TECOLOTE CREEK WATERSHED

FINAL MONITORING PLAN

COMPREHENSIVE LOAD REDUCTION PLAN

Submitted to:

City of San Diego

Transportation & Storm Water Department

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Acronyms and abbreviations

303(d) List	Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments
AMEC	AMEC Environment & Infrastructure, Inc.
Bacteria TMDL	A *Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads for Indicator Bacteria Project I-Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*
Basin Plan	San Diego Region Basin Plan
BMP	Best Management Practices
BPA	Basin Plan Amendment
Caltrans	California Department of Transportation
CLRP	Comprehensive Load Reduction Plan
COC	Chain-of-Custody
CWA	Clean Water Act
EDD	Electronic Data Deliverable
FIB	Fecal Indicator Bacteria
HSA	hydrologic sub-area
LA	Load Allocation
LWA	Larry Walker & Associates
mL	milliliter
MLS	Mass Loading Station
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
*.pdf	Portable Document Format
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
REC-1	Water contact recreation
SDRWQCB	San Diego Regional Water Quality Control Board

State Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
TBD	To be determined by the Responsible Party
TMDL	Total Maximum Daily Load
TWAS	Temporary Watershed Assessment Station
USEPA	United States Environmental Protection Agency
WLA	Waste Load Allocation
WQO	Water Quality Objective
WURMP	Watershed Urban Runoff Management Program

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Project Description

Introduction

The San Diego Regional Water Quality Control Board (SDRWQCB) issued Resolution No. R9-2010-0001, A *Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads (TMDL) for Indicator Bacteria Project I-Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek),* herein referred to as the Bacteria TMDL. The Bacteria TMDL has identified the Municipal (Phase I and Phase II) Separate Storm Sewer System (MS4s) within the City of San Diego as the primary point sources that have been assigned a Waste Load Allocation (WLA) requiring a reduction. Owners and operators of small MS4s (Phase II MS4s) and controllable nonpoint sources, identified by the San Diego Water Board as significant sources of bacteria discharging to the receiving waters and/or Phase I MS4s, are subject to the Bacteria TMDL, however are not included in this Monitoring Program. The Basin Plan Amendment (BPA), which is Attachment A of the Bacteria TMDL, outlines an Implementation Plan that includes a compliance schedule and a description of minimum monitoring requirements to assess compliance with the TMDLs, WLAs, and Load Allocations (LAs). Phase I MS4s (hereafter called the Responsible Party) have developed this Monitoring Plan as part of the Comprehensive Load Reduction Plan (CLRP) for the Tecolote Creek Watershed. The CLRP provides a comprehensive, watershed approach to management strategies designed to address the approved Bacteria TMDL, draft TMDLs, and other constituents listed on the Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments, herein referred to as the 303(d) List.

Purpose

The purpose of this Monitoring Plan is to outline a CLRP Monitoring Program designed to fulfill the monitoring requirements of the Bacteria TMDL and generate data to support the Tecolote Creek CLRP. This monitoring plan has included provisions to meet the TMDL monitoring requirements of the recently adopted National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds Within the San Diego Region Order No. R9-2013-0001, herein referred to as the MS4 Permit (SDRWQCB, 2013). The Tecolote Creek CLRP Monitoring Program will collect data to evaluate the approved TMDL pollutants and other 303(d) Listed constituents. A list of the applicable pollutants for the Tecolote Creek Watershed is provided in Table 1-1. The goals of the Tecolote Creek CLRP Monitoring Program include the following:

- To assess progress toward meeting the Bacteria TMDL numeric targets and WLAs.
- To characterize potential sources of approved TMDL pollutants, draft TMDL pollutants, and other 303(d) Listed constituents.
- To support the selection and evaluation of potential best management practices (BMPs).

The following four principal types of monitoring will be conducted to address the goals of the Tecolote Creek CLRP Monitoring Program.

- Compliance Monitoring is required by the Bacteria TMDL to demonstrate progress toward meeting TMDL requirements including numeric targets and WLAs.
- Optional Monitoring is not required by the Bacteria TMDL; however if sufficient funds are available, it may be implemented by the Responsible Party to better understand water quality conditions in the receiving water and support the goals of compliance monitoring. Optional Monitoring may be added to (and removed) the compliance monitoring effort as deemed appropriate by the Responsible Party.
- Follow-up Monitoring will be implemented to characterize the source, magnitude, and duration of exceedances of bacteria water quality objectives (WQOs) in the receiving water based on the results of compliance monitoring.
- Special Studies will be implemented based on the available data and resources to address management questions regarding adopted TMDLs, and 303(d) Listed pollutants. Special Studies may require the development of separate agreements and funding opportunities between the Responsible Parties, when applicable.

Watershed Background

The Tecolote Creek Watershed includes approximately 5,992 acres of primarily urbanized land located north of downtown San Diego. This watershed receives runoff from the Clairemont Mesa and Los Peñasquitos Watersheds, and drains to the southeastern portion of Mission Bay.

The Tecolote Creek Watershed is one of three hydrologic areas within the Mission Bay Watershed Management Area, and contains only Tecolote Creek. Within this watershed, primary land uses are residential (45 percent), transportation (21 percent), open space/parks and recreation (18 percent), and public facility (8 percent). The remaining 8 percent consists of a combination of commercial, industrial, military, and vacant and undeveloped land (WURMP, 2011).

The Bacteria TMDL is based on the 2002 303(d) List which indicated that the greatest cause of waterbody impairments in the San Diego Region was due to elevated bacteria levels. Table 1-1 and Figure 1-1 present the water bodies in the Tecolote Creek Watershed that have been identified in the Bacteria TMDL and placed on the 2010 State Board's Section 303(d) List. Per the Bacteria TMDL, impaired waters were given a priority number of 1, 2, or 3 with 1 being the highest priority. The prioritized list identifies segments or areas where bacterial water quality improvements are most likely to occur first (Priority 1), and segments or areas where bacterial water quality improvements are most likely to require more time to accomplish (Priority 3). Priority 1 waters also include waterbodies likely to be removed from the CWA Section 303(d) List. Tecolote Creek is listed as Priority 1. The ultimate goal of the Bacteria TMDL analysis is to achieve the necessary pollutant load reductions to restore and protect designated beneficial

uses, particularly water contact recreation (REC-1). Beneficial uses within the Tecolote Creek Watershed, as designated by the State Water Resources Control Board's (State Board) San Diego Region Basin Plan (Basin Plan) for surface waters, are provided in Table 1-2.

Table 1-1.
TMDL Pollutants and Other 303(d) Listed Constituents

Waterbody (Hydrologic Unit)	TMDL Pollutants[a]	Other 303(d) Listed Constituents[b]
Tecolote Creek (906.50)	*Enterococcus*, fecal coliform, total coliform	Turbidity, cadmium, copper, lead, zinc, total nitrogen, total phosphorus, selenium, and toxicity
Mission Bay at Mouth of Tecolote (906.50)	-	Eutrophic and lead
Mission Bay Shoreline at Tecolote Shores (906.50)	-	Bacteria

Notes:

Source: [a] California RWQCB, San Diego Region. Resolution No. R9-2010-0001.

[b] USEPA, 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report).

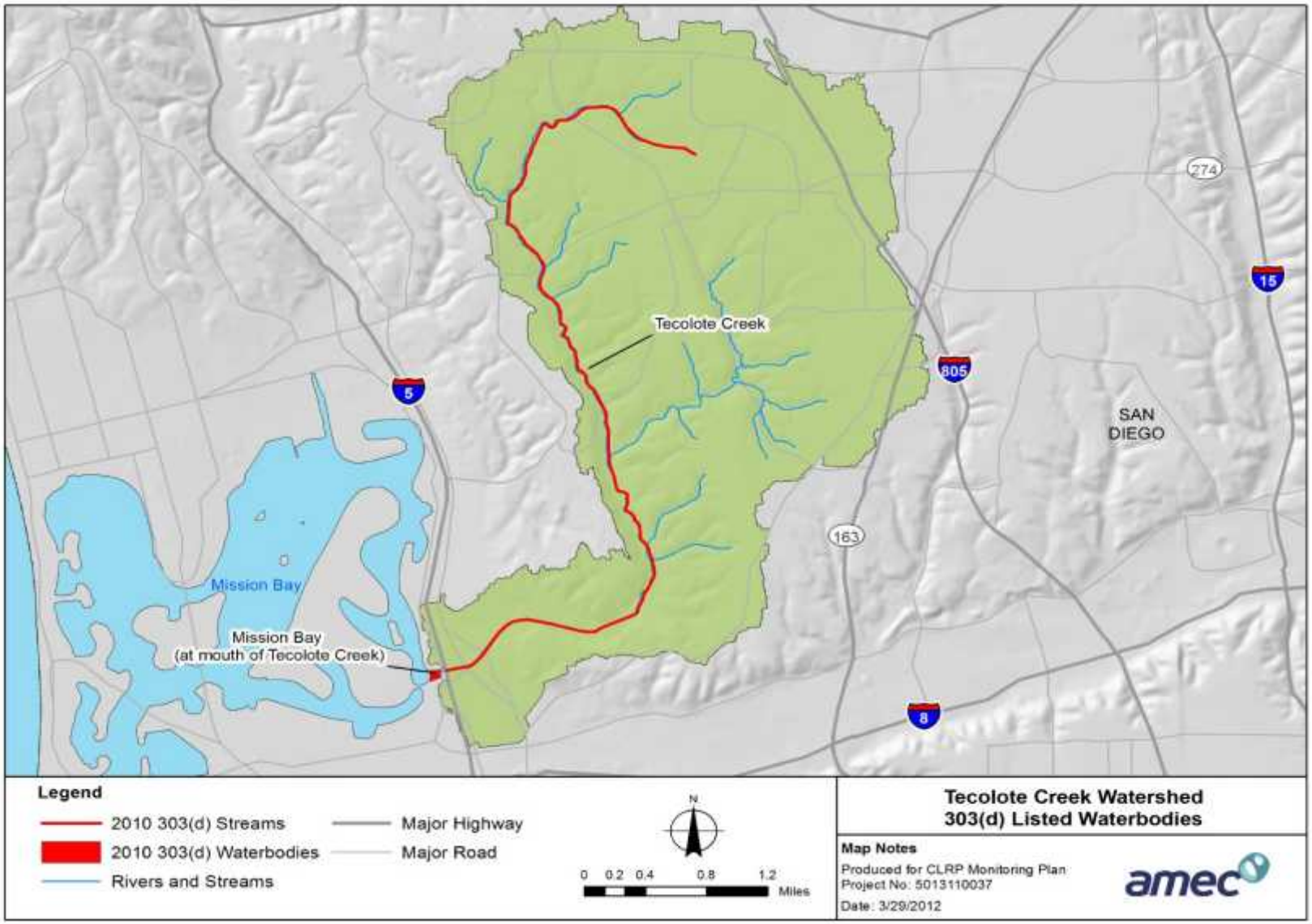

Figure 1-1. Watershed Map

Table 1-2.
Beneficial Uses Listed in Basin Plan

Hydrologic Unit	Waterbody Type	Beneficial Use																
		MUN	AGR	IND	PROC	REC1	REC2	COMM	BIOL	EST	WARM	COLD	WILD	RARE	MAR	MIGR	SPWN	SHELL
Shoreline																		
Mission Bay	Coastal Waters			●		●	●	●		●			●	●	●	●	●	●
Upstream Tributaries																		
Tecolote Creek (906.5)	Inland Surface Water					○	●				●		●					

Notes:

Source: Basin Plan= Water Quality Control Plan for the San Diego Basin (9) (San Diego RWQCB, 1994).

