Middle Santa Ana River Pathogen TMDL BMP Implementation Project - Final Grant Report

April 14, 2010

CDM

ON BEHALF OF

Santa Ana Watershed Project Authority

San Bernardino County Stormwater Program

County of Riverside

Cities of Chino Hills, Upland, Montclair, Ontario, Rancho Cucamonga, Rialto, Chino, Fontana, Norco, Corona, Riverside, Pomona, and Claremont

Agricultural Operators

Final Grant Report - Middle Santa Ana River Pathogen TMDL BMP Implementation Project

Section 1 - Project Summary

The *Middle Santa Ana River Pathogen TMDL BMP Implementation* grant project ("Grant Project") was initiated January 2007 and completed March 2010. Most work was completed by December 2008 before work was suspended due to State of California budget concerns. The following sections provide an overview of the work completed under this Grant Project. Subsequent sections provide additional information.

1.1 Purpose

Various waterbodies in the Middle Santa Ana River (MSAR) watershed are listed on the state 303(d) list of impaired waters due to high levels of fecal coliform bacterial indicators. The MSAR Bacterial Indicator TMDL ("Bacteria TMDL") was adopted by the Santa Ana Regional Water Quality Control Board (Regional Board) in 2005. Following State Water Resource Control Board (SWRCB) and EPA Region 9 approval, the Bacteria TMDL became effective on May 16, 2007.

In anticipation of EPA approval of the Bacteria TMDL, the Santa Ana Watershed Project Authority (SAWPA), in cooperation with the San Bernardino County Flood Control District (SBCFCD) and Riverside County Flood and Water Conservation District (RCFCWCD) and on behalf of the Task Force submitted a Proposition 40 grant proposal to SWRCB to support implementation of the Bacteria TMDL. The state approved the grant proposal 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. Within this framework the Grant Project focused on developing a tool to identify sources of bacterial contamination in the MSAR watershed and pilot testing Best Management Practice (BMP) technologies designed to reduce bacteria in storm drains. The results of these activities were then be used to develop a BMP control strategy and prioritization for clean-up activities during dry weather.

1.2 Project Scope and Goals

As stated in the Project Assessment and Evaluation Plan (PAEP), the project included the following four basic activities or tasks:

- *Task 1: Characterize Pathogen Pollution*: Develop a water quality monitoring plan (including a Quality Assurance Project Plan (QAPP)) that meets requirements identified in the Bacteria TMDL. Develop and execute an Urban Source Evaluation Plan (USEP) to identify source(s) of *E. coli* using advanced molecular analytical

methods. Prepare draft and final reports summarizing results of all sampling and analysis performed as part of the water quality monitoring plan and the USEP.

- *Task 2: Implement BMP Pilot Study* - Coordinate with project participants to select a minimum of three pilot sites to test BMPs for controlling pathogens in dry weather flows. Such BMPs may include direct source control, retention/detention systems, active or passive in-line treatment systems, and interception/diversion strategies. Perform before and after water quality monitoring studies to assess the relative effectiveness of the selected BMP strategies and prepare a draft and final report summarizing the results.

- *Task 3: Develop a BMP Control Strategy and Prioritization Plan* – Using results and recommendations from Task 1 and Task 2, develop and submit a plan to implement additional BMPs to further reduce bacterial indicator concentrations in the MSAR watershed by expanding the most cost-effective control strategies to other locations that have been identified as significant sources of *E. coli* bacteria.

- *Task 4: Prepare and Distribute Materials to Increase Public Awareness* – Develop a plan to increase public awareness regarding bacterial indicator sources and related public health issues and submit it to the Grant Manager. Upon approval of the concept materials, publish and distribute the materials and prepare a report summarizing those activities.

1.3 Summary of Actions Completed

The Grant Project completed a substantial number of actions during project execution between 2007 and 2010 (see list of deliverables in Section 9):

- *Monitoring Plan and Quality Assurance Project Plan* – The Grant Project supported the development of a Regional Board-approved Monitoring Plan and QAPP (first edition of both documents completed in 2007; documents were revised in 2008) to support all monitoring activities, e.g., watershed-wide monitoring, urban source evaluation monitoring and BMP pilot testing. These documents provide the basis for ongoing post-grant funded TMDL implementation activities.

- *Monitoring Programs* – The Grant Project supported the development and implementation of TMDL-related monitoring programs to satisfy Bacteria TMDL requirements and gather data to evaluate sources of bacterial contamination. Monitoring programs supported included :

  - *Watershed-wide Monitoring Program* – Monitoring conducted at selected Regional Board-approved locations to evaluate Bacteria TMDL compliance. Development and implementation of this program satisfied a specific TMDL requirement.

- *Urban Source Evaluation Plan Monitoring Program* - Advanced molecular methods coupled with bacterial indicator monitoring to evaluate bacterial contamination sources in urban discharges.

- *Data Analysis Report* – Project participants developed a comprehensive report in 2009, which provided an analysis of the data generated by the monitoring programs described above for samples collected during the dry season of 2007 and wet season of 2007-2008. This analysis was used to develop a risk-based prioritization approach to direct follow-up source evaluation studies and water quality mitigation activities.

- *Urban Source Evaluation Plan* – Project-related information was used to prepare the USEP (2008), a TMDL-specific requirement for urban dischargers which was approved by the Regional Board. The purpose of the USEP was to identify specific activities, operations, and processes in urban areas that contribute bacterial indicators to MSAR waterbodies.

