusson 2006). Biofilms are dynamic microbial communities that go through an attachment phase and then ultimately a detachment, erosion or "sloughing" phase from the surface to which they are attached.

Managing or eliminating biofilm development has the potential to substantially reduce bacterial indicator levels. A recent study by the City of San Diego shows that enhanced cleaning of catch basins provided minimal benefits in terms of reducing bacterial indicator levels. However, there is evidence that enhanced street sweeping will provide benefits. This can be accomplished by using vacuum street sweepers to reduce biofilms and their habitat and food sources from street gutters. Skinner et al. (2010) found very high bacterial indicator counts in initially bacteria free hose water running along street gutters. Implementing improved street sweeping practices resulted in an order of magnitude reduction in fecal coliform concentration (14,000 MPN/100 mL to 870 MPN/100 mL) in a 300 feet section of gutter before and after street sweeping. This finding suggests that the use of newer vacuum street sweepers targeting the street gutter could provide increased control of this source of bacterial indicators.

CBRP Implementation: Riverside County MS4 permittees will evaluate existing street sweeping programs (e.g., method, frequency, equipment) to determine potential to modify programs to reduce bacterial indicator sources. Based on the findings of this evaluation, a plan and schedule will be developed for implementation.

5.2.2.4 Irrigation or Water Conservation Practices

CBRP Section 5.2.2.1 (water conservation ordinance) describes expectations associated with water conservation ordinance development. A separate but related CBRP element is the implementation of BMPs that target irrigation practices with a goal of reducing/eliminating DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. These practices not only benefit water quality but reduce water demand. The development and implementation of these practices can be addressed in association with the ordinance element, carried out collaboratively with water purveyors to assist them with meeting their water conservation requirements, or addressed as part of an inspection and enforcement program to reduce unauthorized DWFs. Specific practices that would be effective at reducing DWFs include:

- *Replacement of grass with artificial turf* – The use of artificial turf provides a low maintenance, no irrigation alternative to grass lawns. Costs of materials and installation to replace a grass lawn with artificial turf can range from $6-14 per square foot. In the past, through partnerships with MWD and WMWD, Cities of Riverside and Corona have offered a $1 per square foot rebate for property owners that replace existing grass lawns with artificial turf.

- *Replacement of grass with drought tolerant native plant species* – California drought tolerant native plants/gardens require minimal watering and therefore reduce the likelihood of off-site DWF (see the California Native Plant Society webpage for more information at www.cnps.org). Property owners that replace existing grass lawns with drought tolerant plants in the Cities of Riverside and Corona have through past programs been eligible to receive a rebate of $0.90/square foot (sq. ft.) and $0.40/sq. ft., respectively.

- *Installation of Weather Based Irrigation Controllers (WBICs)* – WBICs use climate measurements to determine the amount of water needed to meet evapotranspiration requirements of grass lawns and other landscaped areas on a given day. Limiting irrigation to the needs of the plants can reduce the amount of water that leaves a property as DWF. WBICs can be distributed to potential users via several types of programs, including partial rebates/vouchers, equipment exchanges, or direct installation.

  Typical costs for WBICs range from $300 - $800 for a small residential application to $2,000 -$3,000 for a property with large landscaped areas. The cost effectiveness of installing WBICs to a property owner or water agency is dependent upon the existing water use (potential to reduce demand), avoided cost of water, water rates, and expected lifespan of the device (Mayer et al. 2009). Given these variables, it would be the least cost effective to distribute WBICs to individual homeowners who do not typically over-irrigate. Conversely, the most cost effective applications of WBICs would be on large landscape properties where excess water is used and the potential to generate off-site runoff is high. The most cost effective implementation approach would need to be evaluated by the local jurisdiction.

- *Landscape irrigation audits* – Most water purveyors in southern California provide free landscape irrigation audits to customers, if requested. An audit involves checking the irrigation system for leaks, ensuring spray heads are properly directed and operational, capping unused spray heads, and providing a watering schedule based on precipitation rate, local climate, irrigation system performance, and landscape conditions. A potential implementation approach would be to target landscape audits in areas that are hydrologically connected to downstream receiving waterbodies/compliance sites. The cost of conducting a landscape irrigation audit is low relative to other irrigation practice BMPs; however, the uncertainty of the effectiveness is high. To be effective, property owners would need to consistently implement the audit recommendations.

- *Public education and outreach* - Public education and outreach activities to encourage water conservation are already ongoing (both by the MS4 program and water purveyors). The CBRP does not recommend any new or modified public education and outreach activities unless it is determined that potential additional benefits could be achieved from additional collaboration between the MS4 permittees and water purveyors in this area.

The benefits expected from each of the above BMPs vary. For grass replacement BMPs, DWF is mostly eliminated while WBICs can reduce DWF by approximately 50 percent (Jakubowski 2008). Runoff reduction from landscape irrigation audits and ongoing public education and outreach activities are more difficult to quantify, as they are largely dependent on changing human behavior. These types of BMPs may reduce runoff from an individual property by only a small amount; however, because implementation may be more widespread the overall benefit may be relatively high. Factors associated with each of the above BMPs impact will affect decisions on how such BMP practices can be developed and implemented at the local level as part of the CBRP. These factors include cost, public perception, reliability, ease of implementation, and expected runoff reduction. Table 5-1 provides an evaluation of each of these factors by ranking them as low, medium or high with regards to expected benefits from their implementation.

Table 5-1. Evaluation matrix for irrigation practices/ water conservation BMPs (high benefit ●; medium benefit ⦿; low benefit ○)

Water Conservation BMP	Dry Weather Runoff Reduction	Cost	Ease of Implementation	Water Conservation
Replacement of grass with artificial turf	●	○	○	●
Replacement of grass with drought tolerant plant species	●	⦿	○	●
Installation of WBICs	⦿	○	⦿	⦿
Landscape irrigation audits	○	●	●	○
Public education and outreach	○	●	●	○

CBRP Implementation: To the MEP and where feasible, water conservation BMPs will be implemented as they can provide important benefits in reduced DWFs that may convey bacterial indicators to MS4 facilities and receiving waters. The MS4 area-wide program will evaluate options and minimum requirements for implementation of water conservation BMPs. Individual permittees will implement these BMPs through local authority. Development and implementation of these BMPs will be closely coordinated with the CBRP water conservation ordinance implementation activity (see Section 5.2.2.1).

5.2.2.5 Water Quality Management Plan Revision

The Riverside County MS4 program is required to update its WQMP Guidance and Templates to incorporate low impact development (LID) practices to reduce runoff from new development and significant redevelopment activities. BMP emphasis will be on infiltration, capture and use, evapotranspiration, and treatment through use of biotreatment type BMPs. Revised WQMP documents are required for submittal to the RWQCB for review by July 29, 2011.

The revised WQMP program will provide water quality benefits, but these benefits will be somewhat limited for DWFs. For example, for new development projects the water quality benefit will be restricted to wet weather runoff since the pre-project condition would not have produced any DWF. However, for significant redevelopment projects, the WQMP approval process will result in the introduction of LID practices to existing developed areas where DWF may be occurring. The presumption is that for these existing developments, stormwater management controls were not designed to today's standards and therefore some degree of runoff (e.g., from irrigation runoff) likely currently occurs under dry weather conditions. With significant redevelopment of the project site, an approved WQMP would require implementation of site design, source control, and/or structural control BMPs to address pollutants of concern by reducing runoff or treating runoff.

While water quality benefits are expected to be achieved for significant redevelopment projects, the pace at which such projects are expected to be completed in the MSAR watershed is likely to be slow given economic factors. Moreover, even if the rate of development activity increases in the near term, given the December 31, 2015 compliance date for meeting urban wasteload allocations for dry weather conditions in the dry season, the numbers of acres of redevelopment relative to the total numbers of acres where DWF likely occurs will be relatively small. However, over a much longer time horizon, e.g., 50-100 years, the cumulative benefits will be much greater.

CBRP Implementation: Revision of the WQMP Guidance is a MS4 permit requirement that will be completed by July 29, 2011. Implementation will occur after review by the RWQCB and submittal of a final WQMP Guidance, likely by 2012.

5.2.2.6 Septic System Management

The Riverside County MS4 permit requires permittees to develop an inventory of septic systems within their jurisdictions to be added to a database managed by County Environmental Health. Poorly operating septic systems can potentially lead to the discharge of pollutants to surface waters; however, the extent to which septic systems are currently a source of bacterial indicators in DWFs from the MS4 is unknown. Water quality impacts may be limited to groundwater impacts or surface water impacts that occur only during wet weather runoff events.

CBRP Implementation: CBRP implementation will include the following activities to evaluate the potential for septic systems to contribute bacterial indicators to the MS4 under dry weather conditions. Activities will include:

- *Develop a septic system inventory* – Permittees will complete necessary studies to develop an inventory of existing septic systems within their jurisdictions and provide information to County Environmental Health.

- *Evaluate potential water quality impacts* – Using the inventory, mapping the location of septic systems relative to MS4 facilities will be reviewed to evaluate the potential impact of septic systems to water quality under dry weather conditions as part of source assessment activities.

- *Conduct public education* – Educate owners regarding how to properly maintain their on-site septic systems and distribute materials explaining recommended operation and maintenance schedules. The RCFC&WCD developed a septic system management brochure in 2009.

- *Conduct inspections and initiate enforcement, where appropriate* – Where the potential for water quality impacts is identified, conduct inspections of septic systems to determine the need for mitigation. Where appropriate, conduct enforcement actions to mitigate water quality concerns associated with septic systems.

5.2.3 Element 3 - Inspection Criteria

Element 3 addresses the CBRP requirement for inclusion of specific inspection criteria to identify and manage the urban sources most likely causing exceedances of water quality objectives for indicator bacteria. This required element is incorporated into what is being termed the inspection program, which includes not only a systematic source evaluation program but also the preparation of UAAs, the completion of which will help guide the controllability assessment of the inspection program.

The inspection program envisioned for the CBRP is a systematic campaign to conduct dry weather and bacterial indicator source evaluation activities within each subwatershed draining to a watershed-wide compliance site. The foundation for this approach is defined by the USEP, prepared by the MSAR TMDL Task Force to satisfy a TMDL requirement (see Section 2.5). USEP activities are currently being implemented by the MSAR TMDL Task Force; however, under the CBRP the pace and extent of these activities will be significantly increased to eliminate or reduce controllable urban sources of DWF. Implemented in parallel with source evaluation activities will be the completion of UAAs (discussed in Section 5.2.5).

As noted above, several of the specific BMPs included in Element 2 directly support the implementation of Element 3, e.g., development of the IDDE program and implementation of water conservation BMPs. Completion of these elements will help guide implementation of the inspection program. Conversely, implementation of the inspection program may impact how or where specific BMPs are implemented or how decisions are made regarding the need for additional ordinance authority. For example, over time the inspection program may identify a particular bacterial indicator or DWF source that can be managed better by the adoption of an ordinance. The overall inspection program includes two general components:

- *Reconnaissance of MS4 nodes* – The purpose of this component is to prioritize MS4 sub-drainages for follow-up actions based on historical or newly collected flow and bacterial indicator concentration data. To accomplish this purpose, the MSAR watershed is organized into a system of Tier 1 and Tier 2 nodes, which will be inspected for DWF, bacterial indicators, and where necessary human bacterial indicator sources. Figure 5-2 illustrates this process using a flow chart format. A node may be anywhere within the MS4 facility, but generally nodes are located at major outfalls from underground storm drains to impaired receiving waters or at the confluence of an open channel with one of the impaired receiving waters (e.g., Santa Ana River Reach 3). Breaking up the MS4 into a series of nodes allows for organized source evaluation activities and establishes a means to prioritize follow-up activities to mitigate DWFs or bacterial indicators, if deemed necessary.

- *Evaluation of potential flow and bacterial indicator sources* - Where DWF is persistent and bacterial indicators are elevated, the inspection program includes an inspection strategy that focuses on identifying potential controllable sources. Figure 5-3 illustrates the components of the inspection strategy. Prior to implementing this strategy, the data from the previous component can be used to prioritize inspection activities.

The following sections describe the activities associated with each of the inspection program components in more detail.

5.2.3.1 Component 1 - Reconnaissance of MS4 Nodes

A preliminary set of nodes has been developed for the Riverside County MS4 based on a desktop GIS analysis (Figure 5-4). These preliminary nodes have been divided into two tiers to help prioritize the start of inspection program activities:

- *Tier 1 nodes* are defined as locations where DWF may directly impact an impaired waterbody. Many of these Tier 1 nodes are at the same locations sampled as part of implementation of the USEP in 2007-2008. Additional Tier 1 nodes have been added to expand the coverage provided by the USEP sites. Many of these Tier 1 locations may be dry or have minimal DWF, but until a reconnaissance is completed, their potential to contribute bacterial indicators to impaired waters is unknown.

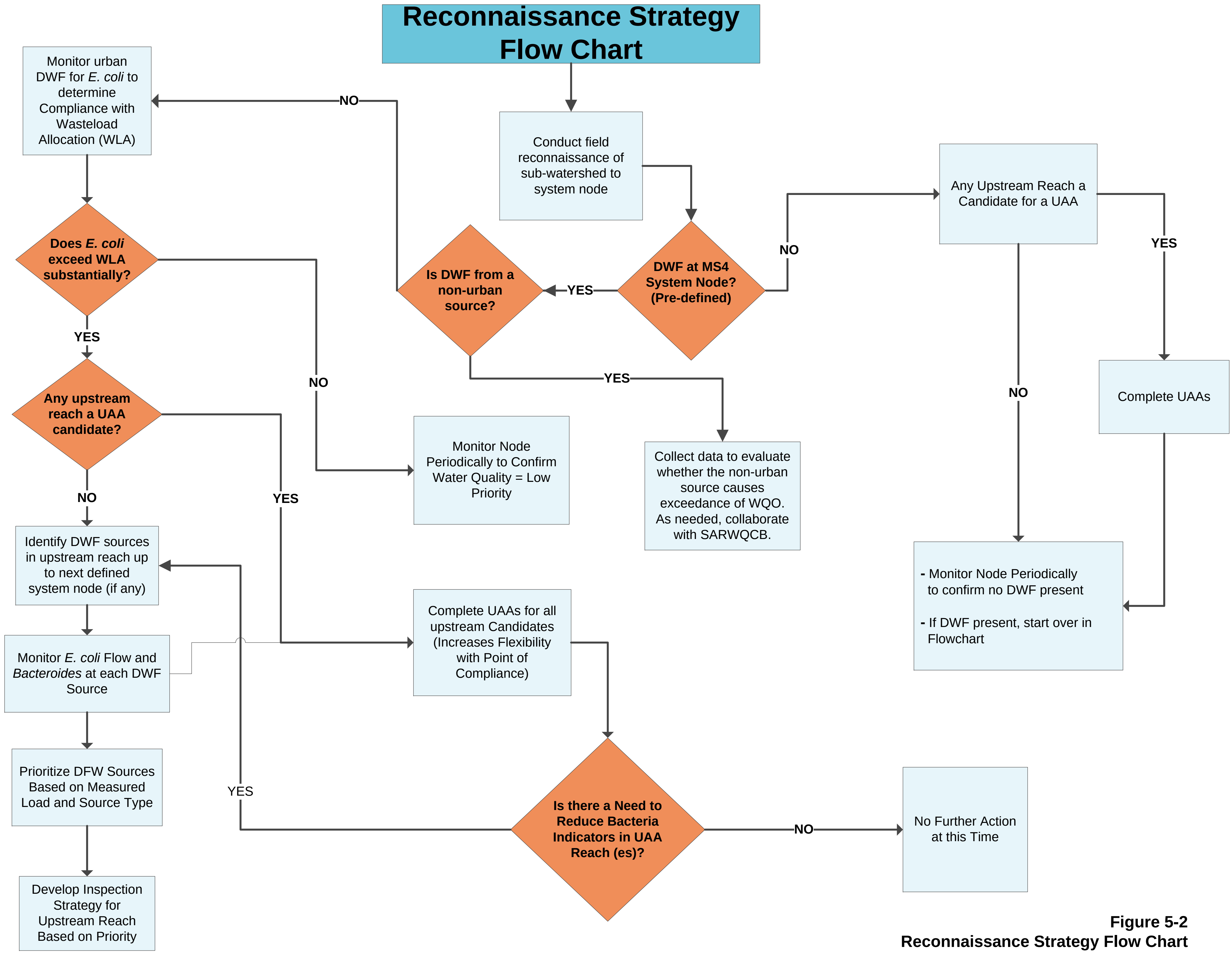


Figure 5-2
Reconnaissance Strategy Flow Chart

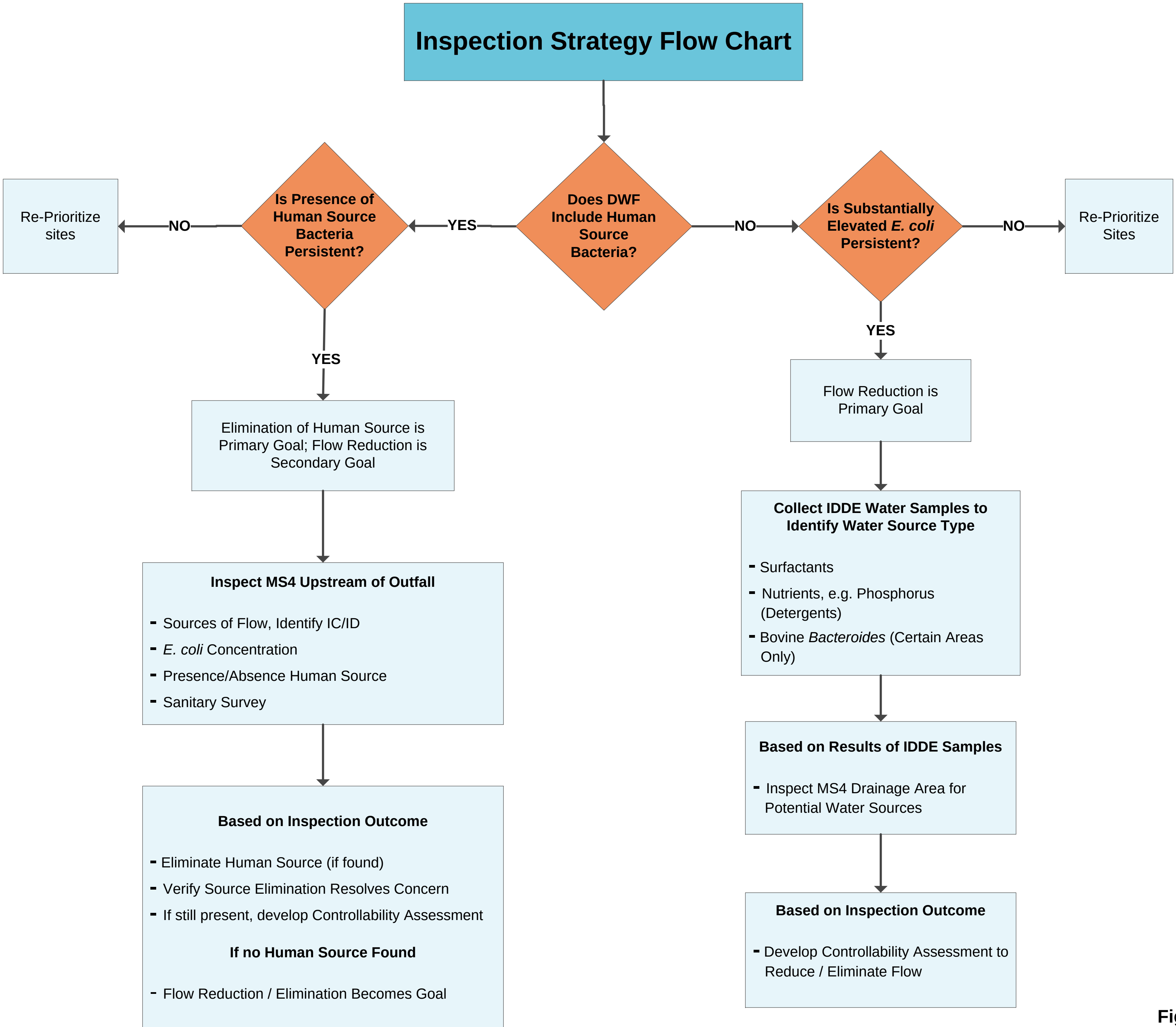


Figure 5-3
Inspection Strategy Flow Chart

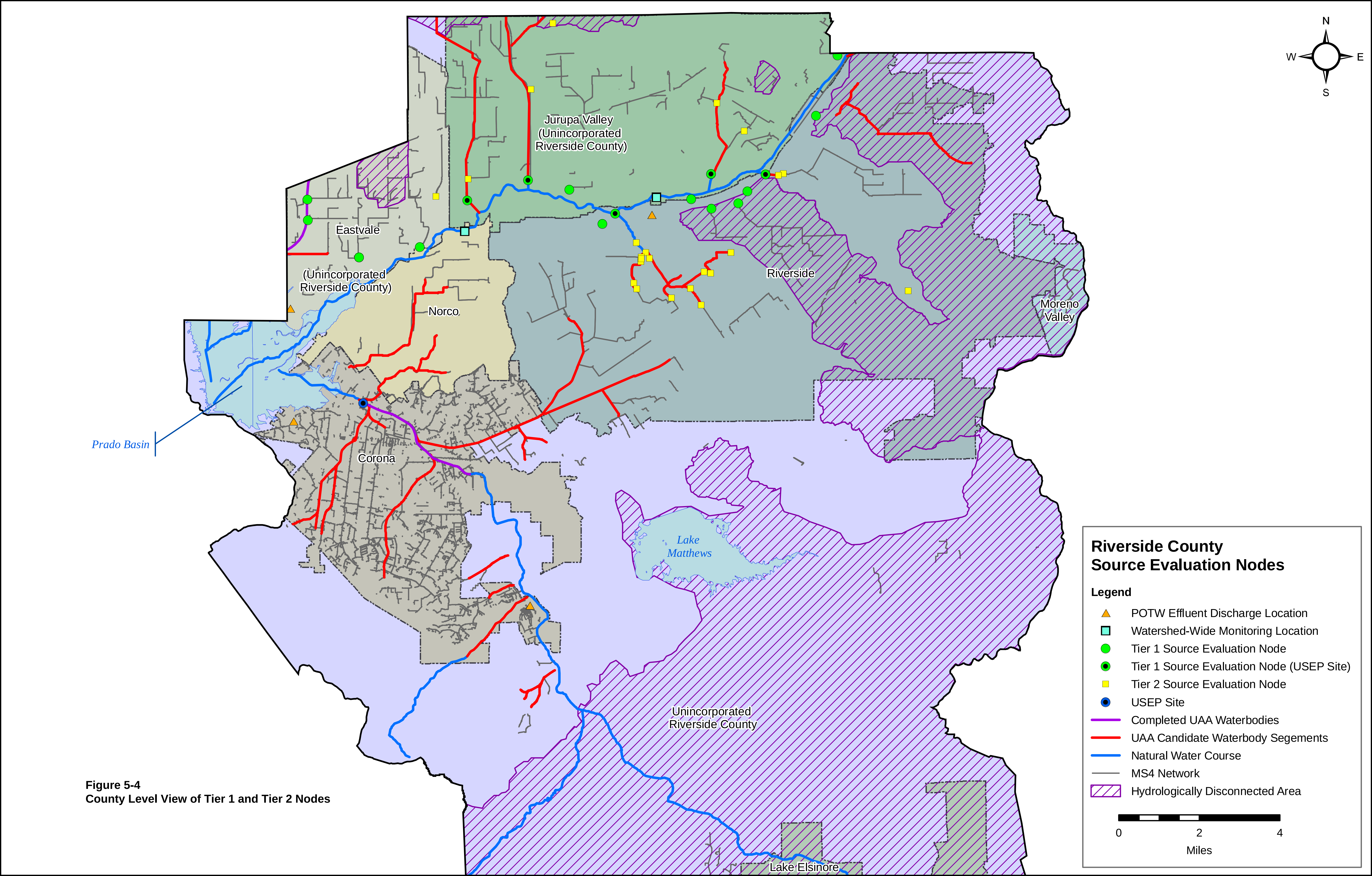


Figure 5-4
County Level View of Tier 1 and Tier 2 Nodes

- *Tier 2 nodes* are predominantly locations where underground storm drains discharge to open channels. Where a Tier 2 node is determined to be a potential contributor to non-compliance (e.g., persistent flow or elevated bacterial indicators), additional inspection activities are proposed, as described below.