- ● Existing Beneficial Use
- ○ Potential Beneficial Use

Project Organization and Responsibilities

The Bacteria TMDL identifies the Responsible Party and Lead Agency for the Tecolote Creek Watershed. The Responsible Party is working on implementation of the monitoring programs for their watershed. The Responsible Party, excluding owners and operators of small MS4s, is:

- City of San Diego

For compliance monitoring, the roles and responsibilities of the City, Consultants, and Laboratory staff are described in the QAPP. Figure 1-2 presents the organization chart for the Tecolote Creek CLRP Monitoring Program.

Figure 1-2. Organizational Chart

To be determined at a later date by Responsible Party.

Implementation Schedule

The effective date of the Bacteria TMDL is April 4, 2011. The CLRP provides a compliance timeline outlining the interim reduction milestones over the 20 year compliance period. Figure 1-3 provides an overall timeline for the Tecolote Creek CLRP Monitoring Program. Per the TMDL, the Responsible Party must submit a CLRP including a Monitoring Plan 18 months after the effective date (October 4, 2012).

- **Compliance Monitoring** is scheduled to begin June 27, 2013 60 days after approval of the MS4 Permit.
- **Follow-up Monitoring** will be implemented after the Dry Weather Exceedance Reduction Milestone, which is scheduled seven years after the effective date of the TMDL.
- **Special Studies** will be implemented based on the available data and resources. Each study will have a project specific schedule that will be provided in a separate QAPP.

For Fiscal Year 2014 (July 2013 through June 2014), Table 1-3 provides the schedule of program activities for the Tecolote Creek CLRP Monitoring Program including work plans, monitoring, and reporting. Program deliverables are described in Section 3 of this document. Note that follow-up monitoring does not begin until 2018, and thus is not reflected in the project schedule. The Responsible Party is funding a San Diego Regional Reference Stream Study that began in Fiscal Year 2012 and will be completed in Fiscal Year 2015.

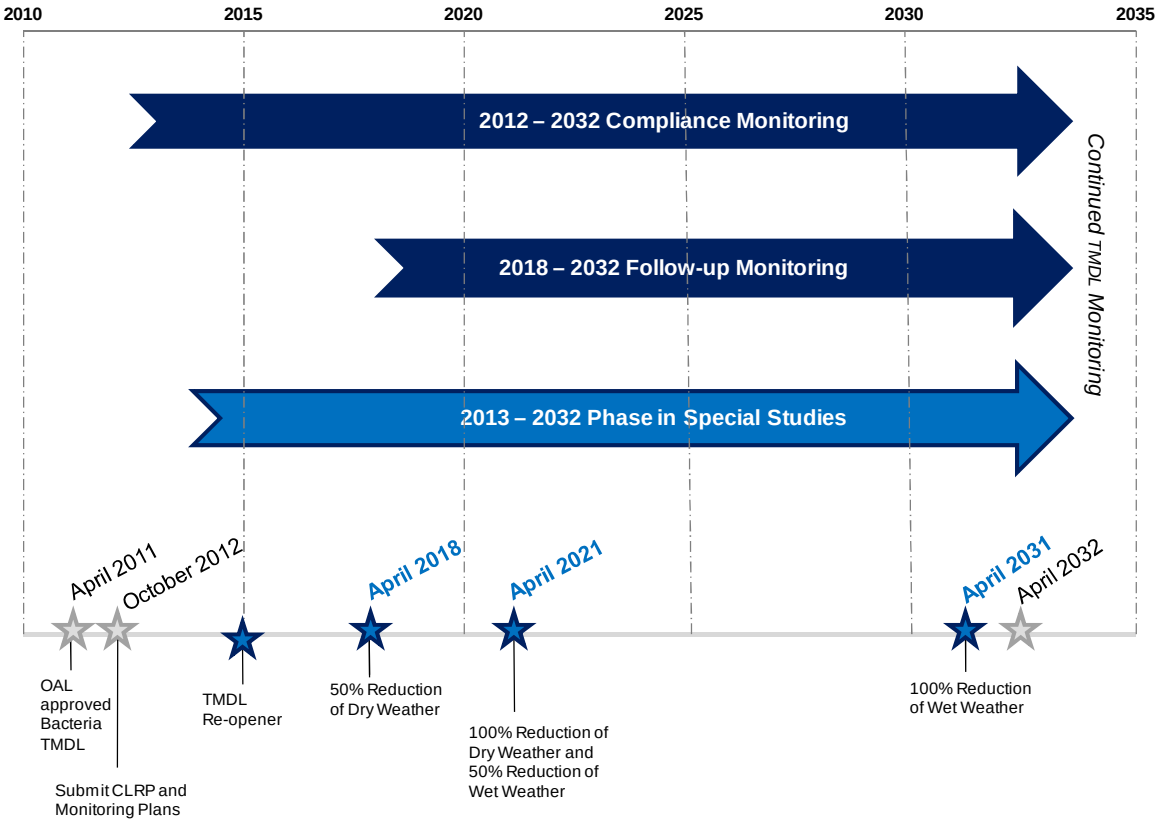

Figure 1-3. Tecolote Creek CLRP Monitoring Program Timeline

Table 1-3.
Project Schedule for Fiscal Year 2014

Activity	Date (MM/DD/YY)		Deliverable
	Anticipated Date of Initiation	Anticipated Date of Completion	
TMDL Monitoring			
QAPP/Monitoring Plan	Submitted herein	Submitted herein	QAPP/Monitoring Plan
Compliance Monitoring	6/27/13	6/30/14	NA
Special Studies			
San Diego Regional Reference Stream Study[(a)]	11/1/11	11/1/15	Project Report will be completed in Fiscal Year 2014
Reporting	NA	6/1/14	Annual CLRP Monitoring Summary to be included in the WURMP Annual Report

Notes:
NA = Not applicable
WURMP = Watershed Urban Runoff Management Program
[(a)] This study began in Fiscal Year 2012 and will be completed in Fiscal Year 2015.

TMDL Numeric Targets and WLAs

The TMDL defines the numeric targets and WLAs for the Responsible Party. Data collected during the Tecolote Creek CLRP Monitoring Program will be utilized to evaluate progress and attainment of TMDL targets and WLAs. Tables 1-4 and 1-5 provide the numeric targets, WLAs, and LAs for the Tecolote Creek Watershed per the Bacteria TMDL. The Compliance Monitoring Program will be updated to reflect requirements of newly approved and adopted TMDLs as well as any delisted segments and/or constituents, as appropriate. This Monitoring Plan addresses draft TMDL and/or other 303(d) Listed constituents via additional monitoring under the Special Studies Program.

Attainment of the TMDLs in the receiving water is based on the frequency that the dry or wet weather days in any given year exceed the respective numeric objective. For dry weather, the TMDL numeric target is based on the geometric mean water quality objective and a 0 percent allowable exceedance frequency as presented in Table 1-4. The “existing” dry weather exceedance frequencies for impaired waterbodies will be calculated using the available historical data from the years 1996 to 2002 per the Bacteria TMDL. For wet weather, the TMDL numeric target is based on the single-sample maximum and an allowable exceedance

frequency of 22 percent as well as the geometric mean as presented in Table 1-4. The Bacteria TMDL provides a modeled estimate of the "existing" wet weather exceedance frequency for Tecolote Creek Watershed. The Responsible Party will compare the "existing" exceedance frequencies for dry and wet weather to the mandated frequency reductions in order to evaluate progress toward attaining the TMDL.

Table 1-4.
Numeric Targets for Bacteria TMDL

Parameter	Dry Weather[a]		Wet Weather[b]	
	WQO (MPN/100mL)[c]	Allowable Exceedance[c]	WQO (MPN/100mL)[d]	Allowable Exceedance[e]
Enterococcus	33	0%	104	22%
Fecal Coliform	200	0%	400	22%

Notes:

mL = mililiters

MPN = Most Probable Number

Source (including footnotes): California RWQCB, San Diego Region. Resolution No. R9-2010-0001.

[a] Dry weather days defined as days with less than 0.2 inch of rainfall observed on each of the previous 3 days.

[b] Wet weather days defined as days with rainfall events of 0.2 inches or greater and the following 72 hours.

[c] Dry weather numeric objectives based on the 30-day geometric mean (or equivalent) water quality objectives in Water Quality Control Plan for the San Diego Basin (1994). Compliance with the dry weather TMDLs in the receiving water is based on the frequency that the dry weather days in any given year exceed the dry weather numeric objective.

[d] Wet weather numeric objectives based on the single sample maximum (or equivalent) water quality objectives in the Water Quality Control Plan for the San Diego Basin (1994). Compliance with the wet weather TMDLs in the receiving water is based on the frequency that the wet weather days in any given year exceed the wet weather numeric objective, but 30-day geometric mean must also be met.

[e] The wet weather allowable exceedance frequency is set at 22%. In the calculation of the wet weather TMDLs, the San Diego Regional Board chose to apply the 22 percent allowable exceedance frequency as determined for Leo Carillo Beach in Los Angeles County. At the time the wet weather watershed model was developed, the 22 percent exceedance frequency from Los Angeles County was the only reference beach exceedance frequency available. The 22 percent allowable exceedance frequency used to calculate the wet weather TMDLs is justified because the San Diego Region watersheds' exceedance frequencies will likely be close to the value calculated for Leo Carillo Beach, and is consistent with the exceedance frequency that was applied by the Los Angeles Regional Board.