- *BMP Pilot Study* - The project team implemented the BMP Pilot Study to evaluate the effectiveness of existing BMPs in the MSAR watershed. This information supported development of the BMP Control Strategy and Prioritization Plan (CSPP) (2010). The monitoring element of this study was incorporated in the Regional Board-approved Monitoring Plan and QAPP.

- *BMP Control Strategy and Prioritization Plan (CSPP)* – Using data developed by the monitoring programs and BMP Pilot Study and data available from other sources, the CSPP was developed as a final Grant Project deliverable to guide future TDML implementation activities. The CSPP provides information on (1) BMP efficiency, cost, and effectiveness in reducing bacterial indicators during dry weather; and (2) a prioritization plan for implementation of technical and regulatory activities to support Bacteria TMDL compliance for dry weather.

- *Public Awareness Plan and Public Awareness Materials* – Following development of the Public Awareness Plan (2009), project participants developed educational materials (DVD, broadcast program) to guide homeowners on residential BMPs that can reduce bacterial loads to the MS4.

1.4 Techniques Used

The Grant Project relied on the following techniques to develop project deliverables:

- Standard water quality monitoring techniques for collection of bacterial indicator data, including sample collection and laboratory methods, consistent with Surface Water Ambient Monitoring Plan (SWAMP) requirements.

- Advanced molecular methods to identify hot spots for bacterial contamination derived from human, bovine or domestic canine sources.

- Standard data analysis techniques for the statistical analysis of water quality data generated by various monitoring programs.
- Development of a new risk-based approach to prioritize implementation actions ranging from source evaluation studies to implementation of BMPs.
- Use of existing BMPs and newly-installed proprietary BMPs to evaluate the effectiveness of selected BMPs to reduce bacterial indicators.
- Rigorous stakeholder process in a public forum to keep local MSAR watershed stakeholders informed regarding Bacteria TMDL implementation activities.
- Collaboration with the local Public Broadcasting System (PBS) affiliate (KCVR) to develop educational materials that can be broadcast on television (as a program or as a commercial) or shown at community event or schools (via a DVD).

1.5 Project Partners

The Grant Project was administered by SAWPA on behalf of the Task Force and executed with its flood control agency project partners – RCFCWCD and SBCFCD. The flood control agencies, which are the MS4 permittees within the MSAR watershed, represented not only their agencies, but co-permittees to the MS4 permits.

Implementation of the Grant Project was coordinated in a public forum with the MSAR Watershed TMDL Task Force ("Task Force"). A key objective of this Task Force is to coordinate Bacteria TMDL implementation activities in the MSAR through the development and implementation of feasible and cost effective strategies to meet water quality objectives. This Task Force includes key watershed stakeholders, including:

- U.S. Forest Service
- Santa Ana Regional Board
- Riverside County Flood Control & Water Conservation District
- San Bernardino County Flood Control District
- County of Riverside
- City of Chino
- City of Chino Hills
- City of Claremont
- City of Corona
- City of Fontana
- City of Montclair
- City of Norco
- City of Ontario
- City of Pomona
- City of Rancho Cucamonga
- City of Rialto
- City of Riverside
- City of Upland\
- Chino Basin Watermaster Agricultural Pool
- Milk Producers Council

Section 2 – Monitoring and Management Practices

All monitoring activities implemented by the Grant Project are fully documented in the Regional Board-approved Monitoring Plan and QAPP (see Section 9 for list of deliverables). These activities all occurred in the MSAR watershed within the Santa Ana River Basin in southern California (Figure 2-1). Following is a summary of those activities – their purpose and location information regarding where monitoring took place.

2.1 Watershed-wide Monitoring Program

The purpose of the Watershed-Wide Monitoring (WWM) Program is to measure compliance with numeric targets established by the Bacteria TMDL. These numeric targets are derived from Basin Plan objectives established to protect the REC-1 beneficial use. Compliance sites were selected based on two key criteria:

- The sites should be located on waterbodies that are impaired and subject to Bacteria 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, the project participants established six WWM sites as Bacteria TMDL water quality compliance sites. Table 2-1 provides the Site ID (provided by the Regional Board) and the specific location of each WWM site. Figure 2-1 (green squares) illustrates the location of each site within the MSAR watershed. In 2009, with Regional Board approval the Icehouse Canyon Creek site was removed as a WWM site. The Monitoring Plan and QAPP provide specific information regarding each sample site and the methods used to collect samples (see Section 9 for list of deliverables).

Table 2-1. Watershed-Wide Monitoring Program Sample Locations

Site ID	Site Description	Longitude	Latitude
WW-C1	Icehouse Canyon Creek	-117.6290	34.2604
WW-C3	Prado Park Lake at Lake Outlet	-117.6473	33.9400
WW-C7	Chino Creek at Central Avenue	-117.6884	33.9737
WW-M5	Mill Creek at Chino-Corona Rd	-117.6156	33.9460
WW-S1	Santa Ana River Reach 3 @ MWD Crossing	-117.4479	33.9681
WW-S4	Santa Ana River Reach 3 @ Pedley Ave	-117.5327	33.9552