Figures 5-5 through 5-7 provide a detailed view of recommended Tier 1 and Tier 2 nodes in each Riverside County jurisdiction. It should be noted that:

- No Tier 1 or 2 nodes have been included in the Temescal Creek subwatershed within the Cities of Corona and Norco (see Figure 5-5) because Temescal Creek is not listed as an impaired waterbody for bacterial indicators and the flows from this subwatershed do not drain to any watershed-wide compliance monitoring location.

- None of the recommended Tier 1 and Tier 2 nodes are located in areas that have been determined to be hydrologically disconnected from impaired waterbodies during dry weather conditions (see hatched areas in Figures 5-5 through 5-7).

Implementation of the inspection program (first component) may identify additional hydrologically disconnected areas that can be removed from further consideration for DWF or bacterial indicator reduction activities. Although hydrologically disconnected waterbodies may not need to implement an inspection program, as described below, these waterbodies should still have UAAs completed on them to ensure the appropriate recreational use and bacterial indicator water quality objectives are applied (see Section 5.2.5 for UAA discussion).

Table 5-2 summarizes the number of Tier 1 and Tier 2 sites that are recommended for inspection for each Riverside County jurisdiction. Figure 5-2, above, illustrated the evaluation that is expected to guide inspection activities at each of the MS4 nodes.

Table 5-2. Summary of recommended Tier 1 and Tier 2 nodes in each Riverside County jurisdiction

Jurisdiction	Receiving Waters	System Nodes	
		Tier 1	Tier 2
Riverside	MSAR, Anza Park Drain, Box Springs Channel, Arlington Storm Channel, La Sierra Channel, Monroe Channel	7	28
Unincorporated Riverside County	MSAR Reach 3, San Sevaine Channel, Sunnyslope Channel, Day Creek	9	4
	Total	**16**	**32**

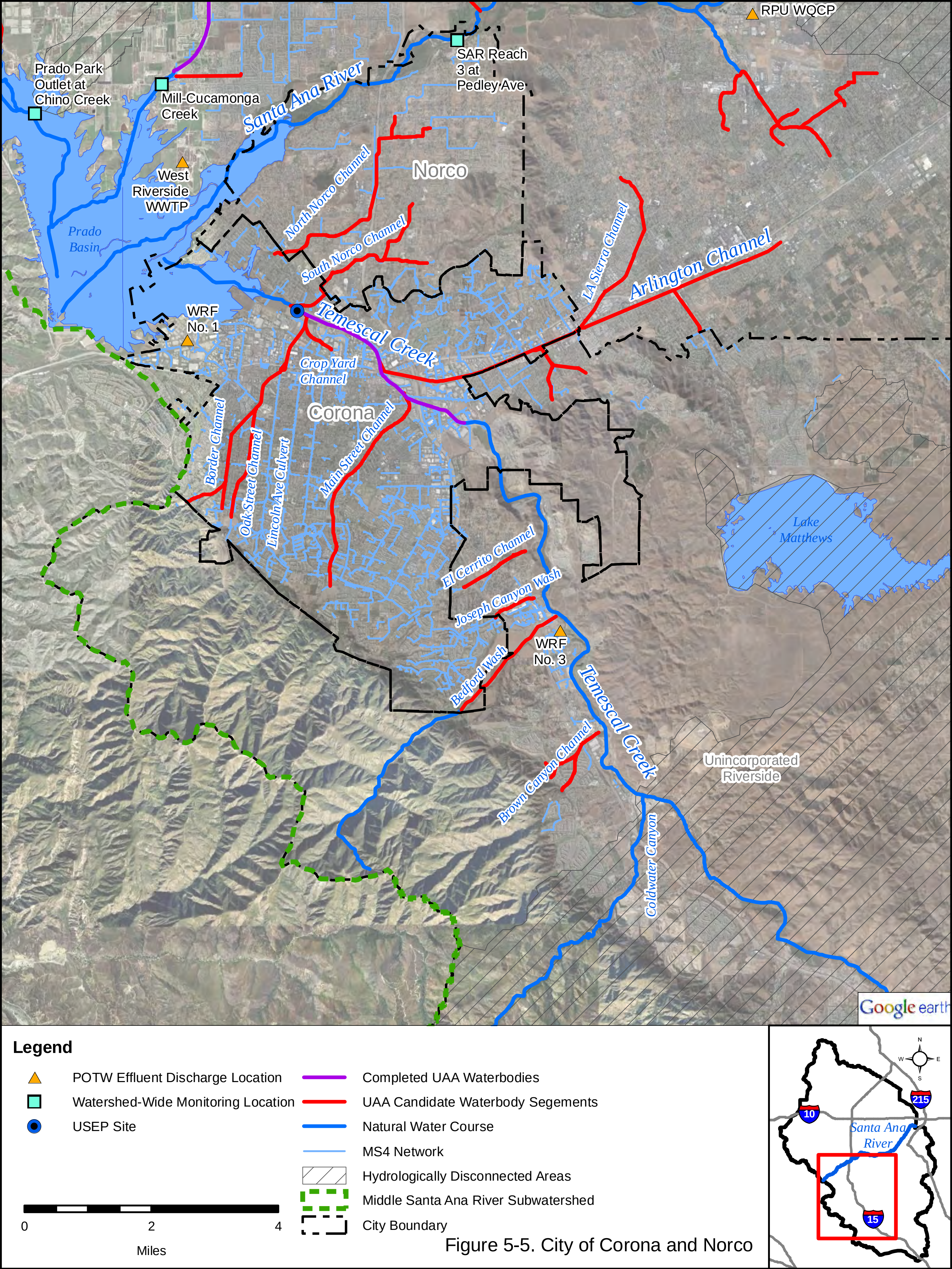


Figure 5-5. City of Corona and Norco

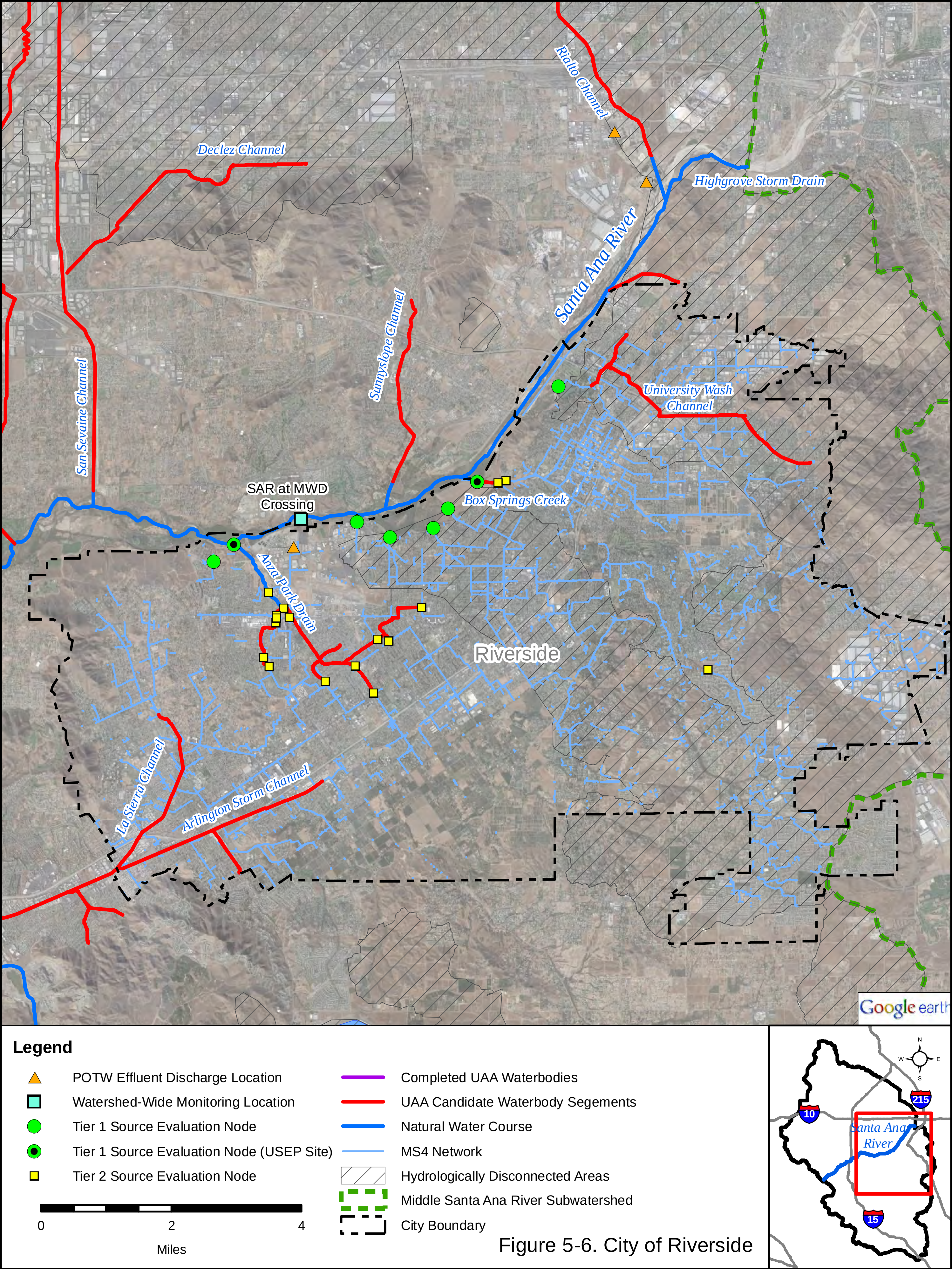


Figure 5-6. City of Riverside

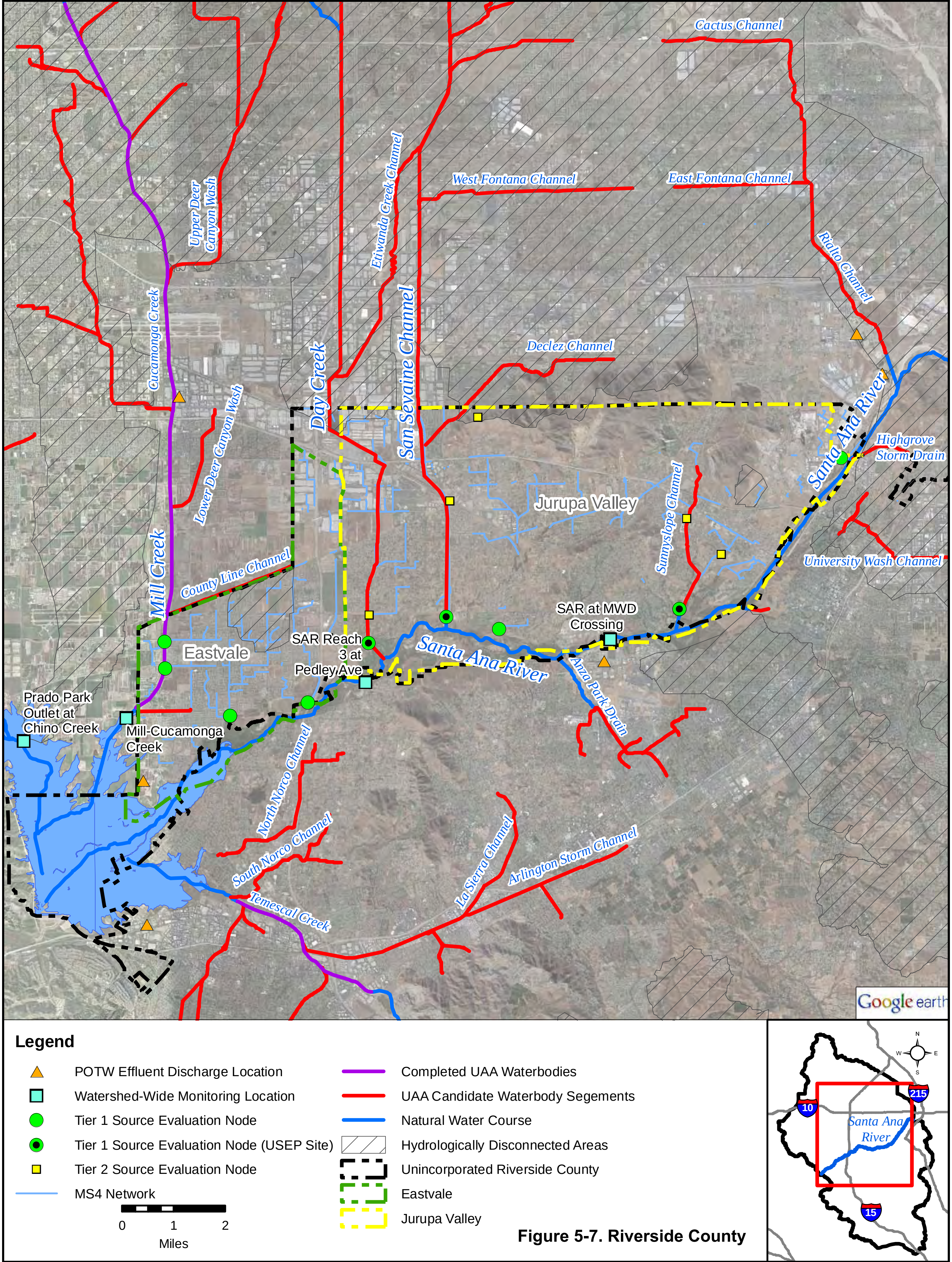


Figure 5-7. Riverside County

General descriptions and assumptions associated with initial outfall inspection activities include:

- *Presence of DWF* – Determining the presence or absence of DWF at a given MS4 node is a critical step. Routine field observation and measurement (if possible) will be conducted during dry weather at varying times of day and on different days of the week for up to one year to develop sufficient data to characterize frequency/volume of DWFs at Tier 1 MS4 nodes. Ideally, at least 10 field visits will be made over a one-year monitoring period. If the node is dry on at least 80 percent of the visits, the area upstream of the node can be assumed to have little to no impact on downstream water quality. While up to a year is recommended to collect flow data to look at seasonal variability, if a site is found to have persistent or substantial flow after only as few as three visits that occur over a short period of time, it can be presumed that the area draining to the node is a candidate for additional inspection activity to determine the source of the DWF. If a site is found to be typically dry after ten visits, then only occasional inspections would be required in the future to provide certainty that this conclusion remains correct. If a Tier 1 node indicates the need for additional inspection, then a similar level of effort may be necessary for Tier 2 system nodes tributary to the Tier 1 node.

- *Non-Urban DWF Sources* - If there are any non-urban sources of DWF to a MS4 node (such as from a well blow off, water transfer, or rising groundwater), it is important to identify the frequency and relative contribution of these flows. Generally, it is assumed that these non-urban DWF sources will have very low concentrations of bacterial indicators. However, it is possible that the physical nature of the discharge generates sufficient shear stress to mobilize bacterial indicators associated with sediment or biofilms present in the receiving water (as compared to the low shear stress generated from MS4 urban sources due to their relatively low flow rates). Elimination of the non-urban source could also result in conditions that enhance decay of bacterial indicators in channel bottom sediments or biofilms, resulting in fewer bacterial indicators available for mobilization during wet weather events. If the non-urban flow source is suspected as the cause of downstream exceedances, a site-specific study would need to be implemented to verify the assumption. The nature of such a study would be dictated by local circumstances, but could require a fairly complex sample plan. If it is determined that the non-urban source is contributing to the exceedance of bacterial indicator water quality objectives, resolution of the issue may occur independent of the MS4 permit in collaboration with the RWQCB.

- *Dry Weather Flow Water Quality* – Where flow is observed at Tier 1 and Tier 2 nodes, an evaluation of *E. coli* concentrations is necessary to determine whether the bacterial indicator load in the DWF has the potential to contribute to bacterial indicator exceedances in downstream waters. An important consideration during this evaluation is the nature of the receiving water. Several of the impaired waters are effluent-dominated, thus *E. coli* concentrations in flows upstream of a MS4 node could exceed the applicable TMDL wasteload allocation, but not cause an exceedance of a water quality objective in the receiving water. Therefore, only those nodes that substantially exceed the wasteload allocations should be prioritized for further inspection program activities. A minimum of five samples over a 30-day period will be collected at a particular node to determine its priority for additional action. If the geometric mean of the sample results exceeds the REC-1 water quality objective of 126 cfu/100 mL by at least 10 times, then the node is categorized as substantially exceeding the wasteload allocation. This value represents the 85th percentile of geometric means of *E. coli* based on data from the 2007-2008 USEP monitoring program.

- *Presence of Human Source Indicator Bacteria* – If a site is found to have elevated *E. coli* concentrations that substantially exceed the wasteload allocation, then additional water quality sampling is recommended to determine if human source bacterial indicators are present. The result of this analysis will assist with the prioritization of areas for additional source evaluations and guide the implementation of the inspection strategy on priority sites. Direct sampling for human *Bacteroides* can be proposed in lieu of *E. coli* monitoring for source assessments sites. In some cases, *Bacteroides* sampling may facilitate quicker identification and elimination of controllable urban sources of bacterial indicators.

- *UAA Candidates* – UAAs are incorporated into the inspection program, because implementation actions may be dependent upon their completion. For the purposes of this CBRP, it was assumed that completed UAAs will be approved by all required regulatory agencies. If there is no DWF at a MS4 node, but the upstream channel is a UAA candidate, then it is important to complete the UAA to ensure proper application of recreational use water quality objectives to any discharge to that upstream channel, e.g., it could eliminate the need to implement any activities to achieve wasteload allocations in upstream channels. This desired outcome includes channels which are hydrologically disconnected from downstream impaired receiving waters. For those UAA candidates that are hydrologically connected it is especially important to complete UAAs as the completed UAA facilitates moving the point of compliance, which provides more flexibility in determining where mitigation actions can or should be implemented. Additional information regarding the development of UAAs under this CBRP is provided below in Section 5.2.5.

Inherent in the inspection program described above is the need to prioritize where to start inspection activities. The approach used will be determined by the Riverside County MS4 program, but following are two potential approaches for developing a high level prioritization before collecting more specific data:

- Conduct a visual or windshield survey of the drainage areas contributing to each Tier 1 node to identify areas that are most likely to be contributing DWFs, e.g., it is possible that areas dominated by a particular land use are more likely to contribute DWFs to the MS4. Local knowledge regarding the MS4 and potential bacterial indicator hot spots can be put to good use under this approach. Based on the outcome of the survey, the Tier 1 drainages are prioritized for systematic implementation of the inspection program.

- Evaluate all Tier 1 nodes (flow and bacterial indicator concentrations) in a single phase to prioritize sub-drainages according to the bacterial indicator load estimated from each Tier 1 node. Once the sub-drainages are prioritized the drainages associated with each node are then inspected systematically beginning with the Tier 2 nodes.

5.2.3.2 Component 2 - Evaluation of Dry Weather Flow and Bacterial Indicator Sources

The second component of the inspection program focuses on the inspection strategy that will be employed to identify potential controllable sources – both DWF and bacterial indicators. This component provides the basis for determining where source reduction activities need to be carried out to achieve compliance. Figure 5-3 illustrates the decision-making process associated with the inspection strategy implemented at targeted sub-drainage areas. Two circumstances may exist:

- *DWF Includes Human Source Bacterial Indicators* - Under this circumstance, the priority is to eliminate the human bacterial indicator sources; a secondary goal is to reduce or eliminate the DWF. However, this may be unnecessary if eliminating the human source mitigates the presence of elevated levels of bacterial indicators.

  Eliminating the human bacterial indicator source involves inspecting the MS4 upstream of the outfall for sources of flow and applying IDDE program elements, as described above under CBRP Element 2 (see Section 5.2.2.2). By systematically moving upstream from the outfall along the trunk line (largest diameter pipe leading to outfall), manholes and/or catch basins are inspected and visual observations are made to isolate flow sources. A section of the trunk line may be dry, but a branch connected to the trunk line may be flowing. This systematic approach continues upstream to locate and further isolate the location of the source of flow. Additional bacterial indicator and human source bacterial indicator sampling will be conducted as needed.

  If the inspection and targeted sampling results isolate the human bacteria source, e.g., a cross-connection or illicit discharge, then appropriate action is taken to correct the problem. Additional sampling is conducted at the outfall after corrective action is complete to verify that the human bacterial indicator source is eliminated. If corrective actions have been completed but the human bacterial indicator source is still present, then inspection activities continue upstream of where the corrective action was completed to look for additional human bacterial indicator sources. If no additional sources are found, but bacterial indicators and/or human bacterial indicator sources remain present, then a controllability assessment is required to determine the next course of action (see below).

- *DWF has Elevated E. coli, but No Human Bacterial Indicator Sources* - For this situation, the primary goal is to reduce or eliminate the DWF. This may be easier than trying to mitigate non-human sources. A similar systematic approach (as described to identify human bacterial indicator sources) is applied moving upstream from the outfall along the trunk line and inspecting the MS4 network. Manholes and/or catch basins are inspected and visual observations are made to isolate flow sources. This systematic approach continues from manhole to manhole to locate and further isolate the location of the source of flow. Once the source of flows has been narrowed down, targeted sampling may be conducted to assess the type of flow source, e.g., presence of detergents (an indicator of an illicit discharge), or presence of non-human bacterial indicator sources (use of microbial source tracking analyses to determine if the bacteria sources are from birds or cows).