Table 1-5.
Indicator Bacteria TMDL for Tecolote Creek

Pollutant	TMDLs, WLAs & LAs for Controllable Sources (Billion MPN/Year)				
	Total Watershed TMDL[a]	MS4 WLA[b]	Caltrans WLA[c]	Agriculture LA[d]	Open LA[e]
Dry Weather					
Enterococcus	39	39	0	0	0
Fecal Coliform	234	234	0	0	0
Total Coliform	1,171	1,171	0	0	0
Wet Weather					
Enterococcus	603,761	471,211	1,266	0	131,284
Fecal Coliform	229,322	126,806	533	0	101,963
Total Coliform	6,379,770	5,136,598	27,095	0	1,216,077

Notes:

Source: California RWQCB, San Diego Region. Resolution No. R9-2010-0001.

(a) TMDLs, WLAs, and Las calculated based on numeric targets and percent allowable exceedance frequency. Meeting the numeric targets in the discharge and/or receiving water indicate the TMDLs, WLAs, and/or LAs have been met.

(b) MS4 WLA = Point source WLA for discharges from Municipal MS4 land uses.

(c) Caltrans WLA = Point source WLA for discharges from Caltrans land uses, assumed to be equal to the Caltrans Existing Load. Caltrans does not require a reduction of existing discharges and is not named as a Responsible Party in the TMDL.

(d) Agriculture LA = Non-point source LA for discharges from Agriculture land uses, assumed to be equal to the Agriculture Existing Load.

(e) Open Space LA = Point source WLA for discharges from Open Space land uses, assumed to be equal to the Open Space Existing Load.

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Monitoring Approach

This section describes the purpose, scope, and type of sampling conducted for each monitoring program including Compliance Monitoring, Optional Monitoring, Follow-Up Monitoring, and Special Studies. Additional details of the sampling and analytical methodology and data quality objectives are described in the QAPP, provided as Appendix A.

Compliance Monitoring

Compliance monitoring is designed to meet the receiving water monitoring requirements of the Bacteria TMDL. Compliance monitoring, including wet and dry weather sampling, will be conducted each year at the compliance monitoring locations. The data generated will be used to address the following questions:

- Are TMDL numeric targets for bacteria indicators being met at the compliance monitoring locations?
- Are bacteria levels improving at the compliance monitoring locations?

The scope of compliance monitoring accounts for the frequency and type of sampling activities of the existing Regional MS4 MLS Monitoring Program in order to facilitate overlap of monitoring efforts and resources. Table 2-1 provides the general scope of the Compliance Monitoring Program.

Table 2-1.
Scope of Compliance Monitoring

Number of Monitoring Locations	Wet Weather Monitoring		Dry Weather Monitoring 10/01/13 to 03/31/14		Dry Weather Monitoring 06/24/13 to 9/30/13 and 04/1/14-9/30/14	
	Grab Samples Per Site Per Event	Event Frequency	Grab Samples Per Site Per Event	Event Frequency	Grab Samples Per Site Per Event	Event Frequency
2	1	3 storms	1	monthly	1	Weekly (minimum 5 events per month)

Compliance Monitoring Locations

The Bacteria TMDL identifies Tecolote Creek as the targeted segment in the TMDL. Two locations will be monitored in the Creek per the requirements set forth in the TMDL. The Bacteria TMDL requires the receiving water monitoring to occur at the mouth of the creek, such as the MLS or Mass Emission Station (MES), and one or more locations upstream of the mouth, such as the Temporary Watershed Assessment Station (TWAS). These locations will provide a historical

dataset that will allow for an evaluation of the effectiveness of TMDL implementation. Each site will be monitored during each event when flowing.

Figure 2-1 presents a map of the compliance monitoring locations within the Tecolote Creek Watershed. Table 2-2 provides the location name and coordinates for the compliance monitoring locations. These locations have been monitored as part of the Regional MS4 MLS Monitoring Program.

(a)

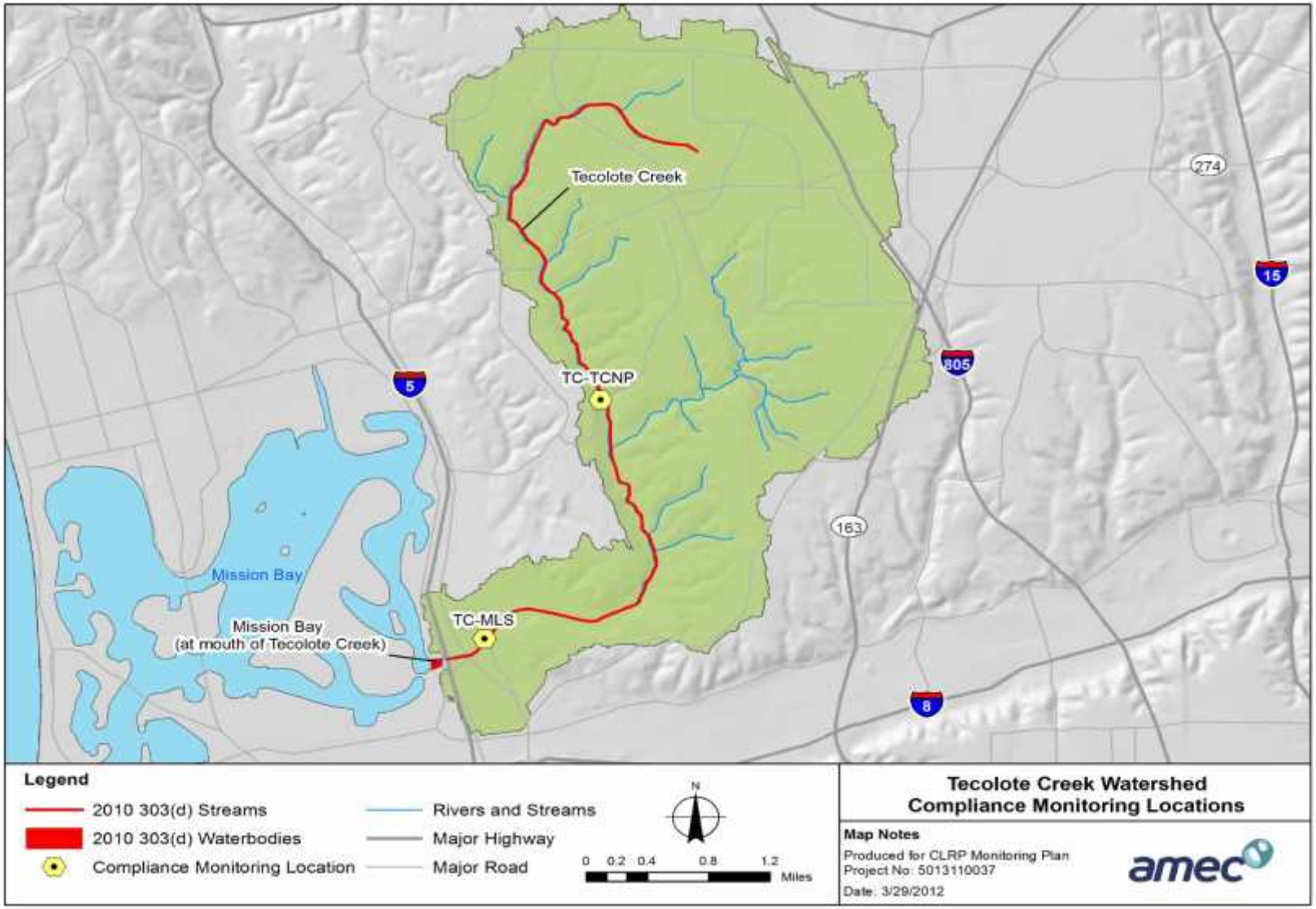

Figure 2-1. Map of Compliance Monitoring Location

Table 2-2.
Compliance Monitoring Locations

Site ID	Site Name	Site Type	Latitude	Longitude
TC-MLS	Tecolote Creek- Mass Loading Station	Inland Surface Water	32.77293	-117.20307
TC-TCNP	Tecolote Creek- Temporary Watershed Assessment Station	Inland Surface Water	32.7979	-117.18898

Constituents

Fecal indicator bacteria (FIB) are the target constituents for Tecolote Creek, as indicated by the TMDL. Grab samples will be representative of the environmental conditions of each location. Therefore, the grab samples will be collected from the horizontal center of the stream to the maximum extent practicable. Samples collected during wet and dry weather monitoring will be analyzed for FIB in accordance with Surface Water Ambient Monitoring Program (SWAMP) requirements provided in the QAPP (Appendix A). Table 2-3 presents the constituents, reporting limits, and analytical methods. In accordance with the new MS4 Permit total coliform is not a required analyte for creeks and will not be analyzed.

Table 2-3.
Compliance Analyses for Bacteria TMDL

Parameter	Project Reporting Limit[(a)] (per 100mL)	Analytical Method[(b)]
Enterococcus	1 CFU	EPA 1600
Fecal Coliform	2 MPN/CFU	SM 9221D (3 or 5 dilutions) or SM9222D (3 dilutions)

Notes:
CFU = Colony Forming Units
The reporting limits are consistent with the existing AB411 program to facilitate overlap with that program. However, reporting limits may be lower depending on the laboratory used to conduct the analysis.
Membrane Filtration is the preferred analytical method.

Dry Weather Monitoring

Dry weather monitoring will be conducted monthly at the compliance monitoring locations listed in Table 2-2 between January and December. Dry weather sampling will occur on dry weather days when there is measureable flow at the location. Samples are to be collected after an antecedent

dry period of 72 hours with less than 0.1 inches of rainfall. During each dry weather monitoring event, field observations will be recorded and a grab water sample will be collected at the compliance monitoring locations. Methodology for field observations and sample collection is described in the QAPP (Appendix A).

Wet Weather Monitoring

Wet weather monitoring will be conducted at the compliance monitoring locations during three storm events each wet season (October 1 to April 30). Per the MS4 Permit Appendix E.6, a minimum of one storm is required to be monitored. Storms resulting in greater than 0.2 inches of precipitation will be targeted for analysis. One grab sample will be collected per storm within 24 hours of the end of precipitation. The storm events will be spread throughout the wet season to the maximum extent practicable as follows:

- Storm Event 1 (October to November)
- Storm Event 2 (December to January)
- Storm Event 3 (February to April)

During each wet weather monitoring event, field observations will be recorded and a grab water sample will be collected at the compliance monitoring locations. Grab samples will be collected using the same sample technique as during a dry weather monitoring event, taking additional safety precautions as needed. Methodology for field observations and sample collection is described in the QAPP (Appendix A).