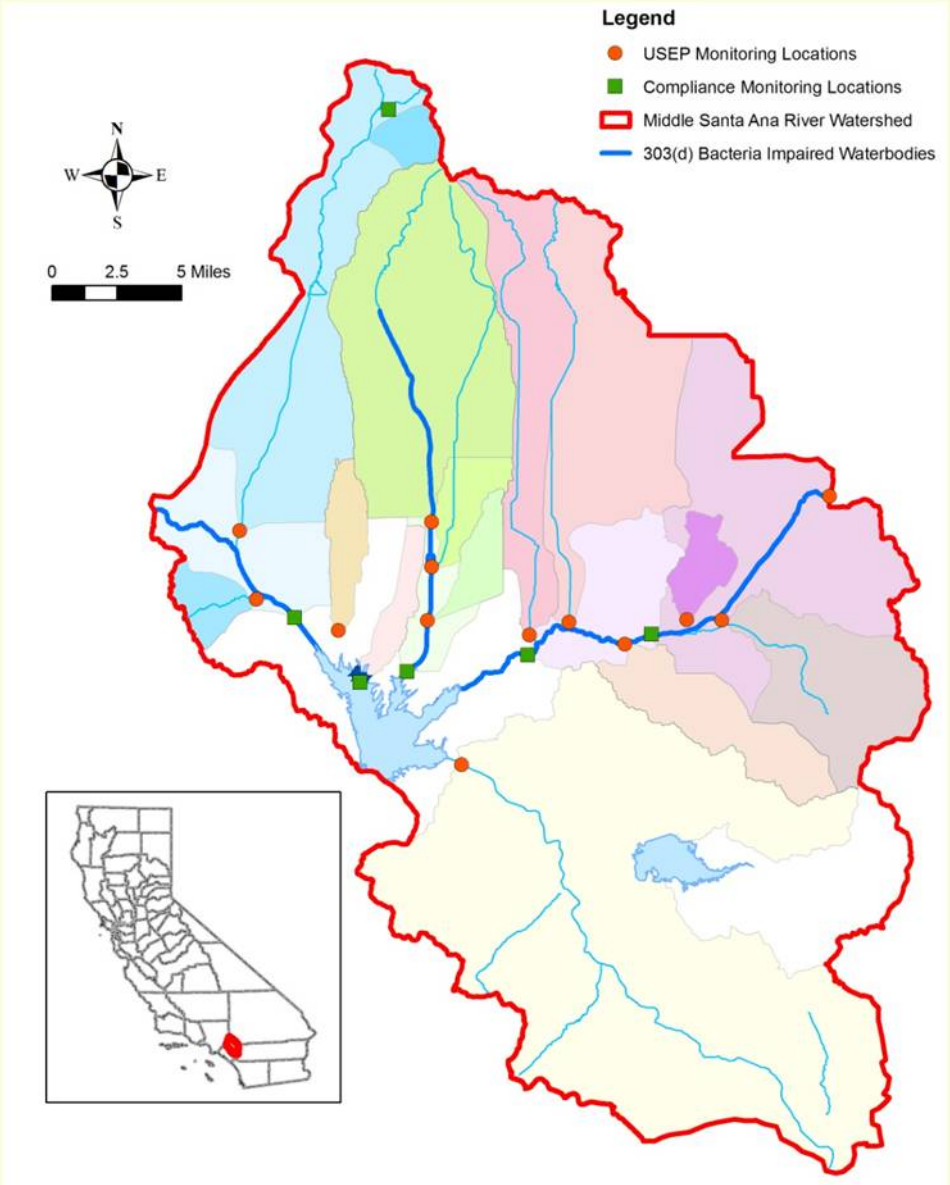

Figure 2-1. Location of Urban Source Evaluation Plan (USEP) Monitoring sites (orange dots) relative to the Watershed-wide Compliance Monitoring sample locations (green squares)

2.2 Urban Source Evaluation Plan Monitoring Program

The primary goal of the USEP Monitoring Program was to identify sources of bacterial contamination and use these data as a basis for guiding efforts to reduce bacteria sources derived from urban discharges covered by MS4 permits. The following criteria provided the basis for sample site selection:

- Sample site is in a waterbody that is tributary to an impaired waterbody;

- Sample site has the potential to contribute a high percentage of the flow (volumetrically) to an impaired water;
- Sample site is close to the base of its watershed so that it characterizes the majority of flow reaching the impaired water from the site's watershed;
- Flow at the selected sample site should not include any permitted treated effluent discharge; and
- Flow at the selected sample site should generally occur under both dry and wet weather conditions.

Based on these criteria, project participants selected thirteen sites for monitoring in 2007-2008. Table 2-2 provides the Site ID (as agreed to by the project participants) and the specific location for each sample location. Figure 2-1 (orange circles) illustrates the location of each USEP Monitoring Program and where these sites are located relative to WWM sites. The Monitoring Plan and QAPP provide specific information regarding each sample site and the methods used to collect samples (see Section 9 for list of deliverables).