Based on results of implementation of the inspection strategy and targeted sampling, several outcomes are possible:

- The flow source is found to be specific, e.g., over-irrigation. Source control activities (such as targeted BMPs or enforcement if the over-irrigation is an ordinance violation) may be targeted to the area to reduce or eliminate the flow source.

- In cases where MST analyses are used, sample results may show that the bacterial indicator source may be uncontrollable (e.g., the source is birds or other animals), or the source is subject to a different jurisdiction. For example, if bovine sources are identified and the inspection strategy finds DWF entering the MS4 from agricultural areas, then this information would be turned over to the RWQCB for their action.

- The flow source is diffuse, i.e., it cannot be attributed to a specific area or cause. In these situations, a controllability assessment will be needed (see below), which may include mitigating the source through structural BMPs somewhere within the MS4 facility.

5.2.3.3 Controllability Assessment

The ultimate goal of the inspection program is to determine the controllability of DWFs or bacterial indicator sources. As described above, systematically conducting source evaluation activities in the MS4 should identify which outfalls or channels are primary contributors of DWF and elevated bacterial indicators. The controllability of flows is largely dependent on the source (specific vs. diffuse) and the controllability of bacterial indicators is largely dependent on the nature of the source, with urban sources likely to be more controllable than non-urban sources, e.g., wildlife. In many cases, it is likely that the elimination or significant reduction of the DWF will also mitigate elevated levels of bacterial indicators.

Following completion of the inspection strategy within sub-drainages, it may become necessary to complete a controllability assessment to determine next steps. This controllability assessment will consider alternatives such as:

- *Prevention (or source control)* – As noted above, if the source of the water or bacterial indicators can be specifically identified, then implementation of local control measures is the best approach for mitigating the problem. The controllability assessment consists of evaluating which BMPs or programmatic tools can be applied to the situation to reduce or eliminate the source. If a targeted solution is not available, then the controllability assessment may need to consider more costly solutions, as described below.

- *Retention Structures or Low Flow Diversions* – The implementation of relatively local structural controls to prevent the DWFs from impacting downstream waters may be an outcome of the controllability assessment. Options may range from the modification of existing retention structures to capture all DWFs to the construction of new retention facilities or construction of diversions to intercept the DWFs and conveying them to a treatment facility.

- *On-Site or Regional Treatment* – The use of on-site treatment facilities, e.g., bioretention (drainage area < 20 acres) and subsurface flow wetlands (drainage area < 1,000 acres), is largely dependent on drainage area, facility sizing criteria and land availability. The practicability of these systems will have to be considered on a site-specific and subwatershed specific basis. In many cases, implementation of a regional treatment solution such as conveying DWF to a regional storage basin requires successful completion of a UAA for upstream waters, which also provides greater flexibility where the regional treatment may be sited. The MS4 permit for Riverside County requires the completion of a system-wide evaluation to identify retrofit opportunities of existing stormwater conveyances (see additional information in Section 5.2.4, Element 4 – Regional Treatment). Development of this information coupled with the establishment of the County's Watershed Action Plan (WAP) (see Section 5.2.4) will support the preparation of controllability assessments.

5.2.3.4 Inspection Criteria Summary

Element 3 – Inspection Criteria implements the USEP to its fullest extent, building on source evaluation work already completed in the watershed. Execution of this element is the key to the success of CBRP implementation. Understanding the localized nature of DWFs and associated bacterial indicators provides the basis for determining where BMPs need to be targeted (Element 2 – Specific BMPs, Section 5.2.2), whether there is a need for additional ordinance authority (Element 1 – Ordinances, Section 5.2.1), and where regional structural controls may be necessary (Element 4 – Regional Treatment, Section 5.2.4).

5.2.4 Element 4 - Regional Treatment

Large portions of the MSAR watershed are already hydrologically disconnected from the waters impaired by bacterial indicators subject to TMDL compliance (see Figure 5-4). As a result, for the most part and with the exception of UAA development, the emphasis of CBRP implementation activities will be focused on the lower portions of the MSAR watershed in Riverside County.

In Riverside County, it is too soon to propose specific locations for new regional treatment facilities given the lack of knowledge regarding the best locations to site such facilities. Too little is known regarding urban sources of DWF and the relative bacterial indicator concentrations associated with these sources. The inspection program (Element 3, Section 5.2.3) has been designed to address this knowledge void with a key outcome of that program being controllability assessments that will lead to decisions on where to site regional treatment facilities, if they are needed. Given the December 31, 2015 dry weather condition compliance date, the inspection program will be implemented aggressively so that discussions regarding the need/siting of regional treatment facilities is occurring by 2013-2014 (see Section 7). The following sections describe the approach for implementation of this element.

5.2.4.1 Riverside County 2005 Retrofit Study

RCFC&WCD completed a BMP Siting Study for the Santa Ana MS4 permit area in 2005. This study identified candidate properties that could be retrofitted to include regional structural BMPs to capture DWF and wet weather runoff (Figure 5-8). This study screened the candidate sites to prioritize implementation of potential projects. Structural BMP retrofit opportunities identified in the BMP Siting Study could be used to provide regional treatment solutions where the inspection program determines that (1) there is a need to control DWF/bacterial indicators, and (2) a controllability assessment demonstrates the need for a regional approach.

This study will be reviewed as part of implementation of the WAP (see below) and as part of the following MS4 permit applicable to permittee-owned facilities (MS4 permit Section XIV.F):

> "Each Permittee shall examine opportunities to retrofit existing MS4 facilities with water quality protection measures, where feasible."

Information obtained as part of the inspection program coupled with the above retrofit evaluations will provide input into decisions regarding implementation of regional treatment.

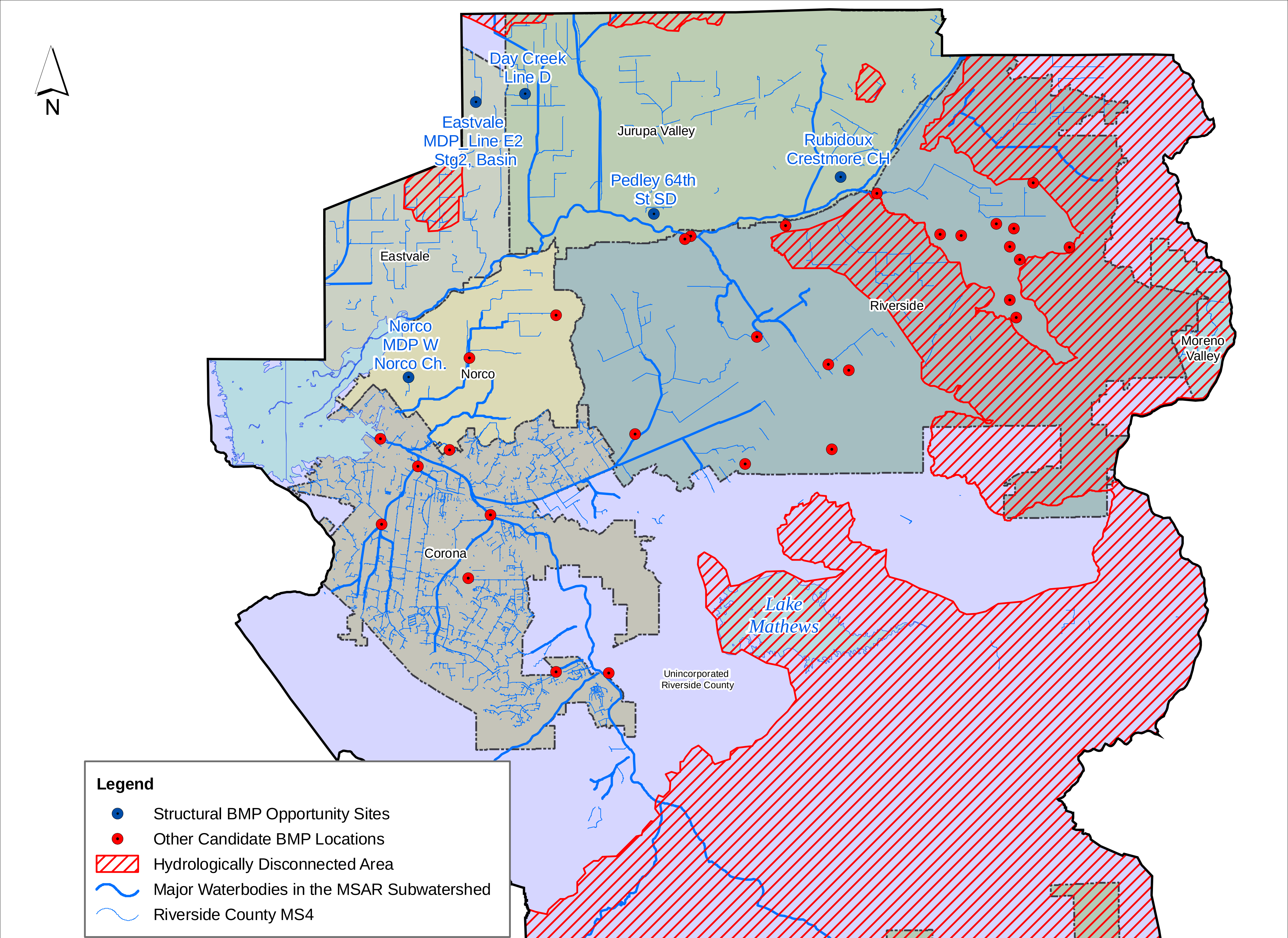


Figure 5-8. Riverside County 2005 Retrofit Study Recommendations

5.2.4.2 Riverside County Watershed Action Plan

The Riverside County MS4 permit requires the development of a WAP within three years of the permit adoption (by January 29, 2013). The WAP is to include the following (MS4 permit Section XI.B.3):

> "…develop recommendations for specific retrofit studies of MS4, parks and recreational areas that incorporate opportunities for addressing TMDL Implementation Plans, hydromodification from urban runoff and LID implementation."

As part of this requirement the 2005 BMP Siting Study (see also Section 5.2.4.1 above) will be reviewed and updated as needed. This is timely as by 2013 substantial information from the inspection program element will have been developed and the need for regional treatment solutions will be better known.

5.2.5 Use Attainability Analyses

The development of UAAs is an integral part of the implementation of the CBRP, especially Element 3 – Inspection Criteria. This section provides additional information regarding the purpose of UAAs and the approach for implementation approach under the CBRP.

5.2.5.1 Current Recreational Use Designations

All waterbodies in the MSAR watershed are presumptively classified as REC-1 protected waterbodies. This means that all waterbodies in the watershed must meet the REC-1 water quality objectives regardless of their characteristics and ability to support REC-1 type activity (see Section 1.2). The REC-1 presumption may be inappropriate for a number of reasons including channel physical attributes (see Section 3.3) and flow volume. To establish more appropriate recreational uses that recognize these factors, a UAA is required. As defined by the Basin Plan, the purpose of a UAA is "to evaluate the physical, biological, chemical, and hydrological conditions of a river to determine what specific beneficial uses the waterbody can support." For a UAA to be implemented it must receive regulatory approval, from the RWQCB, State Board and EPA Region 9.

The outcome of a UAA could be removal of either the REC-1 use or removal of both REC-1 and REC-2 uses. Either outcome would substantially change the basis for determining compliance with water quality objectives and compliance with bacterial indicator TMDL wasteload allocations. For example, if the waterbody is not designated REC-1, then the applicable bacterial indicator water quality objectives are much less stringent than would be the case if the REC-1 use was applicable. These changes could greatly reduce the number of locations where implementation of water quality control activities is necessary to achieve compliance. Modification of recreational uses would also provide additional flexibility for deciding *where* implementation of a water quality control measure is needed. For example, if a regional treatment facility is needed to meet compliance at a downstream site, the number of potential locations where that facility can be sited is increased.

5.2.5.2 Recreational Use Basin Plan Amendment

Section 1.2.2 described ongoing work by the RWQCB to adopt a Basin Plan amendment to modify recreational uses and associated water quality objectives. The RWQCB is developing this Basin Plan revision in collaboration with the SWQSTF. Adoption of the Basin Plan Amendment, planned for Spring 2011, will include the establishment of a UAA for the following Riverside County waterbodies:

- *Temescal Creek* – Reach 1, Lincoln Avenue to the 91 Freeway; remove REC-1 use.
- *Temescal Creek* – Reach 2, 91 Freeway to 1400 feet upstream of Magnolia Street; remove REC-1 and REC-2 uses.

5.2.5.3 UAA Template

The Temescal Creek UAAs will be used as the template for all future UAAs developed in Riverside County. These UAAs will include the following key sections:

- *Waterbody Description*, including candidate reach coordinates and channel characterization;
- *Eligibility Analysis*, including existing and probable future recreational use based on water quality data and known recreational use activity; and
- *UAA Factor Evaluation*, which provides the justification for modifying recreational uses based on federal and state regulatory requirements.
- The recreational use survey database developed by the SWQSTF will be used to support development of UAAs. This database was developed using remote camera technology coupled with occasional site visits to document area recreational activity at 17 locations in the Santa Ana River watershed (Table 5-3). Eight of these sites are located in the MSAR watershed; several are in Riverside County.

Table 5-3. Summary of recreational use surveys completed by SWQSTF in the Santa Ana River watershed

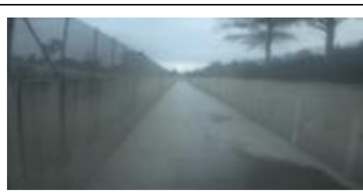
Representative Photo of Site	Summary of Recreational Use Survey
	**Greenville Banning Channel at Adams Avenue Bridge** ■ Concrete lined, vertical walled channel ■ Land use: Residential and open space ■ Period of Survey: 11/17/05 – 1/3/06 ■ Images collected: 2552 ■ Water contact recreational use events: 0
	**Greenville Banning Channel at Pedestrian Bridge** ■ Concrete lined, vertical walled channel ■ Land use: Residential and vacant natural land ■ Period of Survey: 7/7/2005 – 7/27/2005 ■ Images Collected: 45 ■ Water contact recreational use events: 0
	**Santa Ana Delhi Channel at Mesa Ave** ■ Concrete lined, vertical walled channel ■ Land use: Residential / open space and recreation ■ Period of Survey 6/20/2005 – 7/13/2006 ■ Images Collected: 21,284 ■ Water contact recreational use events: 0
	**Cucamonga Creek at RP1** ■ Concrete lined, vertical walled channel ■ Land use: Industrial/commercial and open space/recreation ■ Period of Survey 10/2/2007 – 10/10/2008 ■ Images Collected: 27,122 ■ Water contact recreational use events: 0
	**Anza Channel at John Bryant Park** ■ Concrete lined, vertical walled channel ■ Land use: Residential and open space/ public park ■ Period of Survey 6/6/2008 – 9/29/2009 ■ Images Collected: 20,386 ■ Water contact recreational use events: 2
	**Demens Channel** ■ Concrete lined, vertical walled channel ■ Land use: Residential and open space ■ Period of Survey 2/1/2008 – 2/9/2009 ■ Images Collected: 21,382 ■ Water contact recreational use events: 0
	**Cucamonga Creek at Hellman Ave (Upstream)** ■ Trapezoidal channel, concreted lined wall and bottom ■ Land use: Agriculture ■ Period of Survey 11/1/2005 – 11/1/2006 ■ Images Collected: 2,546 ■ Water contact recreational use events: 0

Table 5-3. Summary of recreational use surveys completed by SWQSTF in the Santa Ana River watershed

Representative Photo of Site	Summary of Recreational Use Survey
	**Temescal at Main Street** ■ Trapezoidal channel, concreted lined wall and bottom ■ Land use: Industrial / Commercial ■ Period of Survey 7/26/2005 – 8/4/2005 ■ Images Collected: 513 ■ Water contact recreational use events: 1
	**Temescal at City of Corona WWTP No. 2** ■ Trapezoidal channel, concreted lined wall and bottom ■ Land use: Industrial / Commercial ■ Period of Survey 11/1/2005 – 11/1/2006 ■ Images Collected: 10,653 ■ Water contact recreational use events: 1
	**Santa Ana Delhi Channel at Sunflower Ave** ■ Trapezoidal channel, rip rap side slopes, natural bottom ■ Land use: Commercial/ residential/ school ■ Period of Survey 7/7/2005 – 7/9/2006 ■ Images Collected: 20,978 ■ Water contact recreational use events: 1
	**Cucamonga Creek at Hellman Ave (Downstream)** ■ Trapezoidal channel, rip rap side slopes, natural bottom ■ Land use: Agriculture ■ Period of Survey 7/26/2005 – 11/1/2006 ■ Images Collected: 16,678 ■ Water contact recreational use events: 8
	**Perris Valley Channel at Moreno Valley WRF** ■ Trapezoidal channel / concrete lined side slope and concrete/natural bottom ■ Land use: Industrial/ Residential/school and open space/public park ■ Period of Survey 10/3/2007 – 10/10/2008 ■ Images Collected: 21,962 ■ Water contact recreational use events: 0
	**SAR at Anaheim** ■ Trapezoidal channel, rip rap side slopes, natural bottom ■ Land use: Industrial/ commercial and open space/public park ■ Period of Survey 10/2/2007 – 10/5/2008 ■ Images Collected: 25,904 ■ Water contact recreational use events: 0

Table 5-3. Summary of recreational use surveys completed by SWQSTF in the Santa Ana River watershed

Representative Photo of Site	Summary of Recreational Use Survey
	**Chino Creek at Central Ave** ■ Trapezoidal channel / rip rap slope and bottom ■ Land use: Industrial / commercial ■ Period of Survey 12/19/2007 – 5/23/2009 ■ Images Collected: 23,913 ■ Water contact recreational use events: 10
	**San Diego Creek at Irvine** ■ Trapezoidal channel / natural side slopes and bottom ■ Land use: Residential/commercial/school and open space ■ Period of Survey 6/10/2008 – 9/30/2009 ■ Images Collected: 24,801 ■ Water contact recreational use events: 4
	**Santa Ana Delhi Channel at Newport Bay** ■ Natural Channel ■ Land use: Open space / commercial ■ Period of Survey 6/20/2005 – 6/6/2006 ■ Images Collected: 20,203 ■ Water contact recreational use events: 2
	**SAR at Yorba Linda** ■ Natural Channel ■ Land use: Residential / open space ■ Period of Survey 4/11/2006 – 4/6/2007 ■ Images Collected: 12,645 ■ Water contact recreational use events: 0

With the exception of recreational use activity data, which is part of the eligibility analysis, most of the information required for each of the UAA sections is relatively simple to compile. It is expected that the existing large recreational use survey image dataset will provide a basis for predicting the level of recreational use activity in unsurveyed waterbodies based on similarities in waterbody characteristics. As a result, for some future UAAs it may not be necessary to collect additional recreational use survey data. However, if unusual site-specific conditions exist, e.g., in areas where a waterbody is within a residential area or near a school and access to the channel is not restricted, there may be some concern with relying solely on the recreational use survey image database to document the existing or potential for recreational use activities in the waterbody. In these situations, it is understood that the RWQCB may require the collection of site-specific use survey data.

The RWQCB's decision to approve a UAA and modify recreational uses is largely based on an evaluation of the potential risk of human exposure to bacterial indicators in a particular waterbody. The potential risk is related to the characteristics of the waterbody and the likelihood of water contact recreational activities occurring given those characteristics. For example, where water contact recreation is likely to occur, such as a natural waterbody with sufficient flow, the risk of exposure is higher than where such recreation is unlikely, e.g. in a vertical-walled concrete-lined engineered channel.

Results from SWQSTF surveys, which are now stored in the recreational use survey image database (currently available at SAWPA), show that channel characteristics are a strong indicator of existing and potential recreational use activity in the Santa Ana River watershed (however, ultimately it is up to the RWQCB to determine applicable uses):

- *Vertical-walled, Concrete-lined Channels* - Based on over 93,000 images collected from all seasons and different areas of the Santa Ana River watershed, no water contact recreation has been observed in vertical-walled channels. Accordingly, no exposure risk has been identified and a UAA could result in the removal of both REC-1 and REC-2 uses.

- *Trapezoidal-walled, Concrete-lined bottom Channels* - Based on over 35,000 images collected from all seasons and different areas of the watershed, only one contact with water was observed – a person kneeling at the edge of a low flow channel contacted the water on two occasions for a period of less than 30 minutes. In these situations, a UAA could result in the removal of the REC-1 use.

- *Trapezoidal-walled, Natural bottom Channels* – Based on over 113,000 images, only a few images (23) showed some type of contact with the water, but limited to shallow wading, e.g., Chino Creek at Central Avenue where 10 observations occurred. The outcome of the UAA in these situations is unclear and site-specific recreational use survey may need to be collected.

- *Natural Stream Channels* – Three natural or somewhat natural stream channels have been surveyed (Santa Ana Delhi Channel at Newport Bay and Reach 2 of the Santa Ana River at Yorba Linda and Anaheim). Based on over 32,000 images, only two observations of contact with the water were observed and these occurrences were limited to hand/water contact at the Santa Ana Delhi Channel at Newport Bay site.

5.2.5.4 UAA Candidate Segments

Figure 5-9 provides an overview of where UAAs have been completed in the MSAR watershed or where they are recommended for future development (see also Figures 5-5 through 5-7). Table 5-4 summarizes the UAAs recommended for development within each drainage area and jurisdiction in Riverside County. These recommendations are based on the channel characteristics and UAA findings already completed by the SWQSTF.

5.2.5.5 UAA Development Process

RWQCB staff will be consulted prior to initiating development of UAAs. In addition (but subject to confirmation), it is expected that that RWQCB would prefer that UAAs be submitted as packages (i.e., multiple UAAs submitted for approval as one Basin Plan amendment) rather than as individual UAAs, which would require multiple Basin Plan amendments and multiple approval processes. With these considerations in mind, the following process will be implemented as part of the CBRP:

- Conduct meeting with RWQCB to obtain agreement on the following:
  - Identify groups of UAAs to be submitted as one Basin Plan Amendment;
  - Determine minimum water quality data requirements;
  - Determine whether any additional recreational survey data collection is required; and
  - Agree on UAA structure and content, i.e., is the existing UAA template adequate or are there any site-specific issues that need to be addressed.
- Collect any necessary data (time period could range from a few weeks or months to a year if substantial recreational use survey data is required).
- Submit draft UAA to the RWQCB for review and comment. Draft UAA will be in the same format as the existing Temescal Creek UAA.
- Prepare revised UAA to the RWQCB for adoption as a Basin Plan amendment.