Optional Monitoring

Optional monitoring is not mandatory to meet TMDL monitoring requirements and may be suspended at any time. Optional monitoring is presented in the Monitoring Plan so that the procedures are available should the Responsible Party decide to conduct the monitoring. The Responsible Party will determine when any optional monitoring elements will be implemented. The Watershed Responsible Party will determine each year whether the optional monitoring will be initiated, modified, or eliminated (although optional monitoring may be revised more frequently if approved by the Responsible Party). Modifications to optional monitoring elements will be documented in the Annual Monitoring Summary. The decision to initiate, modify, or eliminate optional monitoring will be communicated to the SDRWQCB Project Manager to clearly inform the SDRWQCB whether the monitoring is to occur.

The field measurements in Table 2-4 are considered optional for Tecolote Creek. Flow may be monitored during sampling events or throughout the year at the compliance monitoring locations. Flow monitoring is considered optional since it is not clearly specified by the TMDL; however, flow information will be needed to calculate the WLA.

Table 2-4.
Optional Field Parameters

Field Parameter	Reporting Limit	Method
Flow	0.1 ft/s	TBD
Dissolved Oxygen	Per equipment range	Field Meter
pH	Per equipment range	Field Meter
Specific Conductivity	2 µS/cm	Field Meter
Temperature	NA	Field Meter
Turbidity	5 NTU	Field Meter

Notes:

µS/cm = Microsiemens per Centimeter

NTU = Nephelometric Turbidity Units

Follow-Up Monitoring

Per the TMDL, if exceedances of the numeric targets are observed in the monitoring data, additional monitoring locations and/or other source identification methods must be implemented to identify the sources causing the exceedances. Additionally, the locations and/or other source identification methods must also be used to demonstrate that the bacteria loads have been addressed. The Responsible Party has designed the Follow-up Monitoring Program to be implemented prior to the end of the compliance period in order to facilitate compliance with the interim reduction milestones. The Follow-up Monitoring Program should address both expected exceedances and sources limiting the attainment of the milestone. Implementation of follow-up monitoring, if necessary, is scheduled to begin after the first milestone requiring 50 percent reduction of dry or wet weather exceedances.

The Follow-up Monitoring Program will utilize an adaptive monitoring approach to determine the sources contributing to exceedances in the receiving water. Each year, the program will evaluate compliance data to determine if follow-up monitoring is needed and the monitoring approach would be modified to address the pattern of exceedances. The data generated will be used to address the following questions:

- What are the potential sources/areas causing exceedances in the receiving water?
- Are MS4 discharges contributing to WQO exceedances in the receiving water?
- What is the magnitude and duration of the exceedance condition?

Initiation of Follow-up Monitoring

Follow-up monitoring will be implemented based on exceedances of receiving water numeric targets and allowable frequencies recorded each year at the compliance monitoring locations. Follow-up monitoring is designed to address persistent exceedances and to assess the frequency of exceedances over relatively long-term periods. Compliance dates will be consistent with dates presented in the CLRP. Under the Compliance Monitoring Program, FIB results will be compared to TMDL numeric targets and mandated frequency reductions, as described in Section 1.6.

Follow-up monitoring will occur when:

- Allowable exceedance frequency of dry weather data has not been reduced by at least 50 percent by year seven (2018).
- percent by year ten (2021).
- After the 100 percent reduction milestones for both wet and dry weather (i.e., the respective final compliance dates), the initiation criteria will be updated to reflect the most applicable 'trigger' based on the available data and possible revisions to the TMDL.

Follow-up Monitoring Approach

The approach implemented for the Follow-up Monitoring Program will be adaptive based on the type of exceedance (wet or dry weather), the frequency of exceedances, and watershed specific data. Four types of follow-up monitoring options were identified in the Copermittee Compliance Framework (LWA, 2011) and are summarized below. These options are designed to assist with source identification and TMDL compliance and more than one type of monitoring may be implemented per monitoring year.

- Upstream Monitoring: Upstream monitoring may be implemented in watersheds with clear jurisdictional boundaries, hydrologic breaks, or to isolate non-point source inputs along the receiving water. This option will characterize sources throughout the extent of the receiving water and will require additional monitoring to further isolate and identify sources. This option may provide useful data for watersheds where pollutant sources are largely unknown. Follow-up monitoring locations would be located in the receiving water, upstream of the compliance monitoring location.

- Representative Land Use Monitoring: Representative land use monitoring may be implemented in HSAs where homogenous land uses are present and discharge to the MS4. It may provide useful data for distinguishing between non-MS4 land uses and MS4 land uses that may be contributing to receiving water objective exceedances. This data may also be used to further calibrate and validate the watershed model and facilitate selection of management measures and/or BMPs. Follow-up monitoring locations would be selected to be representative of the major land use types present in the watershed.
- Localized Outfall Monitoring: Localized outfall monitoring may be implemented at monitoring stations adjacent to the receiving water in which objective exceedances were detected. It may provide useful data for identification of MS4 discharges to the receiving water in the direct vicinity of the objective exceedance. Monitoring may be employed in watersheds or HSAs that have a limited number of outfalls and may assist in determining whether the MS4 is causing or contributing to particular receiving water exceedances. If WQO exceedances are recorded at the follow-up monitoring locations then additional actions must be taken to bring the location into compliance. This may lead to additional monitoring in the immediate area or an evaluation of management measures and/or BMPs.
- Source Identification Monitoring: Microbial source testing may be added to any of the monitoring options described in the previous sections including both compliance monitoring and follow-up monitoring locations. This will assist in identification of pollutant sources that contribute to exceedances that may or may not be the result of MS4 discharges. Specifically, if no human sources are identified then it is possible to report that controllable sources are not causing the exceedances of WQOs at the monitoring location. This may lead to a potential special study to further identify sources of human fecal bacteria or natural sources.

Follow-up monitoring locations will be identified after compliance year six and will be updated each year after that, to reflect the most recent compliance data set. Therefore, monitoring locations are not provided in this Monitoring Plan. Aerial imagery, GIS, and field surveys may be utilized to assist with determination of appropriate sampling locations.

Follow-up monitoring will be unique to each location and monitoring condition, therefore the monitoring approach for each specific case will be determined at that time.

A summary of follow-up monitoring will be provided in the Annual CLRP Monitoring Program Summary. The summary will include the monitoring approach, monitoring locations, sampling protocols, summary of results, and planned actions.

Special Studies

Special studies will be utilized to support the CLRP implementation strategies for the other 303(d) Listed constituents, draft TMDL pollutants, and potentially approved TMDL pollutants. To support CLRP implementation, special studies may be designed to further characterize pollutants in receiving waters or watershed and/or evaluate the effectiveness of the CLRP. A detailed QAPP will be needed for special studies to detail the monitoring approach, sampling and analytical methods, sample location information, and other pertinent study information.

The Tecolote Creek Responsible Party will determine each year whether a special study should be initiated, modified, or eliminated based on available funding (although special study monitoring may be revised more frequently if approved by the Responsible Party). Initiation or completion of special studies will be noted in the Annual CLRP Monitoring Summary. The decision to initiate, modify, or eliminate special studies will be communicated to the Regional Board so they are clearly informed of planned monitoring.

Currently the Tecolote Creek Responsible Party is participating in a regional special study to evaluate natural sources of bacteria in reference streams in San Diego County. The goal of the San Diego Regional Reference Stream Study is to determine the exceedance frequency of bacteria due to natural sources. The Study will help inform strategies that address the Bacteria TMDL. The Tecolote Creek Responsible Party has determined that sufficient information is available to develop the CLRP and initiate management actions on TMDL and non-TMDL constituents. Additionally, as water quality conditions are not expected to change until a series of management actions are initiated/completed, no additional special studies are currently scheduled for the first year of monitoring.

DATA MANAGEMENT AND REPORTING PROCEDURES

This section describes the management of field and analytical data and reporting procedures for the Tecolote Creek CLRP Monitoring Program.

Data Management

Field Data Records and Analytical Data Reports will be sent to and kept by the designated Lead Agency Project Manager. Data will be submitted in a standardized SWAMP-compatible format. The Lead Agency will compile the monitoring data and provide an annual CLRP Monitoring Summary to SDRWQCB.

The Sampling Agency will review all Field Data Log Sheets for completeness, maintain the original hardcopies, and scan electronic copies (*.pdf) for storage in the project file. Copies of Field Data Log Sheets and photographs for each event will be submitted to the Lead Agency on a quarterly basis.

The laboratories will provide data in electronic format: both *.pdf copies of lab reports and a SWAMP-compatible Electronic Data Deliverable (EDD). Analytical results will be submitted to the Sampling or Lead Agency in *.pdf format and as a SWAMP compatible EDD within three weeks of submittal of samples. A SWAMP-compatible template will generate data files that can be uploaded to the SWAMP regional database. The Sampling or Lead Agency will review all lab reports and EDDs for accuracy, completeness, and compatibility with SWAMP. The contract laboratory shall retain original Chain-of-Custody (COC) forms. The contract laboratory will retain copies of the preliminary and final data reports.

Reporting Procedures

The Sampling Agency will provide quarterly sampling summaries to the Lead Agency as a status of monitoring activities. The update will include a brief summary of activities completed in the previous quarter and the field observations recorded. The Lead Agency will provide quarterly updates to the other participating Responsible Party during regularly scheduled Watershed Workgroup meetings.

The Lead Agency will generate an Annual CLRP Monitoring Summary, which will be included in the Watershed Urban Runoff Management Program (WURMP) Annual Report as an appendix. The Annual CLRP Monitoring Summary will describe the sample collection methods, sampling events, and present key findings of the analytical results. As part of the first year's assessment, the "existing" dry weather exceedance frequency will be calculated based on the 1996 to 2002 data set which will be used to evaluate progress toward attaining the TMDL. Any deviations from protocols listed in the Monitoring Plan and/or QAPP and the implications of those deviations on the interpretation of the data will be included in the report.

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APPENDIX A

TECOLOTE CREEK WATERSHED
FINAL QUALITY ASSURANCE PROJECT PLAN

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GROUP A ELEMENTS: PROJECT MANAGEMENT

1.0 TITLE AND APPROVAL SHEETS

TECOLOTE CREEK WATERSHED
FINAL Quality Assurance Project Plan
Comprehensive Load Reduction Plan (CLRP)

June 2013

Submitted to:
City of San Diego
Transportation and Storm Water Department

Submitted by:
AMEC Environment & Infrastructure, Inc.
San Diego, California

QAPP Revision Number: 2.0

APPROVAL SIGNATURES

PROJECT ORGANIZATION:

Title:	Name:	Signature:	Date*:
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		

REGIONAL BOARD (SWRCB):**

Title:	Name:	Signature:	Date*:
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		

* This is a contractual document. The signature dates indicate the earliest date when the project can start.