Table 2-2. Urban Source Evaluation Monitoring Program Site Locations

Site ID	Site Description	Longitude	Latitude
Santa Ana River, Reach 3			
US-SAR	Santa Ana River (SAR) at La Cadena Drive	-117.33065	34.04453
US-BXSP	Box Springs Channel at Tequesquite Avenue	-117.40272	33.97592
US-SNCH	Sunnyslope Channel near confluence with SAR	-117.42630	33.97620
US-ANZA	Anza Drain near confluence with Riverside effluent channel	-117.46795	33.96212
US-SSCH	San Sevaine Channel in Riverside near confluence with SAR	-117.50555	33.97430
US-DAY	Day Creek at Lucretia Avenue	-117.53192	33.96708
US-TEM	Temescal Wash at Lincoln Avenue	-117.57723	33.89412
Chino Creek, Reach 1			
US-CYP	Cypress Channel at Kimball Avenue	-117.66043	33.96888
Chino Creek, Reach 2			
US-SACH	San Antonio Channel at Walnut Ave	-117.73417	34.01703
US-CCCH	Carbon Canyon Creek Channel at Pipeline Avenue	-117.71585	33.98617
Mill Creek (Prado Area)			
US-CHRIS	Chris Basin Outflow (Lower Deer Creek)	-117.59802	34.00498
US-CLCH	County Line Channel near confluence with Cucamonga Creek	-117.60063	33.97492
Cucamonga Creek, Reach 1			
US-CUC	Cucamonga Creek at Highway 60 (Above RP1)	-117.59950	34.07007

2.3 BMP Pilot Study Monitoring

The primary purpose of the BMP Pilot Study was to evaluate the effectiveness of selected BMPs in removing or reducing bacterial indicators in urban runoff. Bacteria

removal effectiveness data is limited for the MSAR watershed. This effort provided site-specific data to support local Bacteria TMDL implementation. BMP monitoring locations were selected in collaboration with stakeholders. Key criteria for site selection included:

- Need for locations with structural BMPs installed for which bacteria removal effectiveness is generally unknown;
- Need for locations where proprietary BMPs could be tested;
- Site has relatively easy access for sampling dry weather and wet weather flows; and
- Site owner (typically private) willing to provide formal approval for installing or monitoring BMPs located within their property or right-of-way.

Five sites were selected for this study. Three sites already had BMPs installed and operating. Proprietary BMPs were installed at two sites in existing drain inlets by the vendor Kristar (at their expense). Table 2-3 summarizes BMP Pilot Study site locations and monitoring characteristics. Figure 2-2 depicts the location of the BMP sites in the MSAR watershed. The Monitoring Plan and QAPP provide specific information regarding each sample site and the methods used to collect samples (see Section 9 for list of deliverables).

Table 2-3. BMP Effectiveness Monitoring Program Site Characteristics

BMP Type	Site Name (Site ID)	Location	Installed for Project?[1]	Wet Weather	Dry Weather
Bioswale	Northern Bioswale Segment #1 (BMP-BIO1)	Within Dos Lagos commercial and residential development, south of Cajalco Rd. & east of Temescal Canyon Rd. in the City of Corona	No	X	X
Extended Detention Basin	Sycamore Canyon Wilderness Park (BMP-EDB1)	Within Sycamore Canyon Wilderness Park adjacent to industrial and commercial area, southeast part of City of Riverside	No	X	X
Proprietary Device	Up-Flo Filter (BMP-UF1)	Drain inlet located on Canyon Lake Drive North near Outrigger Drive, City of Canyon Lake, access approved by Canyon Lake Property Owners Association	Yes	X	X
	Perk-Flo Filter (BMP-PF1)	Drain inlet located near 655 E. Third Street, City of San Bernardino	Yes	X	
	Contech StormFilter (BMP-SF1)	Parking lot adjacent to commercial office buildings at 2850 E. Inland Empire Blvd, City of Ontario	No	X	

[1] – BMPs installed for the project were proprietary and installed at the expense of the vendor