5.3 Waterbody-Specific Plans – Temescal Creek

Temescal Creek and its tributaries are not listed by the RWQCB as impaired for bacterial indicators. The most immediate downstream waterbody, Prado Flood Control Basin (listed as an inland wetland in the Basin Plan), into which Temescal Creek flows, is also not listed as impaired. Additional findings include:

- No evidence exists that the downstream Prado Flood Control Basin is impaired for bacterial indicators;
- USEP data collected in 2007-2008 at the Temescal Lincoln Avenue site showed that *E. coli* bacterial indicator concentrations are variable, but with a median concentration that was among the lowest of all USEP sites sampled (see Section 3.4.2);
- Ranking of USEP sites for follow-up source evaluation activities, which included MST findings, resulted in a low ranking for Temescal Creek (see Section 3.4.2);
- Much of the Temescal Creek subwatershed is hydrologically disconnected from downstream waters (see Figure 5-5);

- The most downstream segments of Temescal Creek within the MS4 permit area are in the process of have recreational uses reclassified (see Sections 1.2.2 and 5.2.5.2);
- Additional Temescal Creek segments will have UAAs prepared under this CBRP (see Figure 5-5).

Given these findings, the need for implementation of CBRP activities in the Temescal Creek subwatershed will be limited to Elements 1 (Ordinances), 2 (Specific-BMPs), the UAA-related activities in Element 3 (see above and Section 6), and participation in the WAP and BMP retrofit studies, as described under Element 4 (see above).

Table 5-4. UAA candidate waterbodies in Riverside County

Primary Jurisdiction of Waterbody	UAA Candidate Waterbody	Waterbody Length (miles)
Corona	Border Channel	1.05
	Corp Yard Channel	0.54
	Lincoln Ave Channel	1.93
	Mabey Canyon Channel	0.69
	Main Street Channel	3.63
	Mangular Channel	0.71
	Norco Channel	1.04
	Oak Street Channel	3.75
Norco	North Norco Channel	4.29
	South Norco Channel	2.75
Riverside	Anza Park Drain	5.47
	Arizona Channel	0.92
	Arlington Storm Channel	6.89
	Box Springs Creek	0.33
	La Sierra Channel	3.02
	University Wash Channel	5.41
Unincorporated Riverside County	Bedford Wash	2.14
	Brown Canyon Channel	2.00
	Chandler Street Channel	1.04
	Day Creek[1]	15.43
	El Cerrito Channel	1.20
	Highgrove Storm Drain	1.14
	Home Gardens	1.61
	Joseph Canyon Wash	0.78
	Sunnyslope Channel	3.04
	Declez Channel[1]	4.75
	San Sevaine Channel[1]	17.62

[1] - Upper portions located in San Bernardino County

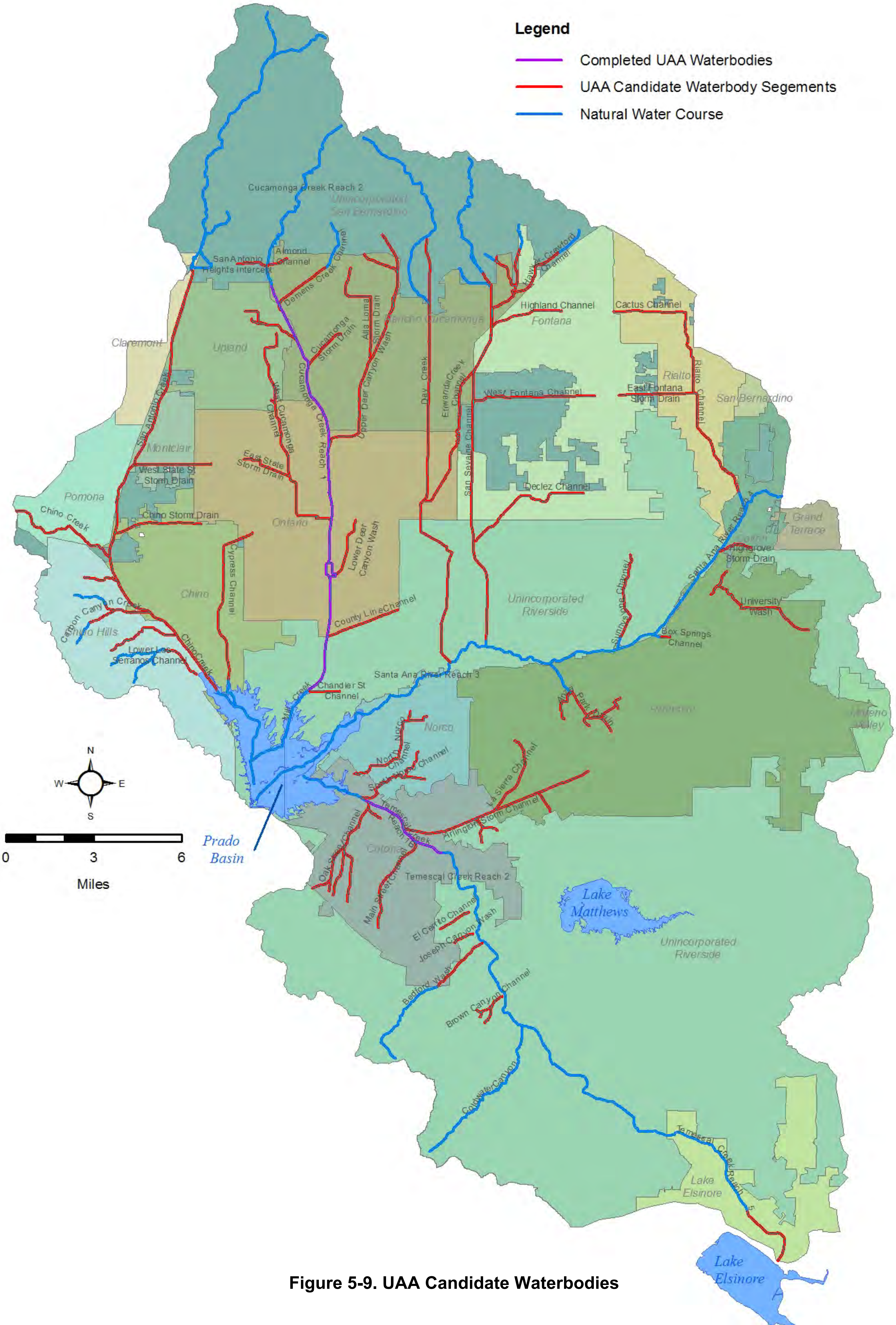


Figure 5-9. UAA Candidate Waterbodies

Section 6
Compliance Analysis

6.1 Introduction

The MS4 permit requires that the CBRP provide the scientific and technical documentation used to conclude that the CBRP, once fully implemented, is expected to achieve compliance with the urban wasteload allocation for indicator bacteria by December 31, 2015 (MS4 permit Section VI.D.1.c.i.(5)). Compliance targets or wasteload allocations were developed for both fecal coliform and *E. coli* bacterial indicators:

- Fecal coliform: 5-sample/30-day Logarithmic Mean less than 180 organisms/ 100 mL and not more than 10 percent of the samples exceed 360 organisms/100 mL for any 30-day period.

- *E. coli*: 5-sample/30-day Logarithmic Mean less than 113 organisms/100 mL and not more than 10 percent of the samples exceed 212 organisms/100 mL for any 30-day period.

This analysis used the 5-sample/30-day Logarithmic Mean for *E. coli* of 113 cfu/100 mL to demonstrate that this plan, once implemented, is expected to achieve compliance with the urban wasteload allocation. This concentration-based wasteload allocation for MS4 permittees is a target for all urban sources of flow; however, it would be nearly impossible to monitor bacteria at all MS4 outfalls. Consequently, compliance with the bacterial indicator TMDL is assessed at five watershed-wide compliance monitoring locations. No analysis was done for the Prado Park Lake compliance location as there currently are no known MS4 facilities discharging DWF to the lake. This presumption will be verified during CBRP implementation.

Several key questions were addressed in order to complete this analysis, including:

- What is the relative contribution of urban DWF from MS4 outfalls to receiving waterbodies? This contribution determines the volume of DWF that is potentially controllable by the MS4 program. See Section 6.2.1.

- What are typical levels of *E. coli* in urban runoff during dry weather conditions? Applying a concentration to urban DWF volumes facilitates the computation of the total daily amount of bacterial indicators (cfu/day) that is potentially controllable by the MS4 program. See Section 6.2.2.

- How is compliance with the wasteload allocation for MS4 permittees best demonstrated? See Section 6.3.

- To what level must *E. coli* (cfu/day) from urban sources of DWF from MS4 permittees be reduced to demonstrate compliance? This question assesses current bacterial indicator levels at the compliance monitoring locations in relation to the wasteload allocation in the TMDL. Only the portion of the baseline bacteria in excess of the TMDL wasteload allocation that are controllable by implementing BMPs within MS4 systems is targeted for bacteria indicator reduction by MS4 permittees. Section 6.4 computes this daily bacterial indicator level targeted for removal through CBRP implementation. Other sources of bacteria to downstream compliance monitoring sites, such as agricultural land uses, illegal discharges, transient encampments, wildlife, or environmental growth, are not well understood. The Inspection Program is designed to provide information to assist the permittees in developing an approach to manage these sources, determined to be uncontrollable within MS4 systems.

- How do the proposed CBRP elements achieve the targeted daily *E. coli* (cfu/day) removal? Section 6.5 discusses the water quality benefits (quantifiable and non-quantifiable) expected from CBRP implementation.
- Section 6.6 summarizes the findings of this compliance analysis and discusses key assumptions and uncertainties associated with computation.

6.2 Baseline Dry Weather Flow and Bacterial Indicator Data

6.2.1 DWF Sources to MS4

Regular DWF exist in many MSAR waterbodies. Sources of DWF include:

- Effluent from publicly owned treatment works (POTWs)
- Turnouts of imported water by MWD
- Well blow-offs
- Water transfers
- Groundwater inputs
- Other authorized discharges (as defined by permit)
- Non-permitted discharges

Each of these sources of DWF has a different pathway and potential to transport bacterial indicators to receiving waterbodies. Thus, it is important to understand the relative role of each of these categories of DWF. Section 3.2 provided an overview of dry weather hydrology in the MSAR watershed. This information provides a basis for the compliance analysis described in this section of the CBRP.

Flow and bacterial indicator level data are available from several sources for all of the compliance monitoring locations and most of the major tributaries to the impaired receiving waterbodies. Table 6-1 provides a summary of the sources of data used to characterize flow and bacterial indicator water quality in the MSAR Bacterial Indicator TMDL waterbodies and their tributaries.

Within the MSAR watershed there are many MS4 drainage areas that do not typically cause or contribute to flow at the compliance monitoring locations. DWF at these MS4 outfalls is hydrologically disconnected from the TMDL receiving waterbodies, by either purposefully recharging groundwater in constructed regional retention facilities or through losses in earthen channel bottoms, where the recharge capacity of underlying soils exceeds dry weather runoff generated in upstream drainage areas.

Table 6-1. Available data for characterization of DWF and bacterial indicators in areas draining to watershed-wide compliance sites

Site	Flow	Bacterial Indicator Concentration
Downstream: Chino Creek at Central Ave (WW-C7)	Watershed-wide field measurements 2007-2009 (n=82)	Watershed-wide compliance monitoring 2007-2009 (n=82)
POTW Influent	Daily effluent at IEUA Carbon Canyon WRRF (2007 - 2008)	Assumed effluent of 2.2 MPN/100 mL
Carbon Canyon Creek Channel	SBCFCD Little Chino Creek gauge 2843 (2007-2008)	USEP samples (n=19)
Chino Creek above Schaeffer	U.S. Geological Survey (USGS) Gauge 11073360 (2005-2009)	USEP samples at San Antonio Channel (n=19)
Downstream: Mill Creek at Chino Corona Rd (WW-M5)	USGS Gauge at Merrill Ave 11073495 (2005-2009)	Watershed-wide compliance monitoring at Chino-Corona Road 2007-2009 (n=80)
POTW Influent	Daily effluent at outfall 001 of IEUA RP1 WRRF (2007 - 2008)	Assumed effluent of 2.2 MPN/100 mL
Lower Deer Creek (CHRIS)	USEP field measurements samples at CHRIS (n=17)	USEP samples at CHRIS (n=17)
County Line Channel (CLCH)	USEP field measurements samples at CLCH (n=16)	USEP samples at CLCH (n=7)
Cucamonga Creek (CUC) above IEUA RP1 WRRF	USEP field measurements at CUC (n=16)	USEP samples at CUC (n=16)
Downstream: Santa Ana River at MWD Crossing (WW-S1)	USGS Gauge at MWD Crossing 11066460 (2005-2009)	Watershed-wide compliance monitoring at MWD Crossing 2007-2009 (n=82)
POTW Influent	Daily effluent from RIX Facility and Rialto WWTP (2007 - 2008)	Assumed effluent of 2.2 MPN/100 mL
Sunnyslope Channel (SNCH)	USEP field measurements at SNCH (n=17)	USEP samples at SNCH (n=17)
Box Spring Channel (BXSP)	USEP field measurements at BXSP (n=17)	USEP samples at BXSP (n=17)
Downstream: Santa Ana River at Pedley Ave (WW-S4)	Sum of POTW effluent and estimated dry weather runoff from ANZA, DAY, and SSCH	Watershed-wide compliance monitoring at Pedley Ave 2007-2009 (n=82)
POTW Influent	Daily effluent from RIX Facility, Rialto WWTP, and Riverside WQCP (2007 - 2008)	Assumed effluent of 2.2 MPN/100 mL
Anza Drain (ANZA)	USEP field measurements at ANZA (n=14)	USEP samples at ANZA (n=18)
Day Creek (DAY)	USEP field measurements at DAY (n=13)	USEP samples at ANZA (n=13)
San Sevaine Channel (SSCH)	USEP field measurements at SSCH (n=13)	USEP samples at ANZA (n=13)

Flow data from these sources characterize the role of DWF from major tributaries and POTW effluent to baseline flow at the compliance monitoring locations. For each of the compliance monitoring locations, column 2 in Table 6-2 shows the median of DWF measurements from upstream USEP sites (major tributaries) and POTW effluent locations in the dry season. Typical DWF at each of the compliance monitoring locations is also shown in column 2 of Table 6-3. These values are determined by summing inputs from USEP subwatersheds and effluent from upstream POTWs. This approach ensures a balance of runoff between inflows and outflows. The downstream flow estimates fell within expected ranges based on long-term daily data collected at USGS gauging stations in the MSAR watershed. As expected, DWF at each of the compliance monitoring locations consists primarily of POTW effluent (Figure 6-1).

Flow data was not available downstream of some portions of MS4 drainage areas; therefore it was necessary to approximate DWF from these areas to complete a water balance for each compliance monitoring location. However, such estimates are confounded by infiltration and rising groundwater conditions in the MSAR watershed. Within the Chino Basin portion of the MSAR watershed, IEUA measures flow at a number of locations to quantify groundwater recharge for water supply benefit. For Riverside County MS4 drainage areas, this monitoring data is the geographically closest characterization of its type. Flow measurements, on days when DWF is predominantly from urban sources, suggest that DWF from urban sources occur at a rate of 100 gal/acre/day in the MSAR watershed, ranging from 20 to 280 gal/acre/day (see Table 3-2 for summary of field measured flows). This is consistent with DWF generation rates developed to support the City of Los Angeles Integrated Resources Plan (2004), which estimated DWF rates from urban watersheds ranging from zero to 300 gallons/acre/day. Thus, it was reasonable to use a rate of 100 gal/acre/day to approximate urban sources of DWF from "other MS4 areas" that may be hydrologically connected to a TMDL waterbody (Table 6-2).

The USEP flow measurements indicated that some tributaries have significantly greater DWF rates per acre of urbanized drainage area (column 3 of Table 6-2) than would be expected solely from urban sources. In these cases, the presence of a non-urban source was determined to be responsible for the elevated DWF rates. Assuming flow in excess of 100 gal/acre/day is from non-urban sources, Column 4 of Table 6-2 shows the portion of DWF that would be attributed to urban sources. At a few locations, field measured runoff was less than 100 gal/acre/day; therefore it was assumed that non-urban sources in these subwatersheds are negligible. Figure 6-1 shows the relative split between urban and non-urban sources of DWF within each of the compliance monitoring watersheds.

Overall, the contribution of runoff during dry weather from urban sources relative to total downstream flow is very small in all of the TMDL waterbodies. This finding suggests that *E. coli* in the runoff from urban sources could be very high, assuming non-urban flows (potable water transfers, groundwater, etc.) and POTW effluent are largely free of fecal indicator bacteria. Alternatively, wildlife, environmental growth, recreational uses of receiving waters, or other sources are significant contributors to impairments at TMDL waterbodies.

6.2.2 Bacteria Concentrations

Section 3.4 summarized the bacterial indicator concentrations observed at watershed-wide compliance sites since 2007 and the concentrations observed during the USEP monitoring program implemented in 2007-2008. These data were used to provide baseline data for this compliance analysis.

The geometric mean of all dry weather *E. coli* concentrations measured at the watershed-wide compliance locations is shown in column 5 of Table 6-3. Geometric means of dry weather *E. coli* concentrations at each USEP site provide an estimate of baseline bacterial indicator levels from the major subwatersheds draining to each watershed-wide compliance site (column 5 of Table 6-3). These values show a wide range of observed *E. coli* concentrations, which suggests that targeted inspection and BMP implementation, would be an effective approach for mitigating controllable bacterial indicator sources.

Bacterial indicator data was not available downstream of some portions of MS4 drainage areas; therefore it was necessary to approximate *E. coli* concentrations from these areas to develop a compliance analysis for the entire MSAR watershed. For purposes of this compliance analysis, the geometric mean of all dry weather *E. coli* monitoring data from the USEP study of 476 cfu/100 mL provides an initial estimate of bacterial indicator levels from drainage areas that have no available data. Monitoring of bacterial indicators downstream of these areas is a key component of the CBRP, and results should be used to update this compliance analysis once available.

Table 6-2. Baseline DWF and bacterial indicator concentrations in areas that drain to watershed-wide TMDL compliance monitoring sites

Site	1 Hydrologically Connected Area (Acres)	2 Dry Weather Flow (cfs)	3 Total Dry Weather Flow Generation (gal/acre/day)	4 Percent of Dry Weather Flow from Urban Sources[1]	5 Dry Weather Geometric Mean of *E. coli* (cfu/100 mL)	6 Dry Weather *E. coli* (cfu/day)
SAR at MWD Crossing	14,832	75.6			149	276
POTW Influent	n/a	68.7	n/a	n/a	2	4
Sunnyslope Channel	2,217	2.9	844	12%	183	13
Box Springs Channel	4,421	3.3	487	21%	1,686	137
Other MS4 Areas	5,887	0.9	100	100%	476 [3]	8
					Unaccounted-for Sources	114
SAR at Pedley Avenue	22,549	58.2			149	213
POTW Influent	n/a	49.4	n/a	n/a	2	3
Anza Drain	6,994	6.1	566	18%	492	74
Day Creek	3,374	0.5	100	100%	577	7
San Sevaine Channel	2,869	1.3	293	34%	320	10
Other MS4 Areas	6,561	1.0	100	100%	476 [3]	10
					Unaccounted-for Sources	109
Chino Creek at Central Ave	11,821	16.8			394	162
POTW Influent	n/a	8.8	n/a	n/a	2	0
Carbon Canyon Creek Ch.	1,820	6.5	2,323	4%	61	10
San Antonio Channel	5,315	0.7	86	100%	412	7
Other MS4 Areas	4,685	0.7	100	100%	476 [3]	8
					Unaccounted-for Sources	136
Mill-Cucamonga Creek at Chino-Corona Rd	13,024	31.1			877	667
POTW Influent	n/a	27.1	n/a	n/a	2	1
Chris Basin (Lower Deer Ck.)	4,043	0.8	126	79%	868	17
County Line Channel	518	0.1	69	100%	1,194	2
Cucamonga Creek	2,134	2.8	839	12%	139	9
Other MS4 Areas	1,155	0.2	100	100%	476 [3]	4
					Unaccounted-for Sources	634

1) DWF generation up to 100 gal/acre/day is assumed to come from urban sources
2) n/a means value is not applicable
3) Geometric mean of all dry weather *E. coli* monitoring data from the USEP study

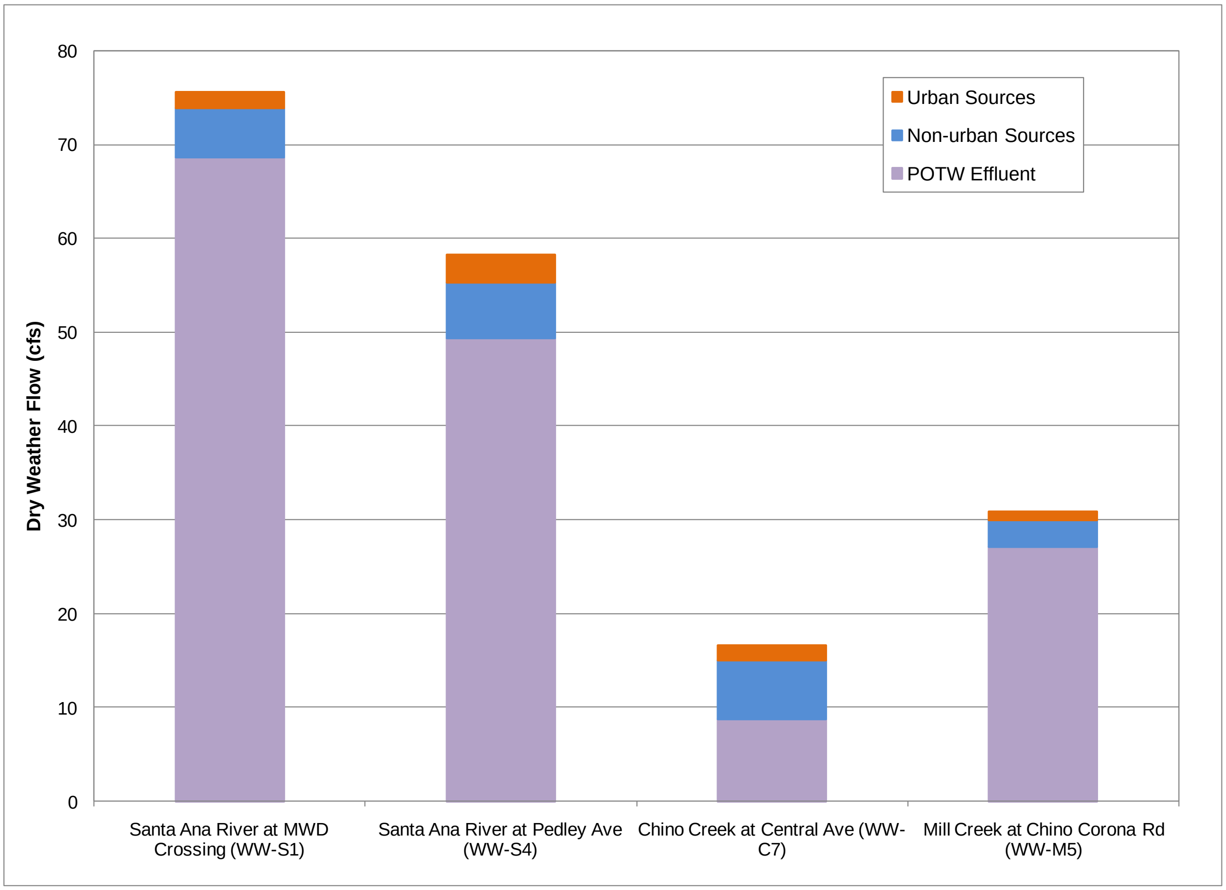


Figure 6-1. Estimated relative DWF contributions to watershed-wide compliance sites

6.2.3 Relative Source Contribution

Relative source contribution analyses were prepared for each of the watershed-wide compliance locations. This analysis provided a comparison of monitored inputs of flow (Q_{inflow}) and bacterial indicator concentrations (C_{inflow}) from MS4 facilities and POTWs with downstream flow (Q_{comp}) and bacterial indicator concentrations (C_{comp}), as follows:

$$FIB_{comp} = Q_{comp} * C_{comp} = \left[\sum_{i}^{J} Q_{inflow} * C_{inflow} \right] + e$$

This type of analysis characterizes the relative role of different flow sources in the watershed on downstream bacterial indicator concentrations. An important outcome of this analysis is the identification of the level of bacterial indicators (*e*) at the compliance locations that cannot be explained by known flow sources within the watershed (referred to as "unaccounted-for sources"). The presence of an unbalanced set of inputs and outputs in relation to downstream bacterial indicator levels is not surprising, given the dynamic in-stream processes, which can increase (growth) or decrease (decay) bacterial indicator levels as instream flows move from their point of origin to the downstream watershed-wide TMDL compliance monitoring sites.