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ACRONYMS AND ABBREVIATIONS

ºC	Degree Celsius
µS/cm	microsiemens per centimeter
303(d) List	Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments
AB411	Assembly Bill 411
Bacteria TMDL	A *Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads for Indicator Bacteria Project I-Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*
Basin Plan	State Water Resources Control Board's San Diego Region Basin Plan
BMP	Best Management Practice
BPA	Basin Plan Amendment
CFS	Cubic feet per second
CLRP	Comprehensive Load Reduction Plan
COC	Chain-of-Custody
CWA	Clean Water Act
DHS	Department of Health Services
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
ft	Feet
ft^2	square feet
ft/s	feet per second
FIB	Fecal Indicator Bacteria
ID	Identification
JPEG	Joint Photographic Experts Group
LA	Load Allocation
MES	Mass Emission Station
mL	millimeter
MLS	Mass Loading Station
MS4	Municipal Separate Storm Sewer System

ACRONYMS AND ABBREVIATIONS (CONT.)

MPN	Most Probable Number
*.pdf	Portable Document Format
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SDRWQCB	San Diego Regional Water Quality Control Boards
SWAMP	Surface Water Ambient Monitoring Program
TBD	To Be Determined
TMDL	Total Maximum Daily Load
TWAS	Temporary Watershed Assessment Station
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Waste Load Allocation
WQO	Water Quality Objective
WURMP	Watershed Urban Runoff Management Program

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2.0 DISTRIBUTION LIST

Title:	Name (Affiliation):	Tel. No.:	QAPP No*:
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		
Insert Title of Person Here	Insert Name of Person		

Laboratory Managers will receive an electronic copy of the QAPP.

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3.0 PROJECT/TASK ORGANIZATION

3.1 Involved Party and Roles

The SDRWQCB issued Resolution No. R9-2010-0001, *A Resolution Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads (TMDL) for Indicator Bacteria Project I-Twenty Beaches and Creeks in the San Diego Region (including Tecolote Creek)*, herein referred to as the Bacteria TMDL. The Bacteria TMDL identifies the Responsible Party and Lead Agency for the Tecolote Creek Watershed. The Responsible Party will collaborate in the Consolidated Load Reduction Plan (CLRP) Monitoring Program. The Responsible Party for this watershed is the City of San Diego.

The City of San Diego, consultants, and laboratory staff will have the following roles and responsibilities (Table 3-1):

- **Contract Manager:** Andre Sonksen is the Contract Manager for the City of San Diego. The Contract Manager will be responsible for establishing contracts with the selected consultants and/or laboratories to implement the Compliance Monitoring Program and act as the liaison between the Responsible Parties and consultants. He will oversee dry weather monitoring activities conducted by the City and act as QA Officer for the dry weather program.
- **AMEC Quality Assurance (QA) Officer:** Jay Shrake is the AMEC Project QA Officer. The AMEC Project QA Officer will be responsible for overseeing the project QA activities independently from the Project Manager to ensure that project implementation is being conducted in accordance with this QAPP.
- **Wet Weather Sampling Project Manager:** Roshan Christoph is the AMEC Project Manager. The AMEC Project Manager will be responsible for overseeing the day-to-day activities of implementing the San Diego River CLRP Compliance Monitoring Program.
- **Weck Laboratories Laboratory QA Officer/Project Manager:** Hai Van Nguyen is the Laboratory Project Manager as well as the QA Officer. Hai Van Nguyen holds a position independent of data generation with Weck Laboratories. Weck Laboratories will be performing wet weather sample analyses.
- **City of San Diego Laboratory QA Officer/Project Manager:** Laila Othman is the Laboratory Project Manager as well as the QA Officer. Laila Othman holds a position independent of data generation with the City of San Diego Public Utilities Department, Wastewater Operations, Environmental Monitoring & Technical Services, Marine-Microbiology Laboratory(herein referred to as the City of San Diego EM&TS Laboratory). Laila oversees the laboratory staff at the City's EM&TS laboratory that will be performing dry weather sample analyses.

Table 3-1.
Personnel Responsibilities

Name	Organizational Affiliation	Role/Responsibility	Contact Information
		Contract Manager	
		Project Manager	
		Project QA Officer	
		Laboratory QA Officer	
		Sample Manager	

3.2 Quality Assurance Officer Role

The Project QA Officer position is independent of data generation. The QA Officer will ensure that the QA and quality control (QC) procedures set in place in this document will be properly applied throughout the sampling activities and analysis. The Project QA Officer will coordinate with the laboratory project managers and QA officers of participating laboratories to ensure all QA and QC procedures within this QAPP are understood and followed by participating Labs.

3.3 Persons Responsible for QAPP Update and Maintenance

The Project Manager and Project QA Officer are responsible for maintaining this QAPP. Changes and updates to this QAPP may be made by the Project Manager and Project QA Officer. The Project Manager will be responsible for making the changes and ensuring these updates are provided to each of the participating agencies and the SDRWQCB as listed in Table 3-1. Previous versions of the QAPP should be removed so as to avoid any confusion with the most current version of the QAPP.

3.4 Organizational Chart and Responsibilities

Figure 3-1 presents the organization chart for the Tecolote Creek CLRP Monitoring Program.

Figure 3-1. Organizational Chart

To be determined at a later date by the Responsible Party

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4.0 PROBLEM DEFINITION/BACKGROUND

4.1 Problem Statement

The Bacteria TMDL has identified the City of San Diego MS4 and as point sources that have been assigned Waste Load Allocations (WLAs). The Basin Plan Amendment (BPA), which is Attachment A of the Bacteria TMDL, outlines an implementation plan that includes a compliance schedule and a description of minimum monitoring requirements to assess compliance with the TMDLs, WLAs, and Load Allocations (LAs). The Responsible Party has developed this quality assurance project plan as part of the Comprehensive Load Reduction Plan (CLRP) for the Tecolote Creek Watershed.

The Tecolote Creek CLRP Monitoring Program is designed to fulfill the monitoring requirements of the BPA and generate data to support the Tecolote Creek CLRP. The Tecolote Creek CLRP Monitoring Program is described in detail in the Monitoring Plan. The goals of the Tecolote Creek CLRP Monitoring Program include the following:

- To assess progress toward meeting the Bacteria TMDL numeric targets and WLAs.
- To characterize potential sources of approved TMDL pollutants, draft TMDL pollutants, and other 303(d) listed constituents.
- To support the selection and evaluation of potential best management practices (BMPs).

The following four principal types of monitoring will be conducted to address the goals of the Tecolote Creek CLRP Monitoring Program.

- Compliance Monitoring is required by approved the Bacteria TMDL to demonstrate progress toward meeting TMDL requirements including numeric targets and WLAs.
- Optional Monitoring is not required by the TMDL; however if sufficient funds are available, it may be implemented by Responsible Parties to better understand water quality conditions in the receiving water and support the goals of compliance monitoring. Optional Monitoring may be added to (and removed from) the compliance monitoring effort as deemed appropriate by the Responsible Parties.
- Follow-up Monitoring will be implemented to characterize the source, magnitude, and duration of exceedances of bacteria water quality objectives (WQOs) in the receiving water based on the results of compliance monitoring.
- Special Studies will be implemented based on the available data and resources to address management questions regarding adopted TMDLs, and 303(d) Listed pollutants. Special Studies may require the development of separate agreements and funding opportunities between the Responsible Parties.

The purpose of this QAPP is to outline the methodology and data requirements to meet the goals of the Tecolote Creek CLRP Monitoring Program and address specific monitoring

requirements of the compliance monitoring and optional monitoring components scheduled to be implemented during Fiscal Year 2013.

4.2 Decisions or Outcomes

The data generated by this project will be used to track water quality at the compliance monitoring locations during wet and dry weather conditions. Compliance monitoring is designed to meet the receiving water monitoring requirements of the BPA. Compliance monitoring will evaluate data collected including the approved Bacteria TMDL pollutants and other optional field parameters.

The general approach and specific design elements of the project are driven by the following monitoring questions.

- Are TMDL numerical targets being met at the compliance monitoring locations?
- Are bacteria levels improving at the compliance monitoring locations?

4.3 Water Quality or Regulatory Criteria

The Bateria BPA defines the numeric targets and WLAs for the Responsible Party Data collected as part of the Tecolote Creek CLRP Monitoring Program will be utilized to evaluate progress and attainment of TMDL targets and WLAs. The receiving water limitation, WLAs and LAs for the Tecolote Creek Watershed are provided in Tables 1-4 and 1-5 of the Monitoring Plan per the Bacteria TMDL.

5.0 PROJECT/TASK DESCRIPTION

5.1 Work Statement and Products

This QAPP reflects the compliance monitoring, optional monitoring, and reporting components of the Tecolote Creek CLRP Monitoring Program.

5.1.1 Compliance Monitoring

The TMDL identifies 7 miles of Tecolote Creek as the targeted segment for indicator bacteria. Compliance monitoring is designed to meet the receiving water monitoring requirements of the BPA. Compliance monitoring, including wet and dry weather sampling, will be conducted each year at the compliance monitoring locations. The wet and dry weather monitoring components are described below:

- Wet weather monitoring will be conducted to characterize the bacteria concentrations during representative storm events. Wet weather monitoring will be conducted for three storm events each wet season (October 1 – April 30).
- Dry weather monitoring will be conducted throughout the year to characterize non-storm flow conditions. Dry weather monitoring will be conducted monthly or until measurable flow ceases at intermittent stream sites.

5.1.2 Optional Monitoring

All optional monitoring is considered above and beyond the requirements of the BPAs and the data needed to answer the compliance monitoring questions. Optional monitoring is presented in the QAPP so that the procedures are available should the Responsible Party decide to conduct the monitoring. If optional monitoring is conducted, it would be implemented concurrently with the compliance monitoring to supplement that data set.

5.1.3 Reporting

The Responsible Party will compile the project data and provide an annual CLRP Monitoring Summary to SDRWQCB.