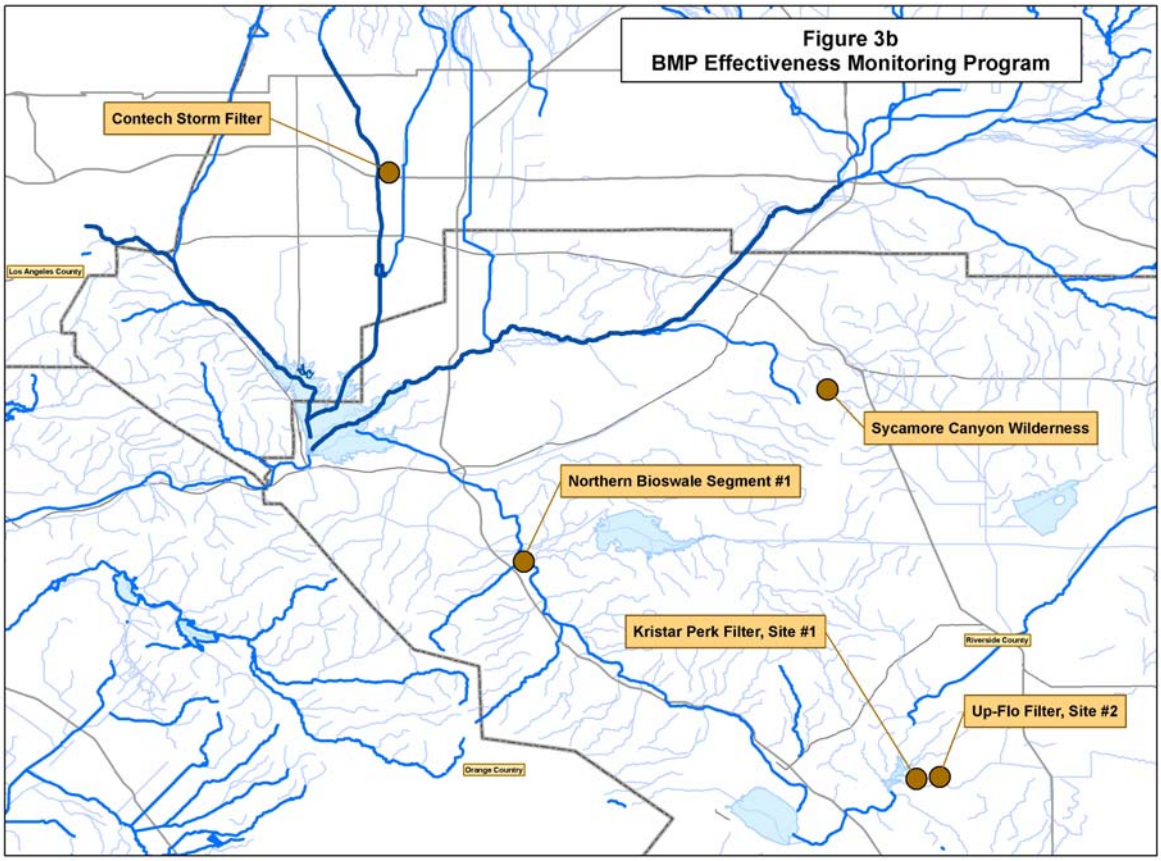

Figure 2-2. Location of BMP Pilot Studies in MSAR watershed area (adapted from Monitoring Plan)

Section 3 – Project Performance

The PAEP established project goals and desired outcomes for the project tasks. The desired outcome for each project task was achieved. This outcome has provided substantial benefit to regional efforts to implement the Bacteria TMDL. These benefits are discussed in more detail in Section 4 - Lessons Learned.

Table 3-1 provides a summary of the project goals and desired outcomes established at the beginning of the project (from PAEP). For each project goal and outcome, the following information is provided: (1) project-related results (including reference to applicable project deliverables; and (2) quantifiable benefits, including specific examples of where benefits may be reviewed further in project deliverables..

Project Goals	Desired Outcome	Project Result	Quantifiable Benefits
Identify the species of origin for *E. coli* bacteria in the impaired reaches of the Middle Santa Ana River Watershed.	Determine the relative abundance of *E. coli* contributed by human and nonhuman species.	• Regional Board-approved Watershed-based Monitoring Plan and QAPP (2007, revised in 2008). • USEMP provided data that documented the relative abundance of *E. coli* contributed by human and nonhuman species.	• Data Analysis Report (DAR) documented results of 2007-2008 WWM and USEMP monitoring activities. • Findings allowed Task Force to rank USEMP sites based on frequency and magnitude of E. coli concentrations coupled with human and non-human bacteria sources (see Sections 5.9 and 5.11, DAR).Two key sites identified for targeting mitigation activities (Box Springs and Chris Basin). • Results led to separate study that identified human bacteria source in Box Springs, which was mitigated by responsible jurisdictions.
	Identify locations with disproportionate contribution to total *E. coli* load in the impaired reaches.	USEMP generated data that identified locations contributing disproportionate loads to impaired reaches.	• Data Analysis Report (DAR) documented results of 2007-2008 WWM and USEMP monitoring activities. • Findings allowed Task Force to rank USEMP sites based on frequency/magnitude of *E. coli* concentrations coupled with human and non-human bacteria sources (see Sections 5.9 and 5.11, DAR). • Data used to prioritize USEMP sites for additional source evaluation based on where REC-1 activity has highest potential of occurring.
	Evaluate relationship between measured bacterial loads and land use types.	USEMP and WWM data used to describe the relationship between bacteria load and land use.	• Relationship between land use and bacteria evaluated in DAR (see Section 5.12). • For *E. coli*, positive correlations observed for commercial/industrial and residential land uses
Evaluate cost effectiveness of various alternative BMP control strategies for reducing bacterial concentrations in dry weather conditions.	Identify several different BMP control strategies believed to be effective in reducing pathogen concentrations in urban runoff.	CSPP used the information from the BMP Pilot Study and other data sources to develop a BMP control strategy (See CSPP, in particular, Sections 4 and 5).	• CSPP provides specific strategies for each subwatershed that drains to the TMDL compliance sites (e.g., see Tables 5-1 through 5-5). • Strategies range from technical solutions, e.g., outfall-specific vs. regional treatment, to implementation of regulatory options, e.g, development of UAAs (e.g., CSPP Table 5-6 lists potential reaches for UAA development).
	Determine the true effectiveness of the BMP control strategies in actually reducing bacterial concentrations.	The BMP Pilot Study provides data on true effectiveness of BMPs in the MSAR area. CSPP summarizes and evaluates this information within the context of other available BMP effectiveness information for bacteria.	• BMP Pilot Study showed that bioswales provided the most effective treatment, but only during dry weather. • Proprietary devices provided limited to no bacteria reduction. • CSPP included summary of BMP effectiveness observed in other regions.
	Determine the efficiency (cost effectiveness) of the pilot-scale BMP projects and evaluate the potential for watershed-wide implementation.	CSPP uses BMP Pilot Study data coupled with published data and regional data from other counties to provide basis for determining BMP cost effectiveness in the context of compliance efficiency.	• CSPP Table 3-22 provides an analysis of compliance efficiency for different types of BMPs that may be used to support compliance with Bacteria TMDL. • Data indicate that infiltration and subsurface flow wetlands are most efficient from a compliance standpoint.