The relative source contribution showed high amounts of unaccounted-for bacterial indicators at all four compliance points during DWF in the dry season. Figure 6-2 summarizes the relative contribution of bacterial indicators from various sources based on existing data. Figure 6-2 shows that the contribution of bacterial indicators from POTW effluent, assuming a concentration of 2.2 cfu/100 ml is minimal.

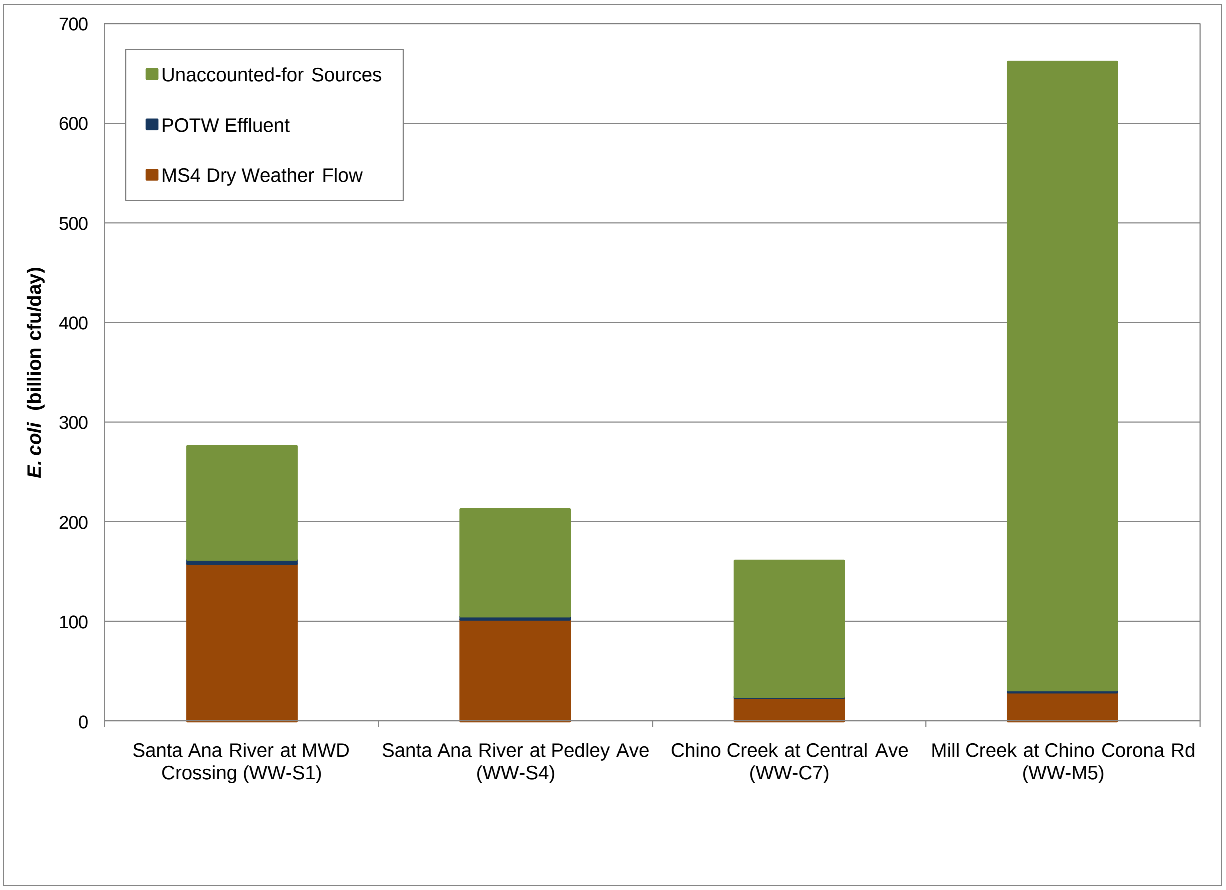


Figure 6-2. Estimated relative sources of bacterial indicators at watershed-wide compliance locations

6.3 Criteria for Demonstrating Compliance

Two alternative approaches were considered for demonstrating how implementation of the CBRP would achieve compliance with urban source wasteload allocations:

Alternative 1 - Demonstrate that implementation of the CBRP would result in achieving the wasteload allocation at every outflow to a receiving waterbody. This approach involves either reducing *E. coli* concentrations at flowing MS4 outfalls to 113 MPN/100 mL or eliminating dry weather runoff from the majority of urban area draining to each outfall. While this approach may be feasible in some smaller subwatersheds, it may be infeasible to implement watershed-wide.

Alternative 2 – If data demonstrate that receiving water impairment is potentially caused by the MS4, then demonstrate sufficient reduction in bacterial indicator loads in DWF from MS4 facilities to not cause an exceedance of the *E. coli* WQOs at downstream watershed-wide compliance monitoring sites. This approach assumes that UAAs will be adopted for selected waterbodies (as described in Section 5.2.5). Required bacterial indicator reductions are determined by comparing baseline *E. coli* loads at the compliance sites with the TMDL numeric target (product of DWF at compliance monitoring site and *E. coli* concentration equal to the WQO of 126 cfu/100 mL). Figure 6-3 shows that there are large amounts of unaccounted-for bacterial indicators in some watersheds.

The MS4 permittees pan to use the second approach to evaluate compliance. This approach allows for a watershed-wide assessment of bacterial water quality in downstream receiving waterbodies and consideration of the relative role of MS4 sources in downstream receiving waterbody bacterial indicator water quality.

The second approach allows for conversion of the concentration based WLA to a watershed wide numeric load (TMDL numeric target), assuming UAAs are adopted as described in Section 5.5.5.5. Demonstration of compliance using loads allows for prioritization of BMP implementation in select MS4 drainage areas, as long as removals are sufficient to have a blended concentration at the downstream point of compliance meets the WQO.

6.4 Bacterial Indicator Reduction from the MS4

6.4.1 Controllability

The relative source contribution analysis showed that substantial unaccounted-for sources of bacterial indicators exist in impaired waterbodies. For the Santa Ana River compliance monitoring locations, approximately 50 percent of E. coli is comprised of unaccounted-for sources. Unaccounted-for sources make up the majority of bacterial indicators during dry weather at the Chino Creek and Mill-Cucamonga Creek TMDL compliance monitoring sites (see Figure 6-2). For this compliance analysis, contributions of unaccounted-for sources of bacterial indicators to the TMDL compliance monitoring sites are not the responsibility of the MS4 permittees. The inspection program is designed to identify sources of bacterial indicators not previously monitored, which could provide more insight into these unaccounted-for sources and allow further refinement of MS4 contributions.

6.4.2 Gap Analysis for Bacterial Indicators

Bacterial indicator data collected from each of the watershed-wide TMDL compliance monitoring sites provide an estimate of existing *E. coli* concentrations in receiving waters. The magnitude of exceedances of the TMDL numeric target provides a basis for estimating the *E. coli* load removal needed from all sources to reduce current bacterial indicator concentrations to the WQO of 126 MPN/100 mL. Table 6-3 shows the daily amount of *E. coli* load at each compliance monitoring site based on current flow and bacterial indicator concentrations (column 1). The TMDL numeric targets are converted to a load of bacteria that would result in a downstream concentration equal to the WQO of 126/cfu/100mL (column 2). The difference between current *E. coli* loads at the compliance monitoring sites and the TMDL numeric target is the total bacterial indicator reduction needed to achieve compliance (column 3).

The portion of the current bacterial indicator load at the compliance monitoring sites attributable to measured MS4 sources is shown as a percentage in column 4 and *E. coli* load in column 5. The basis for the values in Table 6-3 is geometric means of dry weather *E. coli* concentrations and field measurement of flow from the 2007 dry season USEP monitoring, with a sample size of ~20 for most monitored drainages. Follow up monitoring will provide additional information to update the assessment of dry weather compliance in the dry season.

Table 6-3. Relative contribution to bacterial indicator water quality objective exceedances from MS4 DWFs

Compliance Monitoring Location	1 Baseline Dry Weather *E. coli* (billion cfu/day)	2 Numeric Target[1] (billion cfu/day)	3 Total Bacteria Reduction Needed (billion cfu/day)	4 Contribution of MS4 DWF to Bacteria at Compliance Monitoring Site	5 Bacteria from MS4 (billion cfu/day)
Santa Ana River at MWD Crossing	276	233	43	57%	157 [3]
Santa Ana River at Pedley Ave [2]	213	180	33	48%	102 [3]
Chino Creek at Central Ave	161	55	106	15%	24 [4]
Mill-Cucamonga Creek at Chino Corona Rd	662	95	567	4%	26 [5]

1) Water quality objective is a rolling five sample geometric mean of *E. coli* of 126 MPN/100 mL. TMDL numeric target is expressed as daily bacteria load.
2) Values do not include the drainage area to the Santa Ana River at MWD Crossing
3) Bacteria generated in both Riverside and San Bernardino Counties, with most coming from Riverside County
4) Bacteria generated in San Bernardino County only
5) Bacteria generated in both Riverside and San Bernardino Counties, with most coming from San Bernardino County

Two conditions are apparent from comparing the bacterial indicators coming from the MS4 with the bacterial indicator reduction needed to achieve compliance:

- *E. coli* load measured from all upstream MS4 discharges is less than the load reduction that would reduce bacteria to the numeric targets. This makes it impossible to attain the water quality objective even if MS4 discharges were eliminated entirely. Available data show this condition exists in both the Mill-Cucamonga and Chino Creek watersheds. The recommended course of action is then to determine whether the unaccounted source of bacteria is from a controllable non-urban source (e.g. agriculture) or if the source is naturally occurring and uncontrollable. Section 8 describes the CBRP compliance strategy associated with these conditions.
- Conversely, if the *E. coli* load measured from all upstream MS4 discharges is greater than the load reduction needed to reduce bacteria to the numeric targets, then it should be physically possible to attain the water quality objective by reducing bacteria loads from MS4 outfalls. Available data show this condition exists for the two subwatersheds draining to the Middle Santa Ana River compliance sites. Under this condition, the MS4 permittees will implement BMPs to the MEP within the MS4 drainage system and continue to collect water quality data to assess effectiveness. Options for implementation also could include a

trading or offset approach for achieving compliance by mitigating unaccounted for sources of bacteria in lieu of directly controlling bacteria at MS4 outfalls.

6.5 Water Quality Benefit Estimates

CBRP Section 5 describes the key elements that make up CBRP activities planned for implementation to achieve DWF compliance with urban wasteload allocations during the dry season. The following sections provide expected water quality benefits of elements where such quantification is possible. Water quality benefits are shown for implementation of CBRP elements within jurisdictions of Riverside County MS4 permittees only. Levels of implementation in the following sections were developed so that, when combined with San Bernardino County's CBRP implementation, the wasteload allocation would be achieved for all compliance monitoring sites, if compliance can be achieved with reductions from MS4 sources alone.

There is a clear division of primary responsibility for bacterial indicator reduction by compliance monitoring site between the two County MS4 programs. San Bernardino County jurisdictions make up 100 and 85 percent of the hydrologically connected MS4 drainage area to the Chino Creek at Central Avenue and Mill-Cucamonga Creek at Chino-Corona Road compliance sites, respectively. Conversely, San Bernardino County jurisdictions make up only 23 and 4 percent of the hydrologically connected MS4 drainage area to the Santa Ana River at MWD Crossing and Pedley Avenue compliance sites, respectively.

6.5.1 Element 1: Ordinances

As discussed in CBRP Sections 4 and 5, most jurisdictions in the MSAR watershed have adopted ordinances that prohibit common sources of urban DWF, such as excess or improper irrigation causing off-site runoff, hosing of driveways, and in some cases, driveway car washing. While these ordinances exist, enforcement actions are limited, as can be seen from the stormwater program annual reports over the past five years. One alternative to reducing DWF may be to increase enforcement actions for existing ordinances or for some jurisdictions to revise the language of their water conservation ordinances from "encouraging" good behaviors to "prohibiting" specific types of outdoor water waste. For example, there may be substantial water quality benefit to identifying the most significant areas with excessive DWF and targeting them for enforcement actions.

The expected water quality benefit of this CBRP implementation activity can be calculated as follows: The compliance analysis computes *E. coli* level reductions from increased enforcement using the following key assumptions:

- Targeted properties have off-site DWF that is five times a typical pre-intervention DWF generation rate of 100 gal/acre/day.
- Average single-family residential lots of 0.15 acres in hydrologically connected drainage areas.

- Enforcements actions will be implemented on five of 100 properties in hydrologically connected drainage areas.
- Enforcement actions are effective measures to minimize future DWF from a property.

It is infeasible to monitor the levels of *E. coli* in DWF leaving all properties in the MSAR watershed. Therefore, it is necessary for the quantification of bacterial indicator reduction, to assume some level in eliminated or captured DWF. For this compliance analysis, the level of *E. coli* in pre-intervention DWF is approximated as the area-weighted average of geometric mean concentrations from USEP monitoring sites in each of the compliance monitoring locations, in DWF in the dry season. Assuming non-urban sources of DWF are free of bacteria, this level is divided by the portion of MS4 flow that is attributable to urban DWF to estimate *E. coli* level in urban DWF. The resulting values are shown below:

- Santa Ana River at MWD Crossing: 3,900 cfu/100 mL
- Santa Ana River at Pedley Avenue: 1,500 cfu/100 mL
- Chino Creek at Central Avenue: 600 cfu/100 mL
- Mill-Cucamonga Creek at Chino-Corona Road: 1,400 cfu/100 mL

Given the approximated reduction in DWF, the potential water quality benefit of increased enforcement actions is shown in Table 6-4. For purposes of this compliance analysis, the approximate bacterial indicator level reductions per ordinance enforcement action are extrapolated to achieve a portion of the necessary bacterial indicator reduction target for MS4 permittees. Thus, the numbers of enforcement actions shown in Table 6-4 are initial targets. Actual implementation will be dependent upon the nature of the problems identified (i.e. the amount of flow and indicator bacteria level that is controlled in each enforcement action). For example, the City of Riverside may only need to conduct enforcement actions on 400 properties to achieve the same DWF reduction that is shown in Table 6-4.

Additional benefits may be obtained through the development and implementation of a bacterial indicator control ordinance as required by the MS4 permit. However, the estimated benefits cannot be quantified at this time, as information generated during CBRP implementation is needed to determine the content of this ordinance.

6.5.2 Element 2: Specific BMPs

Where possible, water quality benefits expected from the implementation of the specific BMPs identified in Element 2 were quantified. These BMPs include water conservation, enhanced street sweeping practices, and MS4 facility retrofits associated with significant redevelopment projects.

Table 6-4. Estimated bacterial indicator reduction associated with increased enforcement of water conservation ordinances to restrict outdoor water use in Riverside County

Watershed-wide Compliance Location	Hydrologically Connected Jurisdiction	Single Family Residential Properties [1]	Number of Enforcement Actions	Estimated Bacteria Reduction (billion MPN/day)
SAR at MWD Crossing	Unincorporated	8,210	411	4.6
	Riverside	13,552	678	7.5
	Total	21,762	1089	12.1
SAR at Pedley Avenue	Unincorporated	14,852	743	8.2
	Norco	103	5	0.1
	Riverside	22,272	1114	12.3
	Total	37,227	1861	20.6
Mill Creek @ Chino Corona Road	Unincorporated	216	11	0.1
Total for Riverside County Hydrologically Connected Areas		59,205	2,963	32.8

1) Census Block 200 Data. California Department of Forestry and Fire Protection: Fire and Resource Assessment Program (CDF-FRAP) (2002). http://frap.fire.ca.gov/data/frapgisdata/download.asp?rec=cen00bl

6.5.2.1 Water Conservation

Water conservation BMPs are effective because they eliminate or reduce the rate of DWF from outdoor water uses. To provide a basis for quantification of the potential benefits of this BMP, assumptions needed to be made regarding the number of properties where water conservation BMPs would be implemented:

- Two of 100 houses in hydrologically connected drainage areas replace grass with artificial turf.
- Ten of 100 houses in hydrologically connected drainage areas replace grass with native plants.
- Twenty-five of 100 houses in hydrologically connected drainage areas install a WBIC.
- Twenty-five of 100 houses have an irrigation audit or change behavior due to education and outreach programs.

Using these assumptions, Table 6-5 summarizes the number of properties in each jurisdiction where conservation BMPs would be targeted. Findings of a recent study conducted by Metropolitan Water District of Orange County and Irvine Ranch Water District on residential runoff reduction, facilitated the translation of a number of properties into DWF reductions (Jakubowski, 2008). This study evaluated DWF from residential drainage areas with and without use of WBICs. Several key findings of this study provide estimates of DWF reduction that may be used to quantify benefits of increased use of water conservation BMPs in the MSAR watershed:

Table 6-5. Preliminary distribution of water conservation BMPs in Riverside County hydrologically connected drainage areas under dry weather conditions

Watershed-wide Compliance Location	Hydrologically Connected Jurisdiction	Number of Single Family Residence Properties	Replace grass with artificial turf (# of properties)	Replace grass with native plants (# of properties)	Installation of a WBIC (# of properties)	Landscape irrigation audit (# of properties)
SAR at MWD Crossing	Unincorporated	8,210	165	821	2,053	2,053
	Riverside	13,552	272	1,355	3,388	3,388
	Total	21,762	437	2,176	5,441	5,441
SAR at Pedley Avenue	Unincorporated	14,852	298	1,486	3,714	3,714
	Norco	103	3	10	26	26
	Riverside	22,272	446	2,227	5,568	5,568
	Total	37,227	747	3,722	9,307	9,307
Mill-Cucamonga Creek @ Chino Corona Road	Unincorporated	216	5	22	55	55
Total for Riverside County Hydrologically Connected Areas		59,205	1,189	5,920	14,802	14,802

- Dry weather runoff from excess irrigation is 550-650 gal/irrigated acre/day. This rate is used to approximate the runoff reduction benefit of replacing grass lawns with artificial turf or native plants (i.e. no expected runoff).

- Education and outreach reduced DWF by ~190 gal/irrigated acre/day. This rate is used to approximate the runoff reduction from education and outreach BMPs, including an on-site irrigation audit.

- Installation of a weather based irrigation controller on a large portion of the urban landscape provided an additional 170 gal/irrigated acre/day. Assuming education and outreach would be included in the installation process for a WBIC, the runoff reduction from installing a WBIC was approximated as 360 gal/irrigated acre/day.

Quantification of the bacterial indicator level reductions from water conservation BMPs required an estimate of the irrigated acreage of the initial set of projects. Accordingly, the following assumption was developed:

- The extent of irrigated area per single family residential property was assumed to be 2,000 ft^2. The actual extent of irrigated area is dependent upon property specific landscaping features. This estimate is based on an assumed typical residential development of 5 units per acre and a landscaped fraction of 25 percent.

To convert DWF reduction to bacterial indicator level reductions, it is necessary to assume some levels in eliminated or captured DWF. The *E. coli* level in DWF leaving all properties in the MSAR watershed would be infeasible to monitor. Therefore, it is necessary for the quantification of bacterial indicator reduction, to assume some level in eliminated or captured DWF. For this compliance analysis, the *E. coli* level in pre-intervention DWF is approximated as the area-weighted average of geometric mean concentrations from USEP monitoring sites in each of the compliance monitoring locations, in DWF in the dry season. Assuming non-urban sources of DWF are free of bacterial indicators, this concentration is divided by the portion of MS4 flow that is attributable to urban DWF to estimate *E. coli* concentrations in urban DWF. The resulting values are shown below:

- Santa Ana River at MWD Crossing: 3,900 cfu/100 mL

- Santa Ana River at Pedley Avenue: 1,500 cfu/100 mL

- Chino Creek at Central Avenue: 600 cfu/100 mL

- Mill-Cucamonga Creek at Chino-Corona Road: 1,400 cfu/100 mL

Table 6-6 summarizes expected water quality benefits of this level of water conservation BMP implementation. Bacteria indicator level reductions are computed as the product of avoided DWF and bacterial indicator level in the assumed flow. For example, replacement of grass with native plants on 1,355 properties in the City of Riverside jurisdiction within the Santa Ana River at MWD Crossing watershed, bacterial indicator level reduction is 4.6 billion cfu/day (1,355 properties *2,000 ft^2/property / 43560 ft^2/acre * 500 gal/irrigated acre/day * 3,900 cfu/100 mL * 37.85 100 mL aliquots/gal).