5.2 Monitored Constituents and Measurement Techniques

Samples will be analyzed for FIB and may be analyzed for in-situ field measurements. Analysis of FIB, including *Enterococcus* and, fecal coliform are required for compliance with the TMDL. Measurement of *in-situ* field parameters is considered optional and will be implemented at the discretion of the Responsible Party. The Responsible Party may opt to analyze some, all, or none of the field measurements listed. Table 5-1 provides a master list of analytical constituents as well as SWAMP reporting limits (RLs). The Lead Agency will select an ELAP-certified method. Common methods for FIB analysis include multi-tube fermentation, membrane filtration, and Enterolert® by IDEXX Laboratories (for *Enterococcus* only).

The laboratory shall conduct the appropriate dilutions to generate results and avoid greater than values. The following ranges are applicable to all methods and are obtained by performing dilutions, when appropriate. Table 5-2 provides a master list of optional in-situ field measurements, and the SWAMP reporting limits.

Table 5-1.
Master List of Analytical Constituents

Constituents	Method	Target Reporting Limit[(a)]	Sampling Type
Indicator Bacteria			
Enterococcus	TBD	10 colonies/100 mL	D,W
Fecal coliform	TBD	20 MPN/100 mL	D,W

Notes:
TBD = To be determined by the Responsible Party
D = designates dry weather sampling.
W = designates wet weather sampling.
(a) The reporting limits are consistent with methodology of the Assembly Bill 411 Monitoring Program to facilitate comparable results throughout the region. However, reporting limits may be lower depending on the lab used to conduct the analysis.

Table 5-2.
Master List of Optional In-situ Field Parameters

Parameters	Method	SWAMP Target Reporting Limit	Sampling Type
Conductivity	Field Meter	2 µS/cm	TBD
Flow	Field Meter	NA	TBD
pH	Field Meter	NA	TBD
Temperature	Field Meter	NA	TBD
Turbidity	Field Meter	5 NTU	TBD

Notes:
µS/cm – microsiemen per centimeter
NA – not applicable
NTU – nephelometric turbidity unit

5.3 Project Schedule

Compliance Monitoring is scheduled to begin 30 days after submittal of the QAPP and Monitoring Plan to the SDRWQCB pending any comments or revisions. Table 5-3 provides the schedule for the annual activities for the Tecolote Creek CLRP Monitoring Program to be implemented in Fiscal Year 2013 including work plans, monitoring, and reporting. Program deliverables are described in Section 3 of the Monitoring Plan.

Table 5-3.
Project Schedule for Fiscal Year 2013

Activity	Date (MM/DD/YY)		Deliverable
	Anticipated Date of Initiation	Anticipated Date of Completion	
QAPP/ Monitoring Plan	submitted herein	submitted herein	QAPP/Monitoring Plan
Compliance Monitoring	11/4/12	11/4/13	NA
Reporting	NA	6/1/14	Annual CLRP Monitoring Summary to be included in the WURMP Annual Report

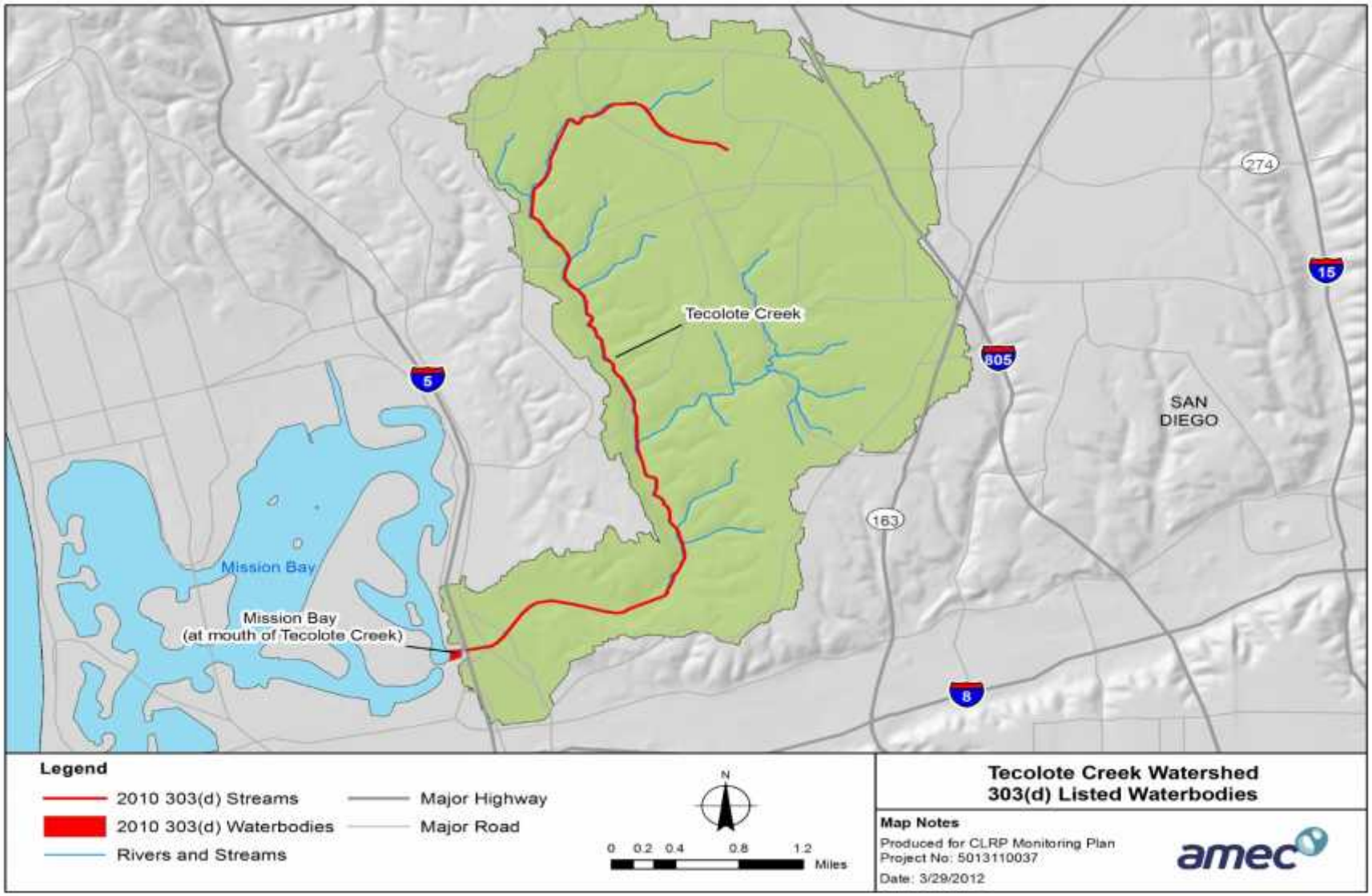
Notes:
NA Not applicable

5.4 Geographical Setting

The Tecolote Creek Watershed includes approximately 5,992 acres of primarily urbanized land located north of downtown San Diego. This watershed receives runoff from the Clairemont Mesa and Los Peñasquitos Watersheds, and drains to the southeastern portion of Mission Bay.

The Tecolote Creek Watershed is one of three hydrologic areas within the Mission Bay Watershed Management Area, and contains only Tecolote Creek. Within this watershed, primary land uses are residential (45 percent), transportation (21 percent), open space/parks and recreation (18 percent), and public facility (8 percent). The remaining 8 percent consists of a combination of commercial, industrial, military, and vacant and undeveloped land (WURMP, 2011).

Figure 5-1. Project Area



5.5 Constraints

To be determined at a later date by Responsible Party.

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6.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Data quality will be assessed using DQOs such as accuracy, precision, and completeness. The applicable DQOs are provided for each analysis type in Table 6-1. Measurement quality objectives for laboratory analyses are provided in Table 6-2. Measurement quality objectives for field measurements, which are optional analyses, are provided in Table 6-3. Details on DQOs and how they are measured are provided below.

Table 6-1.
Data Quality Objectives

Measurement or Analysis Type	Applicable Data Quality Indicators
Laboratory – Bacteria (Required)	Accuracy, Precision, Completeness
In-situ Field Measurements (Optional)	Accuracy, Precision, Completeness

Accuracy is a measurement of the closeness of a test value to the true or reference value. Accuracy can be measured in the laboratory using positive and negative controls.

Precision is a measurement of the repeatability of test measurements. Precision can be measured in the laboratory using laboratory replicates. Precision can be measured in the field using field duplicates. Relative percent differences (RPDs) will be calculated to determine the precision between duplicate samples. This calculation is shown below:

$$RPD = \frac{abs[x_1 - x_2]}{0.5 \times (x_1 + x_2)} \times 100$$

Where: x_1 is the primary sample concentration; x_2 is the duplicate sample concentration.

Completeness is a measurement of the percentage of project-specific data that are valid. Percent completeness will be calculated by dividing the number of useable sample results by total number of sample results planned. This calculation is shown below:

$$Completeness = \frac{\text{Actual Number of Samples Collected (Valid Results)}}{\text{Project Required Total Samples Planned (Number of Sample Results Planned)}} \times 100$$

Table 6-2.
Measurement Quality Objectives for Laboratory Data

Group	Parameter	Accuracy	Precision[a]	Target Reporting Limit[b]	Completeness
Bacteria	*Enterococcus*	Positive control and reference material = 80-120% recovery. Negative control = no growth on filter.	Lab Replicate RPD<25%	10 colonies/ 100 mL	90%
Bacteria	Fecal coliform	Positive control and reference material = 80-120% recovery. Negative control = no growth on filter.	Lab Replicate RPD<25%	20 MPN/ 100 mL	90%
Bacteria	Total coliform	Positive control and reference material = 80-120% recovery. Negative control = no growth on filter.	Lab Replicate RPD<25%	20 MPN/ 100 mL	90%

Notes:
[a] Not applicable, if native concentration of either sample is less than reporting limit.
[b] The reporting limits are consistent with methodology of the Assembly Bill 411 Monitoring Program to facilitate comparable results throughout the region. However, reporting limits may be lower depending on the lab used to conduct the analysis.

Table 6-3.
Measurement Quality Objectives for Optional Field Data

Group	Parameter	Accuracy	Precision	SWAMP Target Reporting Limit	Completeness
Field Analysis	Conductivity	TBD	TBD	2 µS/cm	90%
Field Analysis	Velocity	TBD	TBD	0.1 ft/s	90%
Field Analysis	pH	TBD	TBD	NA	90%
Field Analysis	Temperature	TBD	TBD	NA	90%
Field Analysis	Turbidity	TBD	TBD	5 NTU	90%

Notes:
ft/s feet per second
pH potential Hydrogen

7.0 SPECIAL TRAINING NEEDS/CERTIFICATION

7.1 Specialized Training or Certifications

All project field staff members are required to receive training on sampling standard operating procedures (SOP) and safety procedures prior to engaging in any field activities. Field staff will annually review the following:

- Sampling in accordance with the QAPP
- Safety procedures, site hazards, and safety awareness in accordance with the Sampling Agency's Health and Safety Plan.