Project Goals	Desired Outcome	Project Result	Quantifiable Benefits
To reduce the concentration of indicator pathogen bacteria to safe and acceptable levels in the Middle Santa Ana River Watershed.	Develop a plan to implement BMPs for reducing bacterial concentrations in impaired waterbodies based on a priority system that addresses the most significant and threatening controllable sources first.	• USEMP data (see DAR) supported development of the USEP – a Bacteria TMDL compliance requirement. • USEP includes risk-based prioritization approach that was used to support development of the CSPP. • CSPP takes the USEP-based approach to develop a subwatershed level strategy for achieving compliance with the Bacteria TMDL during dry weather.	• DAR provides quantitative basis for prioritizing areas for TMDL implementation based on risk of exposure to bacterial indicators. Prioritization based on a combination of the following quantified results (in particular see DAR Sections 5.9 and 5.11): o Frequency and magnitude of REC-1 water quality objective exceedance; and o Frequency of human source bacteria detections. • CSPP provides a strategy for reducing bacterial concentrations in impaired waters on a priority basis during dry weather, e.g., WWM data indicate that the Chino and Mill-Cucamonga Creek subwatersheds are priority areas for BMP activities. Each of these areas are further prioritized based on USEMP data (see DAR).
To increase public awareness of the problems associated with excess bacterial loads in local stream segments and methods to such loads from residences, commercial establishments, parks and recreation areas	(1) To reduce controllable non-point source flows from excessive landscape irrigation. (2) To reduce bacterial concentrations in controllable non-point source flows.	• Public Awareness Plan prepared to establish process for increasing public awareness for need to reduce bacteria loads • Developed multi-media DVD for use as a PBS informational broadcast, television commercial, or information for presentation at community events or schools	• DVD provides additional educational tool not previously available to County MS4 programs and targets controllable non-point source flows, especially dry weather flows, e.g., excessive irrigation. • To date, the DVD has been shown twice as a PBS broadcast.
To increase awareness among animal operations (esp. dairy farms, horse ranches, boarding stables, pet kennels, etc.) of proper disposal for wash water.	(1) To reduce controllable non-point source flows from animal management operations. (2) To reduce bacterial concentrations in flows from wash water containing animal feces.	• Agricultural source sampling incorporated by Task Force into Monitoring Plan and QAPP to provide one document for all MSAR TMDL-related monitoring. • USEMP included analysis of bovine sources of bacterial indicators. • Findings reported in DAR and CSPP.	• USEP activities provide opportunity to identify where agricultural sources are inappropriately entering the MS4; any such findings are referred to the Regional Board. • Bovine sources detected fairly often at a number of USEMP sites (e.g., see Table 5-30 in DAR). • Agricultural interests participate in Task Force, which has provided opportunity to share information and coordinate on activities such as development of the Agricultural Source Evaluation Plan and Agricultural Source Monitoring Program (these activities were implemented outside of this Proposition 40 Grant).

Section 4 – Lessons Learned

This section provides a summary of lessons learned and project outcomes that could be used in other areas within the region or other watersheds. This discussion is broken out into three parts: Reasons for Success, Project Challenges, Applicable Benefits.

4.1 Reasons for Success

The Grant Project was implemented over a period lasting three years. Even with the one year project hold caused by the State of California budget crisis, the project was successfully executed. This outcome occurred for a number of key reasons:

- The Task Force provided an excellent forum for discussion and resolution of technical issues that arose during the project.

- The project provided seed money to implement a number of Bacteria TMDL requirements with regulatory deadlines. The linkage between project activities and these deadlines provided the motivation by all parties to meet grant deadlines for producing deliverables.

- As a member of the Task Force, the Regional Board was a regular participant in the Grant Project. This participation expedited the need for grant related decisions.

4.2 Project Challenges

Although the Grant Project goals were met, challenges did occur. Two key examples include:

- Initiating a new monitoring program under a grant with deadlines presents a challenge because of the time needed to meet State of California QAPP development and approval requirements. The State provides good guidance on what is required for a QAPP but the threshold for what constitutes compliance with the guidance was not always clear. While the project participants were ultimately able to develop an approved QAPP, the time required for several review and revision cycles resulted in a delay (and additional cost) to the start-up of the monitoring program.

- For the BMP Pilot Study, the effectiveness of already installed BMPs or proprietary BMPs installed at the cost of the vendor was a good approach for getting critical data at a relatively low cost. However, unexpected delays occurred because of the need to obtain legal approval for access to BMPs to sample them. Private landowners or associations were very willing to participate in the project, but the time needed to address legal liability concerns took longer than expected, delaying start-up of sampling.

4-3 Applicable Benefits

Examples of project outcomes that could be utilized again within the project area or in other watersheds in California include:

- Establishment of a watershed-based approach for implementing Bacteria TMDL monitoring. This program serves all responsible parties to the TMDL including both urban MS4 and agricultural dischargers.

- To better characterize the bacterial load, a subset of the samples was analyzed using advanced molecular methods to determine whether the bacterial contamination originated from human, dog, or cattle sources. The USEMP samples were used to analyze the frequency and magnitude of bacterial indicator concentration exceedances (over REC-1 water quality objectives) coupled with the human-specific, Bacteroides marker to rank the importance of specific sites for follow-up bacterial indicator management activities, including further sampling.