For purposes of this compliance analysis, the approximate bacterial indicator level reductions per water conservation BMP are extrapolated to achieve a portion of the necessary bacterial indicator level reduction target for MS4 permittees. Thus, the numbers of water conservation BMPs shown in Table 6-5 are initial targets. Actual implementation will be dependent upon the nature of the problems identified (i.e. the amount of flow and bacterial level that is controlled in water conservation BMP project). For example, the City of Riverside may only need to install WBICs on 2,500 existing properties to achieve the same DWF reduction that is shown in Table 6-6. Moreover, the mix of water conservation BMPs could be modified from this initial scenario.

6.5.2.2 Enhanced Street Sweeping

Trash and other materials accumulated within MS4 facilities provide a habitat and food source for bacterial indicators. In addition, DWF keeps these facilities damp, which also supports bacterial indicator survivability. Biofilms typically form under these types of conditions. Biofilms are dynamic microbial communities that go through an attachment phase and then ultimately a detachment, erosion or "sloughing" phase from the surface to which they are attached. The rate of attachment/detachment depends on a variety of environmental conditions (EPA, 1983). In a recent study within the Newport Bay watershed, Skinner et al. (2010) showed that bacterial indicators in clean water running along residential street gutters (with no additional flow sources) increases to as high as 14,000 MPN/100 mL. Given these types of bacterial indicator sources, enhanced street sweeping has been included as specific BMP under CBRP Element 2.

To quantify the bacterial indicator reduction that could be achieved from enhanced street sweeping, it is necessary to estimate the *E. coli* concentrations coming from DWF in street gutters. This approach involves the following assumptions:

- Implementation of the CBRP would involve a 15 percent increase in the average number of miles of street sweeping per day over the hydrologically connected drainage area.
- The average drainage area to a catch basin downstream of enhanced street sweeping is 10 acres.
- Urban DWF generation rates for existing developments of 100 gal/acre/day, based on the measured flows at IEUA DWF monitoring stations (see Table 3-2).

Table 6-6. Estimated bacterial indicator level reduction (billions of cfu/day) from implementation of water conservation BMPs in Riverside County hydrologically connected drainage areas under dry weather conditions

Watershed-wide Compliance Location	Hydrologically Connected Jurisdiction	Replace grass with artificial turf	Replace grass with native plants	Installation of a WBIC	Landscape irrigation audit	Combined Water Conservation BMPs
SAR at MWD Crossing	Unincorporated	0.6	2.8	2.4	1.2	7.0
	Riverside	0.9	4.6	3.9	2.0	11.4
	Total	1.5	7.4	6.3	3.2	18.3
SAR at Pedley Avenue	Unincorporated	0.4	1.9	1.6	0.8	4.8
	Norco	0.0	0.0	0.0	0.0	0.0
	Riverside	0.6	2.9	2.5	1.2	7.2
	Total	1.0	4.8	4.1	2.0	12.0
Mill-Cucamonga Creek @ Chino Corona Road	Unincorporated	0.0	0.0	0.0	0.0	0.0
Total for Riverside County Hydrologically Connected Areas		2.5	12.3	10.4	5.2	30.4

To estimate the bacterial indicator level reduction from enhanced street sweeping, it is necessary to assume some *E. coli* level that could be attributed to mobilization during gutter flow. Therefore it is assumed that *E. coli* concentrations in DWF are at least 1,130 cfu/100 mL (10 times the wasteload allocation).

Given these assumptions, the potential water quality benefit of enhanced street sweeping is shown in Table 6-7.

Table 6-7. Estimated bacterial indicator level reduction associated with enhanced street sweeping in hydrologically connected drainage areas under dry weather conditions

<table>
<tr><th>Watershed-wide Compliance Location</th><th>Hydrologically Connected Jurisdiction</th><th>Drainage Area with Increased Street Sweeping</th><th>Estimated Bacteria Reduction (billion MPN/day)</th></tr>
<tr><td rowspan="2">SAR at MWD Crossing</td><td>Unincorporated</td><td>552</td><td>2.6</td></tr>
<tr><td>Riverside</td><td>688</td><td>3.3</td></tr>
<tr><td colspan="2">Total</td><td>1,240</td><td>5.9</td></tr>
<tr><td rowspan="3">SAR at Pedley Avenue</td><td>Unincorporated</td><td>1,531</td><td>7.3</td></tr>
<tr><td>Norco</td><td>11</td><td>0.1</td></tr>
<tr><td>Riverside</td><td>1,038</td><td>5.0</td></tr>
<tr><td colspan="2">Total</td><td>2,580</td><td>12.3</td></tr>
<tr><td>Mill-Cucamonga Creek @ Chino Corona Road</td><td>Unincorporated</td><td>120</td><td>0.6</td></tr>
<tr><td colspan="2">Total for Riverside County Hydrologically Connected Areas</td><td>6,909</td><td>18.8</td></tr>
</table>

6.5.2.3 Stormwater Retrofit on Redevelopment

Stormwater management controls in most existing developments within the MSAR watershed were not designed to today's standards and therefore there is potential for the development to contribute DWF to the MS4. With significant redevelopment of a project site, an approved WQMP that incorporates LID practices consistent with 2010 MS4 permit requirements would address pollutants of concern by eliminating most, if not all, DWF from the site. Estimated bacterial indicator level reduction that may be achieved from these significant redevelopment projects is a function of flow and bacterial indicator from the existing development and the rate of redevelopment expected prior to 2016, per the following assumptions.

- Redevelopment in the MSAR watershed prior to the December 31, 2015 compliance date may occur in 0.5 percent of the MS4 drainage area (46,000 urban acres * 0.005 = 230 acres of redevelopment). This estimate is low relative to historical development rates, but redevelopment in the 2010-2015 time-period is expected to be reduced due to economic factors.

- Urban runoff generation rates for existing developments of 100 gal/acre/day, based on the measured flows at IEUA DWF monitoring stations (see Table 3-2).

To convert DWF reduction to bacterial indicator reductions, it is necessary to assume some concentration in eliminated or captured DWF. The *E. coli* level in DWF leaving all properties in the MSAR watershed would be impossible to monitor. Therefore, it is necessary for the quantification of bacterial indicator reduction, to assume some concentration in eliminated or captured DWF. For this compliance analysis, the *E. coli* level in pre-intervention DWF is approximated as the area-weighted average of geometric mean concentrations from USEP monitoring sites in each of the compliance monitoring locations, during dry weather in the dry season. Assuming non-urban sources of DWF are free of bacterial indicators, this concentration is divided by the portion of MS4 flow that is attributable to urban DWF to estimate *E. coli* level in urban DWF. The resulting values are shown below:

- Santa Ana River at MWD Crossing: 3,900 cfu/100 mL
- Santa Ana River at Pedley Avenue: 1,500 cfu/100 mL
- Chino Creek at Central Avenue: 600 cfu/100 mL
- Mill-Cucamonga Creek at Chino-Corona Road: 1,400 cfu/100 mL

Given these assumed values, the bacterial indicator reduction from redevelopment projects is minimal (less than 1 percent of the targeted bacterial indicator level reduction needed to demonstrate compliance. Improved stormwater BMPs in new development and significant redevelopment projects will provide more valuable benefits during wet weather.

6.5.2.4 Other Non-Quantifiable BMPs

The CBRP includes other recommended specific BMPs that have the potential to reduce bacterial indicator levels from urban DWFs (see Section 5.2.2). While these BMPs have been included to address potential urban bacterial indicator sources, the ability to quantify water quality benefits is greatly limited. For example, transient camps may be an important bacterial indicator source in certain areas, but the benefits of mitigation are unknown since studies have not been done to evaluate the water quality impacts of such camps under dry weather conditions. Given such limitation, the water quality benefits were not quantified. However, the potential reductions in bacterial indicator levels that will be achieved from implementing these BMPs provide an additional margin of safety toward achieving urban wasteload allocation by the compliance date.

6.5.3 Element 3: Inspection Criteria

The inspection program involves rigorous monitoring of flow, bacterial indicators, and human sources of fecal bacterial indicators (using human *Bacteroides* markers) at key locations in the MS4. The purpose of conducting such monitoring activities is to identify smaller portions of MS4 drainage areas that may be responsible for a disproportionate amount of bacterial indicators (referred to as a "hot spot"). The temporal variability of available bacteria indicator levels from downstream monitoring sites (from both the USEP study and watershed-wide compliance monitoring) suggests that in some drainage areas, urban sources may be contributing to increases in downstream bacterial indicator levels. However, because of the high percentage of unaccounted-for sources of bacterial indicators apparent in the system, to what degree the MS4 is a contributor to elevated bacterial indicator levels needs to be evaluated.

The inspection program provides a means to identify urban sources and target mitigation activities. For instance, an MS4 outfall may be determined to be consistently dry or to contain a lower *E. coli* level than expected. If so, there would be no need to implement upstream BMPs for the purposes of reducing bacterial indicators. At the same time, the inspection program could identify drainage areas that generate DWF and have bacterial indicators at levels greater than was assumed in this quantification effort. Targeted BMPs within the watershed upstream would be prioritized and would likely provide more benefit than is estimated in this compliance analysis. Accordingly, the inspection program provides the information necessary to use an iterative adaptive watershed management approach, which allows for the best use of resources to mitigate urban bacterial indicator sources to the MEP. Moreover, data collected under the inspection program will provide the means to further refine the relative contribution of bacterial indicators from urban sources to downstream waters.

RCFC&WCD initiated inspection activities in 2008 following the finding of the presence of a consistent human source of bacteria in Box Springs Channel (see Section 3.4.4) and geometric means of bacterial indicators three times greater than for all USEP monitoring sites. The City of Riverside discovered that a single restroom toilet located in the Sam Evans Sports Complex on the RCC Riverside Campus was inadvertently connected to a storm drain pipe rather than a sewer line. Subsequent elimination of this source of bacteria in Box Springs Channel may result in a significant reduction in bacteria loads to the Santa Ana River. Additional data from this site is necessary to assess the effectiveness of this activity. If we assume this connection was the primary cause of bacterial indicator concentrations in Box Spring Channel to be higher than other MS4 outfall in the MSAR watershed, then its elimination may reduce concentrations by ~ 1,000 cfu/100 mL. This reduction equates to an *E. coli* load removal of 81 billion cfu/day, which could in itself be sufficient to reduce concentration at the downstream point of compliance to meet the WQO.

6.5.4 Element 4: Regional controls

The CBRP does not include any regional structural BMPs at this time. The inspection program is intended to identify the highest priority MS4 drainage areas that need to be targeted for runoff reduction or treatment prior to reaching a receiving waterbody. Once identified, a controllability assessment will be completed to determine the most effective course of action on a drainage area by drainage area basis. In some cases, a regional structural BMP solution may be the best alternative, given the high cost of widespread non-structural BMPs upstream and the potential for mutual benefits of recharging groundwater.

6.6 Compliance Analysis

6.6.1 Summary of Compliance of Urban Runoff Bacterial Indicator Sources

Combining the estimated bacterial indicator reductions from ordinance enforcement, water conservation BMPs, enhanced street sweeping, and significant redevelopment projects, demonstrates that reduction targets for MS4 DWF are achievable with the proposed CBRP for all compliance locations except Mill-Cucamonga Creek (Table 6-8). This estimate is conservative since (1) only a few BMPs can be properly quantified; (2) the inspection program will provide additional information to target DWF and bacterial indicator reduction efforts to the key specific drainage areas; and (3) potential benefits associated with the elimination of a cross-connected toilet on Box Springs Channel is not incorporated into the reductions shown in Table 6-8.

In the Mill-Cucamonga Creek watershed, baseline bacterial indicator levels at the compliance monitoring location exceed the wasteload allocation by over 750 percent. Based on data collected in the USEP monitoring program, only a small portion (< 5 percent) of the bacterial indicator load in this watershed could be attributed to DWFs from MS4 facilities, which include those that drain to Lower Deer Creek, County Line Channel, Cucamonga Creek between Turner Basins and Highway 60, and 830 acres of other unmonitored drainage areas (see Figure 6-2). Consequently, the dilution benefit of IEUA's RP1 effluent is overwhelmed by a large unknown source of bacterial indicators. Given this condition, the systematic implementation of inspection program activities is a high priority in the Mill-Cucamonga Creek watershed. Further, the drainage area of Mill-Cucamonga Creek within Riverside County is very small (< 5 percent), with a limited number of outfalls to the Creek. It may be possible to eliminate DWF from these outfalls to explicitly demonstrate compliance for the Riverside County portion of the watershed.

6.6.2 Uncertainty of Analysis

Each of the sources of data used in the compliance analysis has significant variability. Some of the data sets showed greater variations. Also, the robustness of each data set varies, which suggests there could be greater uncertainty in some of the inputs. For instance, daily flow data from USGS gauges are less variable and have less uncertainty than field flow measurements at USEP monitoring sites. Lower variability comes from the relatively larger watersheds, consistent POTW effluent outflows and established gauging instruments. Conversely, runoff measured at MS4 outfalls has greater variability due to changing water use patterns in smaller subwatersheds, and uncertainly is greater due to the limited number of data points and use of simple field measurements rather than established flow gauges. To address variations and uncertainty, a stochastic modeling approach was used to assess a range of potential bacterial indicator reductions that may be achieved from implementing the CBRP.

Table 6-8. Compliance Analysis Summary

Watershed-wide Compliance Location	Hydrologically Connected Jurisdiction	Ordinance Enforcement	Combined Water Conservation BMPs	Enhanced Street Sweeping	Retrofit on Redevelopment	Total Estimated Bacterial Indicator Reduction
SAR at MWD Crossing	Unincorporated	4.6	7.0	2.6	0.09	14.3
	Riverside	7.5	11.4	3.3	0.11	22.3
	Total	12.1	18.3	5.9	0.20	36.5
SAR at Pedley Avenue	Unincorporated	8.2	4.8	7.3	0.24	20.5
	Norco	0.1	0.0	0.1	0.00	0.2
	Riverside	12.3	7.2	5.0	0.17	24.7
	Total	20.6	12.0	12.3	0.41	45.3
Mill-Cucamonga Creek @ Chino Corona Road	Unincorporated	0.1	0.0	0.6	0.02	0.7
Total for Riverside County Hydrologically Connected Areas		32.8	30.4	18.8	0.6	82.6

Stochastic simulations of the bacterial indicator source contribution were performed using @Risk, an Excel add-in software (Palisade, Inc.). The stochastic model incorporates probabilistic representations of multiple variables and calculates the balance between bacterial indicator levels at specific inflows and concentrations at downstream compliance points. Monte Carlo simulations sample each parameter in the source contribution analysis 10,000 times, using fitted distributions on model variables subject to variability. These distributions were developed using BestFit, a standard @RISK add-in module, which uses the "Maximum Likelihood Estimator" approach to fit distributions to sample data. Distributions were fitted to the following model inputs to test the impact of their combined variability on estimated bacterial indicator reductions

- DWF from MS4 - USEP flow measurements varied widely at most sites. This could be due to diurnal patterns in DWF generation, the presence of intermittent non-urban discharges during some field visits, and errors in field measurements.

- *E. coli* levels at USEP and watershed-wide compliance monitoring locations - Widespread variability in bacterial indicator levels is common at many sample locations. Several locations showed order of magnitude fluctuations from week to week.

These two model parameters affect the estimate of *E. coli* levels in DWF eliminated or treated by different CBRP elements, as well as the baseline load from USEP and watershed-wide compliance monitoring locations. Figure 6-3 shows the probability of achieving compliance given the variability of potential flows and *E. coli* levels. This figure does not account for additional uncertainty associated with the effectiveness of the recommended BMPs, which is not well studied. The stochastic simulation shows a very high probability of compliance in the Santa Ana River at MWD Crossing. For example, there is a 90 percent probability that the CBRP will achieve at least 100 percent of the targeted bacterial indicator reduction. Conversely, it is not expected that compliance would be achieved at the Mill-Cucamonga Creek site solely through the management of controllable urban sources (this is not unexpected given the unaccounted-for bacterial indicator sources in this subwatershed); however, these results show that the proposed BMPs do provide a measurable reduction (20-60 percent of the target). The Santa Ana River at Pedley Avenue and Chino Creek at Central Avenue results show a very high variability in compliance, with the probability of achieving compliance at approximately 50 percent. With the regular collection of additional flow and bacterial indicator data as part of the inspection program, the data variability can be better characterized which will result in an improved compliance estimate.

One of the most significant limits of this compliance analysis is that unaccounted-for sources of bacteria are not included in the computation of necessary reductions. Review of water quality data shows that about half of bacteria indicators in the Santa Ana River and about 90 percent of bacteria indicators in the Chino Creek and Mill-Cucamonga Creek watersheds come from unaccounted-for sources of bacteria.

Implementation of specific BMPs in this CBRP only address the portion of bacteria indicators in DWF that is controllable within MS4 systems. Reductions within the MS4 system could translate into reductions in unaccounted-for bacteria indicators if environmental growth contributes to the unaccounted-for pool. However, there are other types of unaccounted-for source of bacteria indicators may be more important, such as agricultural flows, illegal discharges, or wildlife. The Inspection Program is designed to provide information to assist the permittees in developing an approach to manage these sources, determined to be uncontrollable within MS4 systems. By taking an adaptive management approach to addressing bacteria indicators in the MSAR, the most effective way to manage unaccounted-for sources can be evaluated with detailed information obtained through implementing the Inspection Program.

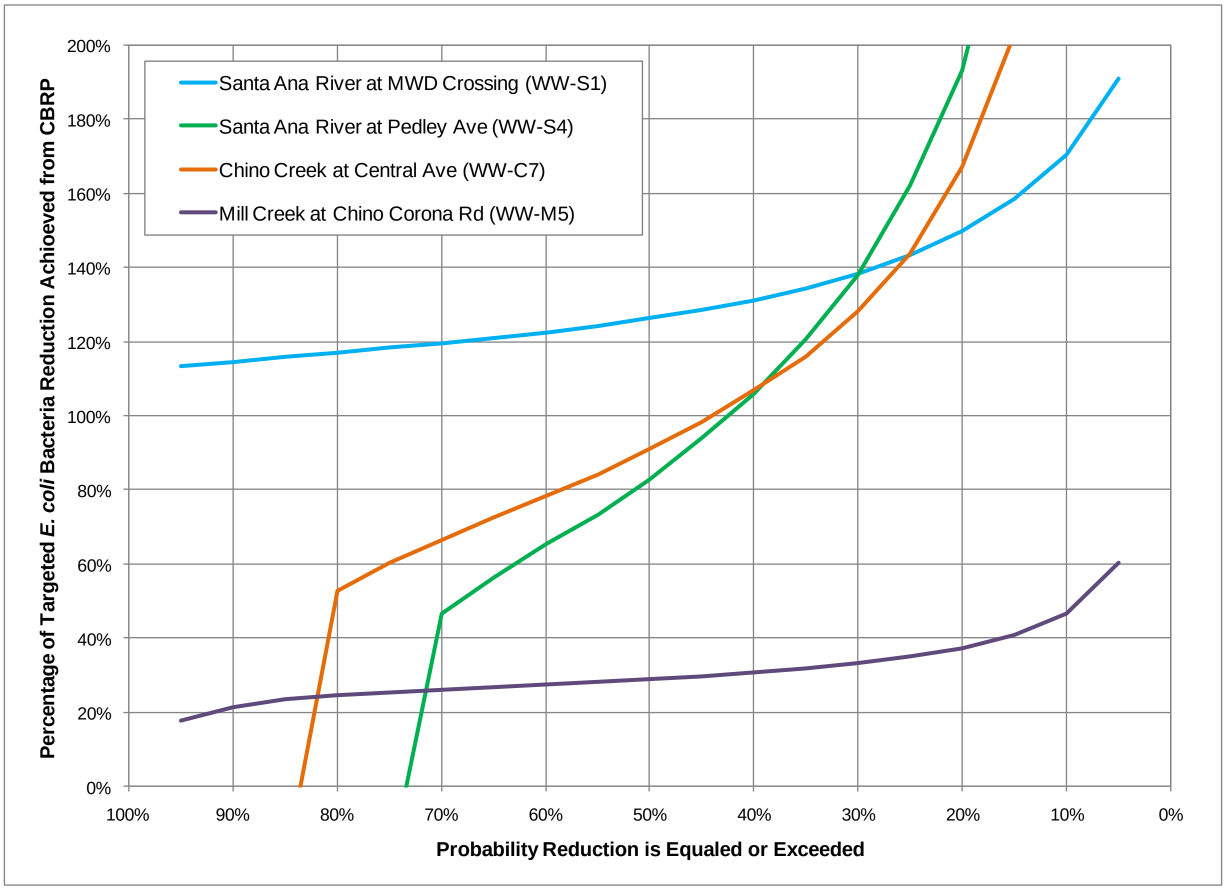


Figure 6-3. Probability density function showing results of Monte Carlo simulation of bacterial indicator reduction achieved by implementing quantified CBRP elements

Section 7
CBRP Implementation

7.1 Introduction

Section 1 summarized the required elements for inclusion in the CBRP. These elements included:

- A detailed schedule with discrete milestones to assess satisfactory progress toward meeting urban wasteload allocations for dry weather
- Designation of the specific agency or agencies responsible for meeting each milestone.
- Specific metrics to demonstrate the effectiveness of the CBRP and acceptable progress for meeting the urban wasteload allocations for dry weather.

The following sections provide information regarding each of the above CBRP elements.

7.2 Compliance Monitoring

A watershed-wide compliance monitoring program was established in 2007 and will continue as designed during CBRP implementation (see Section 2.4 for program description). A report summarizing sample results from dry weather conditions from April 1 to October 31 is submitted to the RWQCB by December 31st of each year. In addition, a 3-year summary (or Triennial Report) is due to the RWQCB by February 15th every three years since TMDL adoption. The first of these reports was submitted on February 15, 2010 (see Section 2 for synopsis of the 2010 report).

Table 7-1 provides the implementation of activities associated with the CBRP that provide the basis for an assessment of compliance with urban wasteload allocations. As part of the CBRP, the watershed-wide compliance monitoring program will continue to be the primary means of evaluating progress toward meeting the wasteload allocations for dry weather. The Monitoring Plan and QAPP will be revised as needed to facilitate source evaluation activities implemented as part of Element 3 – in particular allowing the use of alternative EPA-approved bacterial indicator laboratory analysis methods.