The bacteria analysis will performed by a California DHS ELAP-certified analytical laboratory.

7.2 Training and Certification Documentation

The Sampling Agency will maintain records of training as detailed in Table 7-1. Documentation includes the date of training, the topic, the instructor name, and list of trainees.

Table 7-1.
Specialized Personnel Training or Certification

Specialized Training Course Title or Description	Training Provider	Personnel Receiving Training/Organizational Affiliation	Location of Records & Certification[(a)]
Sampling SOPs and Health and Safety Training	Sampling Agency	Sampling Agency Field Staff	Sampling Agency Address

[(a)] If training records and/or certification are on file elsewhere, then document their location.

7.3 Training Personnel

Field staff will be trained on proper procedures for *in-situ* field measurements (if applicable), sampling, post-sampling processing, sample handling, and flow measurements in accordance with the QAPP and Monitoring Plan. The Sampling Agency's Project Manager is responsible for training their respective employees prior to the start of sampling, and to conduct any training sessions as needed throughout the course of the program.

Trained laboratory analysts will perform sample analysis for this program.

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8.0 DOCUMENTS AND RECORDS

Documentation and record keeping are essential to project organization, consistency, and data verification. There are many types of documents and records required by this project. Table 8-1 identifies the document and record types, where they will be retained and archived, and what will be their respective dispositions. Final and revised versions of the QAPP will be distributed to the Responsible Party (Section 3.0), analytical laboratory, and the sampling agency.

Table 8-1.
Documents and Record Retention, Archival, and Disposition Information

Documentation Category	Identify Type Needed	Retention	Archival	Disposition
Project Plans	QAPP	Project Manager /SDRWQCB	Document/Portable Document Format (*.pdf)	Minimum 5 years
	Monitoring Plan	Project Manager /SDRWQCB	Document/*.pdf	Minimum 5 years
Sampling Records	Water Sampling Field Data Sheets/ Electronic Data Deliverable (EDD), if necessary	Sampling Agency	Field Notebook/ *.pdf/ Excel Spreadsheet	Minimum 5 years
	Creeks only: Instrument Maintenance and Calibration Records	Sampling Agency	Field Notebook/ *.pdf	Minimum 5 years
	Training Records	Sampling Agency	Field Notebook/ *.pdf	Minimum 5 years
	Photographs	Sampling Agency	Field Notebook/ Joint Photographic Experts Group (JPEG)	Minimum 5 years
	Creeks only: In-situ Field Measurements	Sampling Agency	*.pdf or Excel spreadsheet	Minimum 5 years
Analytical Records	Chain-of-Custody	Analytical Laboratory	Field Notebook/ *.pdf	Minimum 5 years
	Laboratory Reports	Analytical Laboratory	*.pdf/Microsoft Excel (Excel) spreadsheet	Minimum 5 years
	EDD	Analytical Laboratory	Excel spreadsheet or Database	Minimum 5 years
Data Records	Corrective Action Forms	Sampling Agency/ Laboratory	*.pdf	Minimum 5 years
CLRP Monitoring Summary	Final Report	Sampling Agency, The Responsible Party[(a)], SDRWQCB	Document/*.pdf	Minimum 5 years

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GROUP B: DATA GENERATION AND ACQUISITION

9.0 SAMPLING DESIGN

This section provides an overview of sampling design. The sampling design is given in detail within the Monitoring Plan.

9.1 Project Description and General Design

The scope of compliance monitoring accounts for the frequency and type of sampling activities of the existing Regional MS4 MLS Monitoring Program in order to facilitate overlap of monitoring efforts and resources. Table 9-1 provides the general scope of Tecolote Creek Compliance Monitoring Program.

Table 9-1
Scope of Compliance Monitoring

Number of Monitoring Locations	Wet Weather Monitoring		Dry Weather Monitoring	
	Grab Samples Per Event Per Site	Monitoring Frequency	Grab Samples Per Event Per Site	Monitoring Frequency
2	1	3 storms	1	monthly

9.2 Monitoring Locations

Two monitoring locations were selected based on the compliance requirements set forth in the Bacteria TMDL. Table 9-2 provides monitoring location information and Figures 9-1 through 9-2 provide an image of each monitoring location. The Bacteria TMDL requires receiving water compliance monitoring to occur at or near the mouth of the creek, such as the Mass Loading Station (MLS) or Mass Emission Station (MES), and one or more locations upstream of the mouth, such as the Temporary Watershed Assessment Station (TWAS). A watershed overview map of the monitoring locations is provided in Figure 9-4.

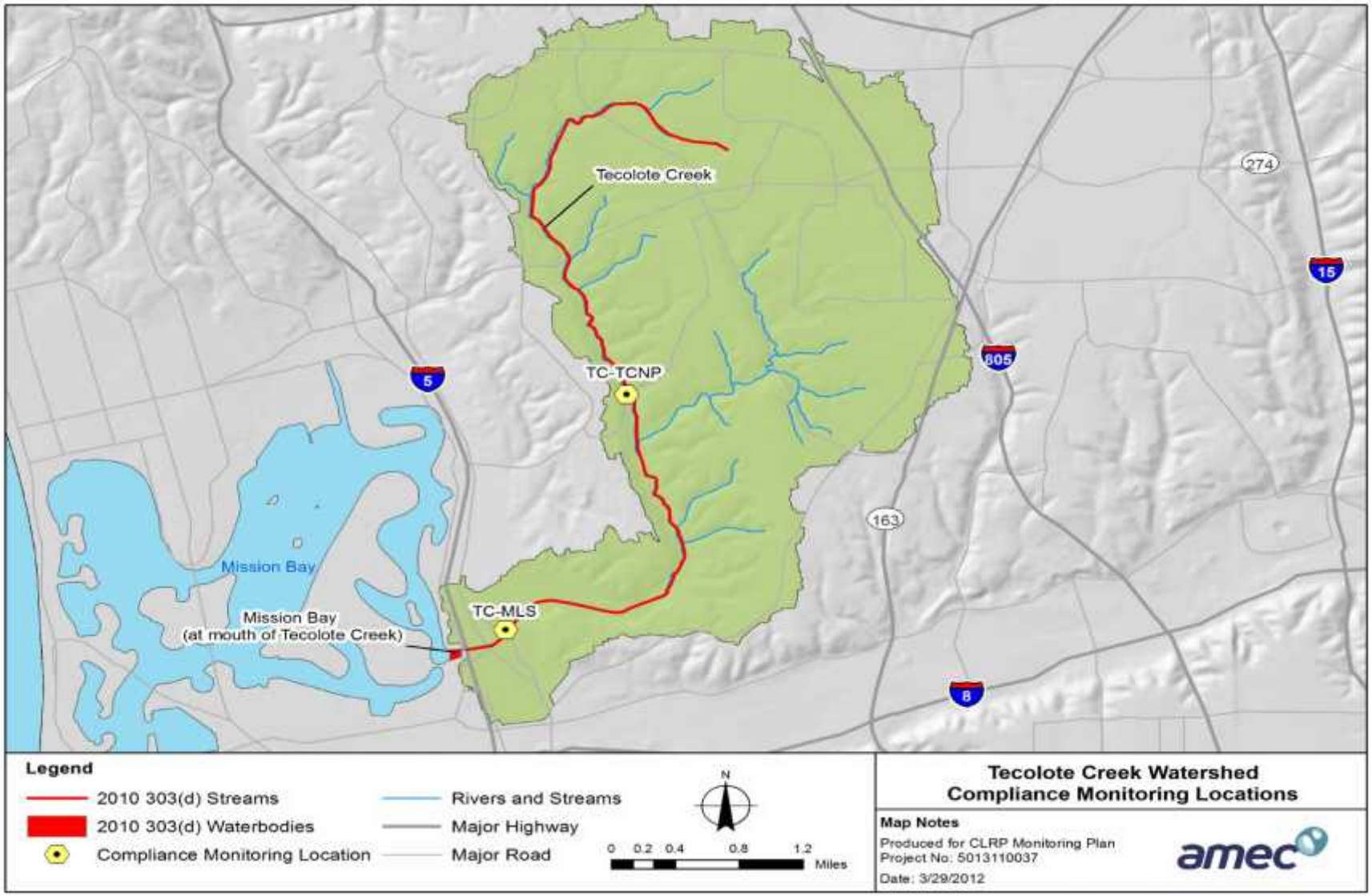
Table 9-2.
Sampling Site

Site ID	Site Name	Site Type	Latitude	Longitude
TC-MLS	Tecolote Creek-Mass Loading Station	Inland Surface Water	32.77293	-117.20307
TC-TCNP	Tecolote Creek-Temporary Watershed Assessment Station	Inland Surface Water	32.7979	-117.18898

Figure 9-1. Satellite Image of TC-MLS

Figure 9-2. Satellite Image of TC-TCNP

Figure 9-3. Sampling Locations



9.3 Wet Weather Sampling

Wet weather monitoring will target three storms with a trigger rainfall of 0.2 inches or greater between October 1 and April 30. USGS rain gauges throughout the watershed will be used to assess the trigger rainfall; however a flow trigger may be used as supplement to a rainfall trigger. One grab sample will be collected per storm at each site within 24 hours of the end of precipitation. Each grab sample will be collected at the compliance monitoring locations listed in Table 9-2 and analyzed for FIB analysis. *In-situ* field measurements (optional) and flow measurements will also be collected for each grab sample collected. The three storms will be targeted to occur during the early, mid, and late-season of the wet weather season to characterize seasonal changes, or during the following months to the maximum extent practicable:

- Storm 1 (Early season): October – November
- Storm 2 (Mid-season): December – January
- Storm 3 (Late-season): February – April

9.4 Dry Weather Sampling

Dry weather monitoring will occur at the compliance sites listed in Table 9-2 once per month throughout the duration of the compliance period. Dry weather sampling will occur on a dry weather day if there is measureable flow at the site. A dry weather day is defined as having an antecedent dry period of 72 hours with less than 0.1 inches of rainfall. Sampling may be conducted on any day of the month as long as the criterion for a dry weather day is met and there is measurable flow at the site. One grab sample will be collected and analyzed for FIB during each dry weather event. *In-situ* field measurements (optional) and flow measurements will be collected for each grab sample collected. Based on the data collected, the Responsible Party may consider increasing the sample frequency to once per week during the summer months when contact and non-contact recreation occur more frequently.