- One of the key outcomes of this project was the development of a risk-based prioritization approach for guiding decisions on implementation of urban runoff management activities. The approach uses the bacterial concentration data coupled with the data generated from advanced molecular methods to rank sites based on greatest threat of exposure to elevated bacterial indicators during REC-1 activities. This approach is of particular importance given the increasingly limited funds available to implement MS4 stormwater programs, especially within the context of a TMDL. Use of a risk-based approach provides a fair means for deciding implementation priorities.

- The Santa Ana Regional Board has a lengthy history of making good use of the Task Force process for encouraging stakeholders to work closely together to address important regulatory and policy issues. Several such Task Forces, which are administered by SAWPA (http://sawpa.org/planning_projects.html) are currently active in the region working with the Regional Board on a variety of environmental issues. Having the Task Force in place prior to project implementation provided strong support for the implementation of this grant. This approach is transferable to anywhere in the state.

Section 5 - Project Outreach

Public outreach has been an important part of the implementation of this Grant Project. To the extent possible, outreach will continue in selected areas. The following sections provide a summary of outreach activities completed to date and those expected to continue.

5.1 Completed Outreach

To date the Grant Project has completed public outreach in the following three key areas:

MSAR Watershed TMDL Task Force Meetings

The Task Force was established to coordinate Bacteria TMDL implementation activities in the MSAR watershed through the development and implementation of feasible and cost effective strategies to meet TMDL requirements. The Task Force includes key watershed stakeholders representing urban stormwater dischargers (including project partners, RCFCWCD and SBCFCD), agricultural operators, and the Regional Board. The TMDL Task Force works under a Task Force Agreement, which establishes cost-sharing responsibilities among its signatories.

The Task Force meetings are open to the public. SAWPA, the administrator of the Task Force and the Grant Project, publicly notices each meeting on its website and serves as a public repository for all Task Force products, including Grant Project deliverables (http://sawpa.org/roundtable-MSARTF.html).

During the Grant Project period (January 2007 through March 2010), the Task Force held numerous meetings, ranging from seven to ten each full calendar year. During each of these meetings, Task Force participants actively participated in discussions regarding Grant Project tasks (e.g., implementation approach) and received updates on authorized activities (e.g., monitoring program activities).

Public Awareness Activities

This project supported the development of new educational materials to increase public awareness regarding urban sources of bacterial indicators. Prior to development of these materials, a Public Awareness Plan was prepared to outline the process for developing appropriate materials to increase public awareness regarding bacterial indicator sources and management issues.

The Task Force discussed several alternative approaches for increasing public awareness regarding urban bacterial indicator sources and issues. Using information gathered from Grant Project monitoring activities, the Task Force identified potential bacterial indicator sources that could be targeted. Pet waste management was identified as a key concern. The Task Force also identified potential residential sources of pathogens that should also be addressed, including sources that might be associated with general home maintenance (e.g., over-irrigation or over-application of fertilizers that may support bacteria re-growth).

The Task Force, which considered brochures, direct outreach (via community events and other venues), enforcement-oriented outreach and video/commercial-based approaches, determined that sufficient print-media information regarding these sources already existed. In contrast, the availability of multi-media information for targeted audiences was limited. Accordingly, the Task Force indicated its intent to move forward with the development of a DVD or similar form of multi-media outreach to enhance public awareness programs.

The proposed plan was discussed with the Regional Board at various TMDL Task Force meetings, and the RCFCWCD and SBCFCD MS4 Programs took the lead on implementing a multi-media approach to increase public awareness. After the MS4 programs agreed to cooperatively move forward on a DVD, they worked with KVCR, the local PBS affiliate, to develop a 30-minute segment entitled, "Curiosity Quest Goes Green", an environmental education program targeting fifth grade students and their parents. Because urban runoff related messages, particularly those related to the management of bacterial indicators, are often complex and difficult to convey to the average homeowner, the program focused on providing general tools and tips to manage a home in a manner that is protective of the environment.

To produce the educational materials, the two Counties formed a committee of representatives that met with Curiosity Quest producers to further develop the concept. The County representatives decided to develop a DVD that could be:

- Broadcast on television as an independent television show on local broadcast channels;
- Broken up into segments that could be used as "commercials" on local broadcast channels; and
- Could be used in either form to support community events, school education programs and distribution via the Internet.

Specific outreach messages regarding pet waste management, yard waste management, irrigation system management and other appropriate urban runoff related environmental messages that fit within the allotted time and were consistent with the message of proper management of a home were incorporated into the education materials.

The committee queried the community to find existing homes that exemplified proper management practices. These homes were then evaluated, ranked, and selected for inclusion in the Curiosity Quest episode. The committee also selected representative experts from the MS4 County Programs and a local water supply agency to deliver the messages related to stormwater management practices, efficient irrigation and drought tolerant landscaping.

The episodes were filmed in late July 2009 and aired on KVCR and other affiliated PBS stations in September and October 2009.

Technical and Policy Forums

Task Force participants have presented findings from the Grant Project at a number of venues including technical conferences and local/regional policy organizations. These outreach efforts have included the following activities:

Technical Conferences

Technical conferences where presentations on Grant Project activities have occurred include:

- American Water Resources Association (AWRA) – Project participants presented, *Evaluation of Urban Sources of Bacteria in the Middle Santa Ana River Watershed*, at the annual AWRA conference in New Orleans, LA, in November, 2008.