The schedule includes the regular reporting of seasonal sampling results that is ongoing. In addition, during CBRP implementation two Triennial Reports will be prepared that will provide opportunity to evaluate newly collected data and the effectiveness of CBRP implementation over the long term:

Table 7-1. Implementation of activities to assess compliance with urban wasteload allocations

CBRP Activity	Milestones	Metrics	Responsibility	Complete by
Watershed-wide Compliance Monitoring	Revise Monitoring Plan and QAPP as needed to facilitate Element 3 activities, including modifying the approved *E. coli* laboratory analysis method to another EPA-approved method to allow use of local laboratories[1]	Revised Monitoring Plan and QAPP approved by RWQCB	Area-wide MS4 Program through MSAR Task Force	June 30, 2011
	Collect 20-weekly samples during dry season (April 1 – October 31)	Submittal of Dry Season Report to RWQCB	Area-wide MS4 Program through MSAR Task Force	Ongoing annual activity
	Collect 11 weekly samples during wet season (November 1 – March 31)	Submittal of Wet Season Report to the RWQCB	Area-wide MS4 Program through MSAR Task Force	Ongoing annual activity
	Collect 4 samples during and after one wet weather event			
2013 Triennial Report	Review and revise compliance analysis contained in CBRP Section 6 based on most recent data (e.g., flow, bacterial indicators, special studies) including additional analysis on relative contribution of bacterial indicators from controllable urban sources	Revised compliance analysis for incorporation into the 2013 Triennial Report	Area-wide MS4 Program through MSAR Task Force	December 31, 2012
	As part of 2013 report, evaluate progress towards meeting urban wasteload allocations, in particular during dry weather conditions (April 1 – October 31)	Submit Triennial Report to the RWQCB by February 15, 2013; incorporate recommendations for modifications to CBRP	Area-wide MS4 Program through MSAR Task Force	February 15, 2013
2016 Triennial Report	Review and revise compliance analysis contained in CBRP Section 6 based on most recent data (e.g., flow, bacterial indicators, special studies) including additional analysis on relative contribution of bacterial indicators from controllable urban sources	Revised compliance analysis for incorporation into the 2016 Triennial Report	Area-wide MS4 Program through MSAR Task Force	December 31, 2015
	As part of 2016 report, evaluate progress towards meeting urban wasteload allocations, in particular during dry weather conditions (April 1 – October 31)	Submit Triennial Report to the RWQCB by February 15, 2016; incorporate recommendations for modifications to CBRP including additional BMPs planned if compliance monitoring indicates additional measures are required (see Section 8)	Area-wide MS4 Program through MSAR Task Force	February 15, 2016

Table 7-1. Implementation of activities to assess compliance with urban wasteload allocations

CBRP Activity	Milestones	Metrics	Responsibility	Complete by
Water Quality Objective Review	Based on the findings/outcomes of CBRP implementation activities, evaluate whether to revise geometric mean *E. coli* water quality objective applicable to Chino Creek, Mill-Cucamonga Creek, Santa Ana River Reach 3 and Prado Park Lake from 126 to 206 cfu/100 mL	RWQCB decision on whether to implement Basin Plan amendment process	RWQCB with MSAR Task Force	Spring 2016

[1] The Basin Plan amendment under development by the SWQSTF allows for the use any EPA-approved *E. coli* method for evaluating compliance. Implementation of the CBRP will require use of local laboratories to facilitate inspection program activities; the existing Monitoring Plan will be revised to accommodate this requirement.

- *2013 Triennial Report* – This report will provide an interim evaluation of progress towards meeting the urban wasteload allocation by the December 21, 2015 compliance date. As part of the preparation of this report, the compliance analysis contained in CBRP Section 6 will be reviewed, and where appropriate, revised to take into account newly available bacterial indicator, flow, and special study data which provide additional information regarding controllable urban sources and the relative contribution of bacteria from the MS4 to impaired waters.

- *2016 Triennial Report* – This report, due to the RWQCB by February 15, 2016, will provide an analysis of the most recent dry weather condition results obtained through October 2015. As part of the preparation of this report, the compliance analysis contained in CBRP Section 6 (and potentially revised in 2013) will be reviewed, and where appropriate, further revised to take into account newly available bacterial indicator, flow, and special study data which provide additional information regarding controllable urban sources and the relative contribution of bacteria from the MS4 to impaired waters.

The submittal dates for each of the Triennial Reports are timely and will provide a basis for evaluating the need to make program modifications (as part of an iterative adaptive management strategy – see Section 8).

7.3 CBRP Elements

This section provides an implementation plan for each of the four key CBRP elements described in Section 5. Each plan includes the following information:

- *CBRP Activity* – Programmatic area to be implemented.

- *Milestones* – Discrete actions associated with the completion of each CBRP activity.

- *Metrics* – Specific outcomes to demonstrate completion of each milestone; in addition, metrics for some activities are related to mitigation of identified urban sources of bacterial indicators and provide a means to measure effectiveness of activity.

- *Responsible Agency* – Assignment of the activity to either the area-wide MS4 program or to local permittees. In some cases, identification of the responsible agency is deferred to a later date when additional required information is complete.

- *Completion Date* – Each CBRP milestone has been given a completion date. Where the activity is also an MS4 permit requirement, the completion date is the same as the date contained in the permit.

The following sections provide a brief summary of the implementation plan associated with each of the CBRP elements.

7.3.1 Element 1 – Ordinances

Two activities comprise this Element 1 - water conservation and bacterial indicator control ordinances. Table 7-2 provides the implementation activities planned for each of these CBRP activities. Evaluations of legal authority and the development of minimum ordinance requirements are expected to be completed collectively by the Area-wide MS4 Program. Local ordinance development will be implemented by individual permittees. Development of the bacterial indicator control ordinance is an MS4 permit requirement and the completion date is consistent with the permit. Progress towards implementing Element 1 activities will be summarized and reported in the Annual Report prepared under the MS4 permit.

7.3.2 Element 2 – Specific BMPs

Six specific BMPs or CBRP activities are included in Element 2. Table 7-3 provides the implementation plan associated with each of these activities. Many of the activities will be implemented collectively by the Area-wide MS4 Program. Exceptions are where local implementation is required, e.g. mitigation of a problem transient camp or implementation of modified street sweeping practices. Some activities are closely linked to other CBRP Elements, e.g., implementation of irrigation practices is closely linked with the water conservation ordinance under Element 1. Several activities are also MS4 permit requirements, e.g., IDDE program development, WQMP revisions, and septic system management. The completion dates for these activities are consistent with the MS4 permit requirements. Progress implementing Element 2 activities will be summarized and reported in the Annual Report prepared under the MS4 permit.

7.3.3 Element 3 – Inspection Criteria

This element includes six key CBRP activities ranging from preparation of UAAs to preparation of controllability assessments where necessary (Table 7-4). As noted in Section 5.3, only the UAA activities (CBRP Activity 3.E) are applicable to the Temescal Creek subwatershed.

Several of the Element 3 activities require data collection, the results of which lead to decisions regarding next steps. Accordingly, this element contains several deliverables that provide additional information regarding implementation schedules. For example, the need for controllability assessments is dependent on data collected as part of reconnaissance and inspection activities. When inspection of a particular portion of the MS4 identifies required actions to mitigate a bacterial indicator source, a plan and schedule will be developed at that time to guide subsequent activities.

Table 7-2. Implementation Plan for CBRP Element 1 - Ordinances

CBRP Activity	Milestones	Metrics	Responsibility	Complete by
1.A - Water Conservation Ordinance	1.A.i – Evaluate existing legal authority to manage and enforce DWF	Establish minimum DWF management and enforcement requirements for the area based on outcome of milestones 1.A.i, 1.A.ii, 2.D.i, and CBRP Element 3 activities	Area-wide MS4 Program	June 30, 2012
	1.A.ii - Evaluate opportunities to collaborate with water purveyors on implementation of SB7 to maximize use of outdoor water use efficiency BMPs and reduce DWF			
	1.A.iii –Evaluate need to revise local ordinances to incorporate more stringent DWF management requirements	Prepare draft revised ordinances, as needed	Permittees	December 31, 2012
	1.A.iv - Adopt revised water conservation ordinances (as appropriate)	Revised ordinances adopted	Permittees	December 31, 2013
1.B – Pathogen Control Ordinance	1.B.i – Evaluate existing legal authority to manage animal wastes	Establish minimum requirements for the control of bacterial indicator sources based on outcomes of 1.B.i,1.B.ii, and CBRP Element 3 activities	Area-wide MS4 Program	June 30, 2012
	1.B.ii –Identify other controllable bacterial indicator sources (other than pet waste) that may contribute to bacterial indicator exceedances in the MS4			
	1.B.iii –Evaluate need to establish/revise local ordinances to incorporate minimum bacterial indicator control requirements	Prepare draft revised ordinances, as needed	Permittees	December 31, 2012
	1.B.iv – Adopt/revise pathogen control ordinances	Revised ordinances adopted	Permittees	January 29, 2013[1]
1.C - Reporting	1.C.i – Provide annual summary of ordinance development activities and recommendations for CBRP modification as identified by Element 1 implementation	MS4 permit Annual Report with incorporation of CBRP update	Area-wide MS4 Program	Annually by November 15

[1] - Consistent with MS4 permit requirement

Table 7-3. Implementation Plan for CBRP Element 2 – Specific BMPs

Activity	Milestones	Metrics	Responsibility	Complete by
2.A –Transient Camps	2.A.i - Identify locations of transient encampments in MS4 facilities	Report	Area-wide MS4 Program	Ongoing
	2.A.ii – Implement source assessment water quality study to evaluate potential water quality impacts to the MS4 from transient camps during dry weather	Identify spatial and temporal nature of water quality impacts to the MS4 from transient camps during dry weather conditions in assessed watersheds	Permittees	Ongoing
	2.A.iii - Develop model program for mitigating water quality impacts from transient encampments	Establish model program for use by individual jurisdictions	Area-wide MS4 Program	December 31, 2012
	2.A.iv - Develop targeted transient camp mitigation plan	Based on the outcome of 2.A.i, 2.A.ii and 2.A.iii, prepare mitigation plan that includes prioritized schedule for implementation	Area-wide MS4 Program	June 30, 2013
	2.A.v - Implement transient camp mitigation plan	Complete targeted activities based on mitigation plan	Permittees	December 31, 2014
2.B – IDDE	2.B.i - Develop draft IDDE Program that is consistent with permit requirements and supports CBRP Element 3 (Inspection Program)	Develop program guidance based on MS4 permit requirements and needs of inspection program	Area-wide MS4 Program	March 31, 2011
	2.B.ii – Develop final IDDE Program for submittal to the RWQCB	Submit final guidance to RWQCB	Area-wide MS4 Program	July 29, 2011[1]
	2.B.iii – Implement IDDE Program	Implementation of Inspection Program (Element 3)	Area-wide MS4 Program	As required by Element 3
2.C- Street Sweeping	2.C.i – Literature review of street sweeping programs (e.g., method, frequency, equipment) to determine potential to modify programs to reduce bacterial indicator sources	Develop recommendations for modified street sweeping program targeted at bacterial indicators	Area-wide MS4 Program	June 30, 2012
	2.C.ii - Develop plan/schedule for implementation of modified program (as appropriate)	Establish plan/schedule for implementation of modified street sweeping program	Permittees	September 30, 2012
	2.C.iii – Implement modified street sweeping program	Compliance with established plan/schedule	Permittees	As required by 2.C.ii

Table 7-3. Implementation Plan for CBRP Element 2 – Specific BMPs

Activity	Milestones	Metrics	Responsibility	Complete by
2.D – Irrigation or Water Conservation Practices	2.D.i - Develop irrigation and water conservation BMP programs in coordination CBRP activity 1.A	Identify irrigation and water conservation BMP practices for implementation	Area-wide MS4 Program	December 31, 2012
	2.D.ii - Develop plan/schedule for implementation of BMP practices	Establish plan/schedule for implementation of BMP practices	Area-wide MS4 Program	March 31, 2013
	2.D.iii – Implement BMP practices	Compliance with established plan/schedule	Permittees	As required by 2.D.ii
2.E – Water Quality Management Plan Revision	2.E.i - Submit draft WQMP revision to RWQCB	Submit draft WQMP Guidance and Template revisions as required by permit	Area-wide MS4 Program	July 29, 2011[2]
	2.E.ii - Submit final WQMP to RWQCB	Submit final WQMP Guidance and Template as required by permit	Area-wide MS4 Program	Based on Regional Response to Draft[2]
	2.E.iii - Incorporate WQMP revisions into training programs	Establish revised training modules to incorporate new WQMP provisions	Area-wide MS4 Program	July 29, 2012[2]
	2.E.iv – Implement revised WQMP	WQMP approved by RWQCB	Permittees	Within 90 days of Board approval[2]
2.F –Septic System Management	2.F.i – Analyze relationship between location of septic systems and MS4 facilities to evaluate potential for impacts from septic systems on water quality under dry weather conditions.	Using existing septic system inventory, identify areas where septic systems have the potential to impact the MS4; establish plan to target areas for education, inspection and enforcement activities	Area-wide MS4 Program	January 29, 2012[2]
	2.F.ii – Develop educational materials and conduct public education activities to inform septic system owners on proper maintenance of septic systems	Complete targeted educational activities	Area-wide MS4 Program	January 29, 2012[2]
	2.F.iii – Conduct inspection and enforcement activities as needed, to ensure potential water quality impacts to MS4 are mitigated	Complete targeted inspections and implement enforcement actions as needed	Permittees	December 31, 2014
2.G - Reporting	2.G.i – Provide annual summary of BMP activities and recommendations for CBRP modification as identified by Element 2 implementation	MS4 permit Annual Report with incorporation of CBRP update	Area-wide MS4 Program	Annually by November 15

[1] - Program guidance is an MS4 permit requirement with no due date; the CBRP establishes a due date 18 months after permit adoption
[2] - Consistent with MS4 permit requirement

Table 7-4. Implementation Plan for CBRP Element 3 – Inspection Criteria[1]

Activity	Milestones	Metrics	Responsibility	Complete by
3.A – Reconnaissance of Tier 1 Nodes	3.A.i - Revise Watershed-wide Monitoring Program Monitoring Plan and QAPP, as needed	Revised Monitoring Plan and QAPP approved by RWQCB	Area-wide MS4 Program	June 30, 2011
	3.A.ii - Collect required data to prioritize Tier 2 reconnaissance activities	Prioritized Tier 2 reconnaissance activities with implementation schedule (it was assumed that Tier 2 reconnaissance activities would be divided into at least 3 priority categories (high = 1; medium = 2; low = 3)	Permittees	December 31, 2011
3.B – Reconnaissance of Tier 2 Nodes	3.B.i - Collect required Tier 2 data for Priority 1 areas	Identify MS4 drainage areas for inspection (Element 3.D)	Permittees	September 30, 2012
	3.B.ii - Collect required Tier 2 data Priority 2 areas	Identify MS4 drainage areas for inspection (Element 3.D)	Permittees	September 30, 2013
	3.B.iii - Collect required Tier 2 data for Priority 3 areas	Identify MS4 drainage areas for inspection (Element 3.D), if needed	Permittees	September 30, 2014
3.C – Inspection Strategy Implementation	3.C.i - Based on the findings of Elements 3.B.i, schedule and implement inspections, as needed, in Priority 1 sub-drainages.	Identify follow-up actions, including need for controllability assessments, and schedule for implementation of any next steps	Permittees	June 30, 2013
	3.C.ii - Based on the findings of Elements 3.B.ii, schedule and implement inspections, as needed, in Priority 2 sub-drainages.	Identify follow-up actions, including need for controllability assessments, and schedule for implementation of any next steps	Permittees	June 30, 2014
	3.C.iii - Based on the findings of Elements 3.B.ii, schedule and implement inspections, as needed, in Priority 3 sub-drainages.	Identify follow-up actions, including need for controllability assessments, and schedule for implementation of any next steps	Permittees	June 30, 2015
3.D – Controllability Assessments	3.D.i - Complete Controllability Assessments in Priority 1 areas, if needed	Identify site-specific or regional BMP solutions to address urban source; develop mitigation plan and schedule	Permittees	December 31, 2013
	3.D.ii - Complete Controllability Assessments in Priority 2 areas, if needed	Identify site-specific or regional BMP solutions to address urban source; develop mitigation plan and schedule	Permittees	December 31, 2014
	3.D.iii - Complete Controllability Assessments in Priority 3 areas, if needed	Identify site-specific or regional BMP solutions to address urban source; develop mitigation plan and schedule	Permittees	December 31, 2015
3.E – UAA[2, 3]	3.E.i - Meet with RWQCB to establish UAA development schedule and waterbody-specific data requirements	UAA schedule and waterbody specific approaches established	Permittees	January 31, 2012

Table 7-4. Implementation Plan for CBRP Element 3 – Inspection Criteria[1]

Activity	Milestones	Metrics	Responsibility	Complete by
	3.E.iv - Collect required data for UAAs in Santa Ana River at MWD Crossing drainage area	Complete data collection needs for Santa Ana River at MWD Crossing drainage area	Permittees	December 31, 2012
	3.E.v - Complete UAAs in Santa Ana River at MWD Crossing drainage area	Submit draft Santa Ana River at MWD Crossing drainage area UAAs to RWQCB	Permittees	June 30, 2013
	3.E.ii - Collect required data for UAAs in Santa Ana River at Pedley Avenue drainage area	Complete data collection needs for Santa Ana River at Pedley Avenue drainage area	Permittees	December 31, 2013
	3.E.iii - Complete UAAs in Santa Ana River at MWD Crossing drainage area	Submit draft Santa Ana River at Pedley Avenue drainage area UAAs to RWQCB	Permittees	June 30, 2013
	3.E.vi - Collect required data for Temescal Creek drainage area	Complete data collection needs for Temescal Creek drainage area	Permittees	December 31, 2014
	3.E.vii - Complete UAAs in Temescal Creek drainage area	Submit draft Temescal Creek drainage area UAAs to RWQCB	Permittees	June 30, 2015
3.F - Reporting	3.F.i – Provide annual summary of inspection activities and recommendations for CBRP modification as identified by Element 3 implementation	MS4 permit Annual Report with incorporation of CBRP update	Area-wide MS4 Program	Annually by November 15

[1] – The Element 3 CBRP Activity applicable to the Temescal Creek subwatershed is 3.E.
[2] – The scheduling of UAAs assumes RWQCB adoption of Basin Plan amendment in Spring 2011 and approval by the State Board and EPA Region 9 by Spring 2012.
[3] - UAAs in the Santa Ana River Reach 3 drainage area will be coordinated with San Bernardino County as needed.

Currently, the USEP (approved by the RWQCB in 2008) and the 2010 MS4 permit require the completion of semi-annual USEP reports to describe progress and plans associated with the implementation of urban source evaluation activities. Element 3 activities, described in Table 7-4, will replace the need to periodically identify source evaluation activities for implementation. Reports regarding the outcome of annual CBRP activities will be summarized in the MS4 permit Annual Reports due to the RWQCB each November. The Annual Report will also be used to report key decisions or recommendations for changes to CBRP implementation (see also Implementation Strategy, Section 8).

7.3.4 Element 4 – Regional Treatment

This element includes two key CBRP activities: Completion of the WAP, which will guide regional urban runoff management issues (including treatment needs); and regional treatment implementation, if required (Table 7-5). The WAP element is an MS4 permit requirements and the milestones, metrics and schedule are consistent with the permit. The need, locations for and extent of regional treatment of DWF is unknown at this time.

Updates to the 2005 BMP Retrofit Study coupled with the development and implementation of the WAP and the outcome of Element 3 activities, i.e., controllability assessments, will dictate the responsibility and schedule for implementation of regional treatment. An aggressive Element 3 schedule has been incorporated into this CBRP to facilitate the timing of regional treatment decisions so that a determination regarding when and where regional treatment is needed is made prior to the dry weather compliance date of December 31, 2015. Actual design and construction, which will likely require extensive regional coordination, funding, environmental permitting and even land acquisition, may occur beyond the 2015 compliance date. Decisions regarding plans for regional treatment will be summarized and reported in the Annual Report prepared under the MS4 permit.

Table 7-5. Implementation Plan for CBRP Element 4 – Regional Treatment

Activity	Milestones	Metrics	Responsibility	Complete by
4.A – Watershed Action Plan	4.A.i – Prepare WAP, including evaluation of retrofit opportunities (update of 2005 BMP retrofit study)	WAP submitted to RWQCB	Area-wide MS4 Program	January 29, 2013
	4.A.ii - Implement WAP	Compliance with established WAP and associated schedule	To be determined as part of WAP development	WAP dependent
4.B – Regional Treatment Implementation	4.B.i - Implement regional treatment recommendations identified by Element 4.A.i, as appropriate	Compliance with plan/schedule	To be determined by affected stakeholders	Project-specific
	4.B.ii - Implement BMP solutions identified under CBRP Activity 3.D	Compliance with plan/schedule established under CBRP Activity 3.D	To be determined by affected stakeholders	Project-specific
4.C - Reporting	4.C.i – Provide annual summary of activity involving regional treatment evaluations and decisions as identified by CBRP implementation	MS4 permit Annual Report with incorporation of CBRP update	Area-wide MS4 Program	Annually by November 15

Section 8 Implementation Strategy

8.1 Introduction

This CBRP describes required activities and expected effectiveness in reducing bacterial indicators to the extent possible with present information and evaluation techniques, but considerable uncertainties remain, especially when planning five years out to 2015 and given the state of science with regards to bacterial indicator management in urban environments (e.g., CREST 2007). Given this uncertainty, this section provides a compliance strategy to guide decision-making during the implementation process, and an iterative and adaptive management strategy for making course corrections to the CBRP as new data are collected and evaluated. Collectively, these two strategies comprise the implementation strategy for the CBRP.

8.2 Compliance Strategy

Figure 8-1 provides a flow chart that illustrates the overall compliance strategy associated with this CBRP. The CBRP is designed to mitigate, to the MEP, controllable urban sources of bacterial indicators that cause non-attainment of bacterial indicator water quality objectives at the watershed-wide compliance sites. In contrast, the CBRP is not intended to address bacterial indicator impairments attributable to non-MS4 sources (e.g., agricultural or water transfers) or to sources that cannot be accounted for, e.g., wildlife, or that arise from within the impaired waterbody (per Findings, Sections I.D, and II.E.1 of the MS4 permit). These types of sources of bacterial indicators are not the responsibility of the MS4.

Fundamental to the compliance strategy is the development and implementation of ordinances and specific BMPs targeted to reduce dry weather runoff and sources of bacterial indicators in the area (Figure 8-1, Box 1). In addition, the compliance strategy relies on the RWQCB's approval of UAAs for channels where REC uses are not occurring (Box 1).

To determine whether the MS4 is potentially responsible for a receiving water impairment, the CBRP includes a comprehensive source evaluation to locate sources of DWFs that contain levels of bacterial indicators that may cause or contribute to impairment of receiving waters (see Boxes 2 and 3). Data from the source evaluation will be used to make key decisions regarding the need for further source evaluation activities and/or potentially the selection of an appropriate mitigation approach for achieving compliance. Figure 8-1 illustrates when these key decision points occur (Boxes 4, 5a, 5d).

Where source evaluation data demonstrate that an MS4 discharge has a reasonable potential to cause or contribute to impairment of a receiving water, then the MS4 program will prioritize the contributing drainage area to attempt to isolate the source(s), and, as needed, develop controllability assessments and evaluate mitigation alternatives. Such a finding will be made if the analysis of flow and bacterial indicator data show reasonable potential that non-compliance in the receiving water downstream of an outfall or collection of outfalls is attributable to MS4 discharge. Reasonable potential would include a finding that human sources of bacterial indicators are present and persistent.

Prioritization of inspection activities is the second key decision point, and is especially relevant as all permittees are working with limited resources. Accordingly, where necessary within subwatersheds, the activities described in Boxes 5b through 5d will be prioritized based on relative contribution of bacterial indicator loads as well as the source of the bacteria, with the highest priority areas being those where human sources are present and persistent.

Where the source investigation identifies areas where mitigation of bacterial indicators is deemed necessary to achieve compliance and mitigation alternatives have been evaluated, a third decision point occurs. Selection of an alternative must include consideration of regional watershed and local jurisdictional planning goals. Accordingly, selection of an alternative will consider a wide range of issues, including, but not limited to:

- Technical feasibility to mitigate the bacterial indicator source;
- Regional water supply management plans and objectives;
- Environmental considerations (CEQA/NEPA analysis with consideration of issues ranging from in-stream flow and habitat to energy and greenhouse gas emissions, where appropriate);
- Offset and trading strategies with compliance objectives and metrics designed to be applicable within a larger area (e.g., a regional project in one area could provide offsets for overall bacterial indicator reductions needed within another area); and
- Economic feasibility, which will consider the capital cost and the long term operation and maintenance cost (which can in some instances exceed the original construction cost over the long-term).

Implementation of a selected alternative will typically require multi-stakeholder input from regulatory agencies, city councils, taxpayers, and groups with varied watershed interests ranging from water supply utilities to environmental advocacy groups.

Source evaluation studies may demonstrate that MS4 discharges are not the source of bacterial indicators that are causing or contributing to impairments to receiving waters (Box 6). This CBRP identifies two situations where this may occur:

- Data indicate that elevated bacterial indicators are caused by discharges not under the jurisdiction of the MS4 permittees, such as agricultural activities or water transfers (Box 7). In such cases, the information will be submitted to the RWQCB for action (Box 7a).

- Data cannot identify the specific source of bacterial indicators, which may include wildlife or *in-situ* sources, such as bacteria growing in sediments (Box 8). In this situation the MS4 permittees will be required to reduce bacterial indicators to the MEP, which includes implementation to the MEP of the elements in Box 1 (Box 8a). Where appropriate, periodic sampling will be conducted in future years to verify that MS4 discharges are not causing or contributing to any observed bacterial indicator impairments (Box 8b).

8.3 Iterative and Adaptive Management Strategy

This CBRP is based on: (1) the current level of knowledge of urban sources of bacterial indicators, and (2) current practices regarding how water is managed in the County. However, both of these foundational elements will be modified by the implementation of the MS4 permit and this CBRP. Specifically,

- Implementation of the inspection program described under Section 5.2.3 – Inspection Criteria will result in the collection of a large volume of new data regarding urban sources of DWF and bacterial indicators. These new data will greatly narrow down where mitigation of dry weather urban sources of flow or bacterial indicators is needed.

- Riverside County is required to evaluate MS4 facility retrofit and restoration opportunities, the results of which will enhance the evaluation and selection of regional or sub-regional BMP sites.

Given the expected changes in knowledge expected from MS4 permit and CBRP implementation, an iterative and adaptive management strategy has been built into the CBRP to provide opportunities to revise CBRP implementation, where appropriate. This approach includes the following elements:

- *Triennial Reports* – The TMDL requires these reports as part of TMDL implementation. As noted in Section 7, these reports will include an evaluation of CBRP implementation including progress towards meeting the urban wasteload allocation for dry weather conditions in the dry season. This evaluation may include recommendations for CBRP revisions to the RWQCB on how the CBRP to incorporate new data or programmatic requirements (e.g., as related to WAP implementation). Two Triennial Reports are required within the timeline of CBRP implementation:

    - *2013 Report* – This report will evaluate activities completed through 2012, which corresponds to progress on early CBRP activities and any important findings from ongoing data collection efforts that may result in recommendations for CBRP modification.

- *2016 Report – This report (due on February 15, 2016) will evaluate the overall effectiveness of CBRP implementation. The report will provide the means to determine if compliance with urban wasteload allocations for dry weather conditions has been achieved. The 2016 Report will also provide detailed descriptions of any additional BMPs planned and the schedule for implementation in the event data from source evaluation activities and the watershed-wide water quality monitoring program indicate that a reasonable potential still exists that the MS4 is contributing to non-compliance at the watershed-wide compliance sites.*

- *MS4 Permit Annual Reports* – As stated in Section 7.3.3, the MS4 permit Annual Report will include a summary of CBRP implementation activities. This summary will replace the semi-annual USEP reports as a USEP and MS4 permit reporting requirement. The MS4 Annual Reports will also include recommendations to the RWQCB for modifications to the CBRP if alternative approaches or actions are identified that will contribute to the goal to achieve compliance with urban wasteload allocation during dry weather conditions.

Successful CBRP implementation requires timely input and decisions by the RWQCB so that new information or outcomes (anything from completion of a UAA to DWF and bacterial indicator data) can be quickly integrated into the decision-making process. This is especially true for efficient implementation of the compliance strategy. Accordingly, the Principal Permittee will provide as much advanced notice as possible regarding the need for RWQCB approval of decisions associated with CBRP implementation and any recommendations for CBRP modification.

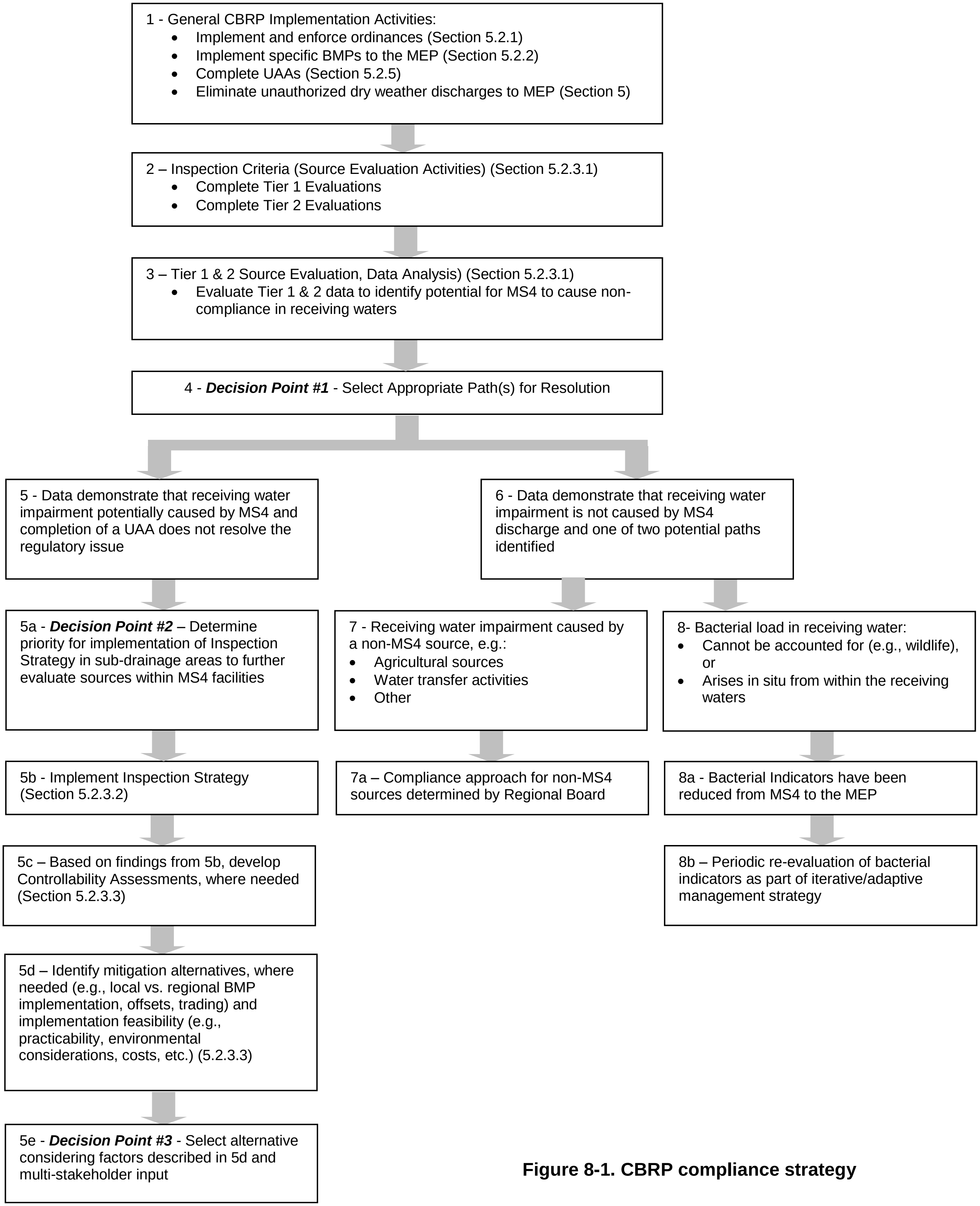


Figure 8-1. CBRP compliance strategy

Section 9
Wet Weather Condition CBRP

The requirements for development of a dry weather condition CBRP include establishing a schedule for developing a wet weather condition CBRP (November 1st through March 31st) to comply with urban wasteload allocations for indicator bacteria by December 31, 2025.

The RWQCB will issue the next MS4 permit on or after January 29, 2015 when the existing MS4 permit expires. Similar to the requirements contained in the existing MS4 permit, it is recommended that the next MS4 permit include a requirement to develop a CBRP for wet weather conditions. Given the expected challenges associated with compliance with wasteload allocations under wet weather conditions, the wet weather CBRP will require more time to develop. Accordingly, the earliest a draft wet weather condition CBRP will be submitted to the RWQCB for review will be 24 months following adoption of the next MS4 permit.

Section 10
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Appendix A
Glossary

The following glossary terms were adapted from Appendix 4, Glossary, Riverside County MS4 Permit, Order No. R8-2010-0033.

303(d) list - provides information on impaired waters, likely pollutant sources, and priority for TMDL development.

Bacterial Indicator - indicator for the potential presence of pathogens.

Basin Plan – Water Quality Control Plan developed by the Regional Board for the Santa Ana River watershed.

Bacterial Prioritization Score [BPS] – Scoring given to a Middle Santa Ana River subwatershed on the basis of frequency and magnitude of water quality objective exceedences and number of human detections over the course of the 2007-2008 USEP monitoring period.

Beneficial Use – Uses of water necessary for the survival or well being of man, plants, and wildlife. These uses of water serve to promote the tangible and intangible economic, social, and environmental goals. "Beneficial Uses" that may be protected include, but are not limited to: domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. Existing Beneficial Uses are those that were attained in the surface or ground water on or after November 28, 1975; and potential Beneficial Uses are those that would probably develop in future years through the implementation of various control measures. "Beneficial Uses" are equivalent to "Designated Uses" under federal law. [California Water Code Section 13050(f)] Beneficial Uses for the Receiving Waters are identified in the Basin Plan.

BMP [Best Management Practices] – Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the Pollution of Waters of the U.S. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of MS4 permits, BMPs are typically used in place of Numeric Effluent Limits.

Comprehensive Bacteria Reduction Plan [CBRP] – A plan presenting a long-term solution designed to achieve compliance with the WLAs by the dates specified in the MSAR Bacteria Indicator TMDL. This plan includes a description of the proposed BMPs and the documentation demonstrating that the BMPs are expected to attain the WLAs by the compliance dates when implemented.

DAMP [Drainage Area Management Plan] – The DAMP is a programmatic document developed by the Permittees and approved by the Executive Officer that outlines the major programs and policies that the Permittees individually and/or collectively implement to manage Urban Runoff in the Permit Area.

De Minimus Permit – General De Minimus Permit for Discharges to Surface Waters, Order NO. R8-2009-0003, NPDES No. CAG 998001.

Dry Season – For the CBRP, the dry season is defined by the period from April 1 through October 31 of each year.

Dry Weather Flow [DWF] – Flow in MS4 drains or receiving waterbodies during dry weather in either wet or dry seasons.

Dry Weather – a condition where daily rainfall does not exceed 0.1 inches.

Illegal Discharge –Defined at 40 CFR 122.26(b)(2) as any discharge to the MS4 that is not composed entirely of storm water, except discharges pursuant to an NPDES permit, discharges that are identified in Section VI.A. of this Order, and discharges authorized by the Executive Officer.

Illicit Connection – Any connection to the MS4 that is prohibited under local, state, or federal statutes, ordinances, codes, or regulations. The term Illicit Connection includes all non storm-water discharges and connections except discharges pursuant to an NPDES permit, discharges that are identified in Section V, Effluent Limitations and Discharge Specifications, of this Order, and discharges authorized by the Executive Officer.

Impaired Waterbody / Impaired Waters – Section 303(b) of the CWA requires each of California's Regional Water Quality Control Boards to routinely monitor and assess the quality of waters of their respective regions. If this assessment indicates that Beneficial Uses are not met, then that waterbody must be listed under Section 303(d) of the CWA as an Impaired Waterbody. The 2006 water quality assessment found a number of water bodies as Impaired pursuant to Section 303(d). The Santa Ana River, Reach 3 is listed as an impaired waterbody for pathogens.

Impressions – The most common measure is "gross impressions" that includes repetitions. This means if the same person sees an advertisement or hears a radio or sees a TV advertisement a thousand times, that will be counted as 1000 Impressions.

LA – [Load Allocations] – Distribution or assignment of TMDL Pollutant loads to entities or sources for existing and future Non-Point Sources, including background loads.

Local Implementation Plan (LIP) – Document describing an individual Permittee's procedures, ordinances, databases, plans, and reporting materials for compliance with the MS4 Permit.

Low Impact Development (LID) – Comprises a set of technologically feasible and cost-effective approaches to storm water management and land development that combines a hydrologically functional site design with Pollution Prevention measures to compensate for land development impacts on hydrology and water quality. LID techniques mimic the site's predevelopment hydrology by using site design techniques that store, infiltrate, evapotranspire, bio-treat, bio-filter, bio-retain or detain runoff close to its source.

Major Outfall – Outfalls from MS4 systems expected to contribute a measurable amount of dry weather flow based on desktop GIS analysis of upstream drainage area. It is expected that this desktop GIS analysis is moderately comparable with the NPDES Permit definition of a major outfall as an outfall "with a pipe diameter of 36 inches or greater or drainage areas draining 50 acres or more".

Maximum Extent Practicable [MEP] – Standard for implementation of storm water management programs. Section 402(p)(3)(B)(iii) of the Clean Water Act requires that municipal storm water permits "shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques, and system design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants."

In practice, compliance with the MEP standard is evaluated by how well the Permittees implement the "minimum measures" identified by EPA, including: (1) Public education and outreach on storm water impacts; (2) Public involvement/participation; (3) Illicit discharge detection and elimination; (4) Construction site storm water runoff control; (5) Post-construction storm water management in new development and redevelopment; and (6) Pollution prevention/good housekeeping for municipal operations. Collectively, these minimum measures are often referred to as "Best Management Practices" or BMPs. The MEP standard does not require Permittees to reduce pollutant concentrations below natural background levels, nor does it require further reductions where pollutant concentrations in the receiving water already meet water quality objectives. In implementing the MEP standard, it is appropriate for Permittees to prioritize their resource allocation to address the storm water pollution problems that pose the greatest and most immediate threat to human health or the environment.

MEP is a technology-based standard established by Congress in CWA section 402(p)(3)(B)(iii) that operators of MS4s must meet. Technology-based standards establish the level of pollutant reductions that dischargers must achieve, typically by treatment or by a combination of source control and treatment control BMPs. MEP generally emphasizes pollution prevention and source control BMPs primarily (as the first line of defense) in combination with treatment methods serving as a backup (additional line of defense). MEP considers economics and is generally, but not necessarily, less stringent than BAT. A definition for MEP is not provided either in the statute or in the regulations. Instead the definition of MEP is dynamic and will be defined by the following process over time: municipalities propose their definition of

MEP by way of their urban runoff management programs. Their total collective and individual activities conducted pursuant to the urban runoff management programs becomes their proposal for MEP as it applies both to their overall effort, as well as to specific activities (e.g., MEP for street sweeping, or MEP for MS4 maintenance). In the absence of a proposal acceptable to the Regional Board, the Regional Board defines MEP.

In a memo dated February 11, 1993, entitled "Definition of Maximum Extent Practicable," Elizabeth Jennings, Senior Staff Counsel, SWRCB addressed the achievement of the MEP standard as follows:

“To achieve the MEP standard, municipalities must employ whatever Best management Practices (BMPs) are technically feasible (i.e., are likely to be effective) and are not cost prohibitive. The major emphasis is on technical feasibility. Reducing pollutants to the MEP means choosing effective BMPs, and rejecting applicable BMPS only where other effective BMPS will serve the same purpose or the BMPS would not be technically feasible, or the cost would be prohibitive. In selecting BMPS to achieve the MEP standard, the following factors may be useful to consider:

a. Effectiveness: Will the BMPS address a pollutant (or pollutant source) of concern?

b. Regulatory Compliance: Is the BMP in compliance with storm water regulations as well as other environmental regulations?

c. Public Acceptance: Does the BMP have public support?

d. Cost: Will the cost of implementing the BMP have a reasonable relationship to the pollution control benefits to be achieved?

e. Technical Feasibility: Is the BMP technically feasible considering soils, geography, water resources, etc?

The final determination regarding whether a municipality has reduced pollutants to the maximum extent practicable can only be made by the Regional or State Water Boards, and not by the municipal discharger. If a municipality reviews a lengthy menu of BMPs and chooses to select only a few of the least expensive, it is likely that MEP has not been met. On the other hand, if a municipal discharger employs all applicable BMPs except those where it can show that they are not technically feasible in the locality, or whose cost would exceed any benefit derived, it would have met the standard. Where a choice may be made between two BMPS that should provide generally comparable effectiveness, the discharger may choose the least expensive alternative and exclude the more expensive BMP. However, it would not be acceptable either to reject all BMPs that would address a pollutant source, or to pick a BMP base solely on cost, which would be clearly less effective. In selecting BMPs the municipality must make a serious attempt to comply and practical solutions may not be lightly rejected. In any case, the burden would be on the municipal discharger to show compliance with its permit. After selecting a menu of BMPs, it is the responsibility of the discharger to ensure that all BMPs are implemented."

MS4 – [Municipal Separate Storm Sewer System] – A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, natural drainage features or channels, modified natural channels, man-made channels, or storm drains): (i) Owned or operated by a State, city town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to Waters of the U.S.; (ii) Designated or used for collecting of conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the POTW as defined at 40 CFR 122.2.

New Development – The categories of development identified in Section XI.D of this Order. New Development does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of a facility, nor does it include emergency New Development required to protect public health and safety. Dischargers should confirm with Regional Board staff whether or not a particular routine maintenance activity is subject to this Order.

Non-Point Source – Refers to diffuse, widespread sources of Pollution. These sources may be large or small, but are generally numerous throughout a watershed. Non-Point Sources, include but are not limited to urban, agricultural or industrial area, roads, highways, construction sites, communities served by septic systems, recreational boating activities, timber harvesting, mining, livestock grazing, as well as physical changes to stream channels, and habitat degradation. Non-Point Source Pollution can occur year round any time rainfall, snowmelt, irrigation, or any other source of water runs over land or through the ground, picks up Pollutants from these numerous, diffuse sources and deposits them into rivers, lakes and coastal waters or introduces them into groundwater.

National Pollutant Discharge Elimination System (NPDES) – Permits issued under Section 402(p) of the CWA for regulating discharge of Pollutants to Waters of the U.S.

Point Source – Any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operations, landfill leachate collection systems, vessel, or other floating craft from which pollutants are or may be discharged.

POTW – [Publicly Owned Treatment Works] – Wastewater treatment facilities owned by a public agency.

Report of Waste Discharge [ROWD] – Application for issuance or re-issuance of WDRs.

Non-structural BMPs – In general, activities or programs to educate the public or provide low cost non-physical solutions, as well as facility design or practices aimed to limit the contact between Pollutant sources and storm water or authorized Non-Storm Water. Examples include: activity schedules, prohibitions of practices, street sweeping, facility maintenance, detection and elimination of IC/IDs, and other non-structural measures. Facility design (structural) examples include providing attached lids to trash containers, canopies for fueling islands, secondary containment, or roof or awning over material and trash storage areas to prevent direct contact between water and Pollutants.

Structural BMPs – Physical facilities or controls that may include secondary containment, treatment measures, (e.g. low flow diversion, detention/retention basins, and oil/grease separators), run-off controls (e.g., grass swales, infiltration trenches/basins, etc.), and engineering and design modification of existing structures.

Total Maximum Daily Load [TMDL] - The TMDL is the maximum amount of a pollutant that can be discharged into a water body from all sources (point and non-point) and still maintain water quality standards. Under Clean Water Act Section 303(d), TMDLs must be developed for all water bodies that do not meet water quality standards after application of technology based controls.

Waste Load Allocations (WLAs)– Maximum quantity of Pollutants a discharger of waste is allowed to release into a particular waterway, as set by a regulatory authority. Discharge limits usually are required for each specific water quality criterion being, or expected to be, violated. Distribution or assignment of TMDL Pollutant loads to entities or sources for existing and future Point Sources.

Water Quality Objectives – Means the numeric or narrative limits or levels of water quality constituents or characteristics which are established for the reasonable protection of Beneficial Uses of water or the prevention of Nuisance within a specific area. [California Water Code Section 13050(h)]

Water Quality Standards –The water quality goals of a waterbody (or a portion of the waterbody) designating Beneficial Uses to be made of the water and the Water Quality Objectives or criteria necessary to protect those uses. These standards also include California's anti-degradation policy.

Watershed Action Plan (WAP) – Integrated plans for managing a watershed that include consideration of water quality, hydromodification, water supply and habitat protection. The Watershed Action Plan integrates existing watershed based planning efforts and incorporates watershed tools to manage cumulative impacts of development on vulnerable streams, preserve structure and function of streams, and protect source, surface and groundwater quality and water supply in the Permit Area. The Watershed Action Plan should integrate Hydromodification and water quality management strategies with land use planning policies, ordinances, and plans within each jurisdiction.

Wet Season - For the CBRP, the wet season is defined by the period from November 1 to March 31, of each year.