- Water Environment Federation (WEF) TMDL 2009 Conference – Project participants presented, *Prioritization of Bacterial Indicator TMDL Compliance Activities in the Middle Santa Ana River Watershed in Southern California*, at the WEF TMDL conference in Minneapolis-St. Paul in August 2009. The presentation was supplemented with a conference proceedings manuscript.

Abstracts were also submitted to the California Stormwater Quality Association (CASQA) in 2008 and 2009, but neither abstract was accepted.

Regional Organizations

Presentations have been made to the following organizations to keep them informed on Grant Project activities:

- SAWPA Commission, comprised of 5 member agencies representing water districts and planning agencies in the Santa Ana River watershed, received a briefing on Grant Project work on July 29, 2009.

- A project briefing was provided to the Chino-Prado Basin Workgroup planning meeting on October 2, 2008.

MS4 Stormwater Programs

Presentations have been made to the Management Committees for each County's MS4 stormwater program to keep them updated on TMDL implementation activities occurring under the Grant Project.

5.2 Continued Outreach

The Task Force will continue to meet periodically. These meetings will continue to be public noticed, providing opportunity for anyone to participate in Bacteria TMDL implementation discussions.

Also, in the future, opportunities to share information, developed at least in part as a result of Grant Project funded work, will be utilized whenever possible. Examples include:

- Submission of an abstract for presentation at the 2010 CASQA annual meeting in November 2010.
- Presentation of Bacteria TMDL implementation updates to local and regional organizations, as needed, to keep them informed regarding TMDL implementation activities.

Section 6 - Project Funding

The cost to implement the *Middle Santa Ana River Pathogen TMDL BMP Implementation* Grant Project is estimated at $850,000. The project was funded through a combination of monetary and in-kind contributions from stakeholders and Proposition 40 Integrated Watershed Management Program grant funding. Stakeholder funding included a total cash contribution of $204,500 from RCFCWCD and SBCFCD. These stakeholder funds were used in part to hire consultants and pay for project administration to SAWPA through the Task Force. In addition, SBCFCD provided $45,500 in in-kind staff time to conduct water quality monitoring for the project. The balance of project funding, $600,000, was Proposition 40 grant funding.

The Grant Project provided local stakeholders, working together as a Task Force representing key watershed stakeholders including urban stormwater dischargers (including project partners, RCFCWCD and SBCFCD), agricultural operators, and the Regional Board (See Section 1. 5 for more information regarding Task Force participation).

The actual cost to complete the project was $850,000 and included the full expenditure of the available Proposition 40 grant funding of $600,000. Actual stakeholder expenses including both monetary and in-kind contributions were recorded at $250,000. This funding provided the foundation for future work planned by the Task Force to address Bacteria TMDL requirements. Through the grant stakeholders were able to develop documents and initiate implementation of a long term WWM program for the watershed (as required by the TMDL). In addition, the funding provided the opportunity to implement methods to identify human and non-human sources of bacterial contamination. Stakeholders have employed these methods to identify and prioritize potential problem areas. This project also enabled stakeholders to evaluate a number of structural BMPs to assist in the development of a comprehensive plan to implement BMPs to address indicator bacteria throughout the watershed.

Section 7 – Planned or Potential Follow-Up Activities

The Grant Project provided seed money to initiate a number of critical Bacteria TMDL implementation requirements, e.g., establishing a watershed-wide monitoring program to evaluate compliance with TMDL wasteload allocations and the development of the USEP to guide TMDL implementation. With this foundation in place, key planned or potential follow-up activities include:

- RCFCWCD and SBCFCD are each required to develop Comprehensive Bacteria Reduction Plans (CBRP) as part of their respective MS4 permit requirements. Draft plans are being readied for submittal to the Regional Board by the end of 2010. The Grant Project deliverables, e.g., monitoring data and the CSPP, provide the foundation for the CBRPs.

- The TMDL requires that a watershed-wide monitoring program continue to be implemented. The Monitoring Plan and QAPP prepared under the Grant Project provide the basis for the continued monitoring that will occur under the direction of the Task Force.

- Future source evaluation work conducted as part of the TMDL implementation process will further explore opportunities for advancements in the use of advanced molecular methods to locate human and non-human sources of bacterial contamination.

- The Task Force for will continue to meet periodically to provide opportunity for stakeholders to discuss and resolve TMDL implementation issues.

Section 8 – Appropriate Photographs and Graphics

Photographs and graphics relevant to the Grant Project are available in the project deliverables (see Section 9 for list of deliverables). These deliverables as well as presentations made to the Task Force (which include numerous photographs and graphics) are available at (http://sawpa.org/roundtable-MSARTF.html).

Section 9 – List of Items Submitted

The following Grant Project deliverables have been submitted to the Regional Board, as required by the Grant Project:

- Middle Santa Ana River Water Quality Monitoring Plan, originally completed in August 2007, revised in April 2008.
- Quality Assurance Project Plan for the Middle Santa Ana River Pathogen TMDL – BMP Implementation Project, originally completed in August 2007, revised in April 2008.
- Middle Santa Ana River Bacterial Indicator TMDL Urban Source Evaluation Plan, April 2008.
- Middle Santa Ana River Bacterial Indicator TMDL Data Analysis Report, March 2009.
- Public Awareness Plan and DVD (2009)
- BMP Control Strategy and Prioritization Plan, February 2010.