Sampling will be suspended once the stream is too low to sample. Field crews will check the creek for flow periodically and sample at a later date that month, if flow occurs. The flow conditions and date of site visits will be noted on field data sheets.

9.5 Monitoring Logistics

Wet weather and dry weather sampling will consist of a team of two field scientists collecting one grab sample for each sampling event. The sampling field staff will deliver samples to the laboratory courier at a designated meeting location or directly to the laboratory within the 6-hour holding time. Sample runners independent of the sampling team may be used instead of the sampling field staff during wet weather monitoring to deliver samples to the courier or laboratory. If samples are delivered to couriers during dry or wet weather events, meeting locations will be utilized to exchange samples between the couriers and sampling field staff (or

runners). After receiving samples, the couriers will deliver samples to the laboratory to meet bacteria holding times.

9.6 Laboratory Distribution

Laboratories will be ready to receive, preserve, and analyze bacteria samples as necessary according to this QAPP as they are delivered during wet weather and dry weather sampling. Sample delivery times for wet weather events may include weekends and 24-hour delivery (holidays excluded). However, sample collection may be timed by the Sampling Agency so that sample collection and delivery will occur during daylight hours. Timing of sample collection and delivery during the daytime is possible since sampling may occur within any time during the 24 hours of the end of precipitation. Dry weather samples will be delivered to the laboratory during business hours Monday through Friday (holidays excluded). Additional details regarding the sampling handling and distribution is provided in Section 11.

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10.0 SAMPLING METHODS

Table 10-1 presents the sampling locations and methods for each monitoring site. The water samples will be collected and analyzed for the bacterial analysis listed in Table 5-1. The collection of samples will be in accordance with the Standard Operating Procedure (SOP) for Conducting Field Measurements and Field Collections of Water and Bed Sediment Samples in SWAMP MPSL-DFG Field SOP v1.0 (SDRWQCB, 2007).

Table 10-1.
Sampling Locations and Sampling Methods

Sampling Type	Number of Sites	Station Code	Matrix	Depth (units)	Constituent Category per Site	Maximum # Samples per Site[a]	Sample Type	Sampling SOP #
Wet Weather	2	TC-MLS	Water	Mid-depth or Just Below Surface	*In-situ* Field (Optional) and Flow	5[b]	Grab	MPSL-DFG Field SOP v1.0
		TC-TCNP			Bacteria			
Dry Weather	2	TC-MLS	Water	Mid-depth or Just Below Surface[b]	*In-situ* Field (Optional) and Flow	14[c]	Grab	MPSL-DFG Field SOP v1.0
		TC-TCNP			Bacteria			

Notes:
[a] Maximum number of samples includes field duplicates and field blanks.
[b] Samples may be collected at the surface if water level is too low. If this occurs, it will be noted on the field forms.
[b] One sample per storm (3 storms per year), 1 field blank, 1 field duplicate
[c] One sample per month (12 months per year), 1 field blank, 1 field duplicate

10.1 Field Observations and Documentation

Field observations will be recorded during each monitoring event to record site conditions and actions taken during sampling. Field data sheets will be used to record general observations and potential sources of bacteria located in the vicinity of the site. General observations include weather, debris/trash observed, color and clarity of the water, odor, and any other conditions of interest. Potential sources of bacteria will be identified, including human-related sources, activities, and natural sources. Field data sheets will also be used to document possible field equipment failure that may occur during sampling activities.

The following general information should be recorded on a field data sheet during each site visit:

- Site identification (ID)
- Date and time
- Monitoring project name
- Field team personnel
- Weather conditions
- Water quality observations
- *In-Situ* field measurements (optional)
- Grab sample IDs
- Grab sample date/time
- Approximate sampling depth

- Miscellaneous comments
- Runoff characteristics

10.2 In-Situ Field Measurements

The Responsible Party may choose to collect *in-situ* field measurements for the some, all, or none of the following list of constituents:

- Conductivity
- Flow
- pH
- Temperature
- Turbidity

10.2.1 In-Situ Water Quality Measurements

If the Lead Agency elects to collect *in-situ* water quality measurements, the measurements will be made in the field by placing the probe(s) directly in the water column. Probes should be exposed to flow in a representative portion of the creek. A secondary container may be used if the water depth does not allow the probe to be completely submerged. Troubleshooting and corrective actions will be recorded in the calibration log and/or field datasheet. Field meters will be calibrated prior to use or according to the manufacturer's specifications. I*n-situ* field measurements will be collected at the same sample time and sample point as the grab sample. Field measurement values and collection times will be recorded on the field data sheet.

10.2.2 Flow Monitoring

Dry weather and wet weather flow monitoring will occur as an instantaneous flow measurement recorded at the time of sample collection. Velocity will be measured using a handheld flow meter selected by the Sampling Agency to measure instantaneous velocity. USGS cross-sectional stream rating methodologies (Rantz, 1982) will be used to calculate flow when conditions allow. Flow will ultimately be calculated as a function of velocity and area as provided below:

$$Q = A \times V$$

Where:
Q = Flow (cubic feet per second [cfs])
A = Area (square feet [ft^2])
V = Velocity (feet per second [ft/s])

If the flow meter should become nonoperational during field activities and troubleshooting methods are unable to resolve the issue, or conditions do not allow for use of the flow meter, the timed object method may be used as a temporary replacement method of measuring velocity.

Another method to estimate flow is to use the Time-Object Method. This method measures velocity (V) by recording the time (T) it takes for a floatable object such as a leaf or twig to travel a measured distance (D).

$$V = \frac{D}{T}$$

Where:
V = Velocity (ft/s)
D = Distance (foot [ft])
T = Time (second)

Estimate or measure the channel cross-sectional area, then calculate the volumetric flow rate (Q) using the following equation:

$$Q = A \times V$$

Where:
Q = Flow (cfs)
V = Velocity (ft/s)
A = Area (ft^2)

10.3 Grab Sampling

10.3.1 Wet Weather Grab Sampling

Grab samples will be representative of the environmental conditions at each site. Sampling will occur in the middle of the water column height, or just below the water surface, in a manner that avoids collection of surface scum and sediment from the bottom. Although grab samples will ideally be collected from the horizontal center of the stream, the stream stage may rise quickly and unexpectedly during storm conditions. As such, sample collection may need to be adapted depending on monitoring location conditions, including collecting samples closer to the banks of the stream so as to allow a safe sampling approach. The sample container will be attached to a grab pole and submersed into the water column, facing downward, to mid-depth (or just below the surface) and turned slightly upwards while moving the bottle upstream through the water until full to eliminate cross contamination from the sampling equipment.

Should field staff still consider the grab pole method to be unsafe, sampling may proceed using a sterilized bucket. This decision will be made by the field lead on-site at the time of the sampling event. If samples are to be collected using a bucket, it will be noted on the field data sheet and the Sampling Manager will be informed.

10.3.2 Dry Weather Grab Sampling

Samples will be collected during base flow or low flow conditions at the creek. Grab samples will be representative of the environmental conditions of each monitoring location, therefore grab samples will be collected at flowing, non-ponded sections of the stream. Sampling will occur in the middle of the water column height, or just below the water surface, to avoid collection of surface scum and sediment from the bottom to the maximum extent practicable. The sample

container will be submersed into the water column, facing downward, to mid-depth (or just below the surface) and turned slightly upwards while moving the bottle upstream through the water until full to eliminate cross contamination from the sampler. The sampler will take precaution and collect the samples in a manner that does not disturb the bottom sediments. A grab pole may be required if the center of the creek cannot be reached by hand.

10.3.3 Sample Handling

The following sample handling protocols will be followed when collecting samples to minimize the possibility of contamination. Further information regarding sample handling and custody is provided in Table 11-1.

- Field personnel will be thoroughly trained in the proper use of sample collection gear.
- Unused (new), clean, powder-free nitrile gloves will be worn while collecting samples and will be replaced with new, clean gloves between samples and/or sites.
- Previously unused (new) sample bottles of the recommended type will be employed. Sample bottles and bottle caps will be protected from contact with solvents, dust, or other contaminants during storage and bottle handling.
- Field personnel will make an effort, within reason, to prevent large gravel and uncharacteristic floating debris from entering the sample containers. Personnel will also make an effort to not disturb sediments that may be at the bottom of the channel.
- The inside of the sampling container and lids will not be touched during preparation and sampling activities.
- Vehicle engines will be turned off during sampling activities to minimize exposure of samples to exhaust fumes.
- New bags of previously unopened ice will be used to cool samples following sample collection.
- FIB samples will be collected directly into a sterilized polyethylene or polypropylene container to the maximum extent practicable.
- Sodium thiosulfate may be used if chlorine is suspected in the water. If used, care will be taken during sampling to avoid flushing out the preservative tablet.

Once sample containers are filled, they will be promptly placed on ice, in a clean cooler (maximum temperature of 6 ºC), in the dark and transported to the laboratory for processing to meet holding times.

10.4 Field Corrective Actions

Any failures (e.g., instrument failures) that occur during data collection will be the responsibility of the sampling team conducting the work. Samplers will carry basic spare parts and consumables with them to the field, and will have access to spare parts to be stored at their

respective agency. In the case of field instruments, problems will be addressed through instrument cleaning, repair, or replacement of parts or the entire instrument, as warranted. If meters fail in the field, sampling teams will instruct the laboratory to analyze for required constituents that were not collected in the field and will record this modification on the field data sheet and notify Sampling Manager immediately. All troubleshooting and corrective actions will be recorded in the calibration log and/or field datasheet. Records of all repairs or replacements of field instruments will be maintained at the offices of field sampling personnel.

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11.0 SAMPLE HANDLING AND CUSTODY

The sample container for *Enterococcus*, fecal coliform, total coliform will be a minimum of 150 mL, sterilized, plastic bottle. All bottles will be pre-labeled with the following information:

- Project name
- Date
- Time
- Sampling location name and number
- Sample matrix
- Collector's initials
- Sample ID number
- Analysis name.

Grab samples will be marked with a unique sample ID will be used to track the sample throughout its analyses. These sample IDs are also entered directly on to field and laboratory data sheets. All observations recorded in the field, as well as, information recorded in processing all field samples in the laboratory will be transcribed to Microsoft Excel spreadsheets. Hard copies of these field and laboratory data sheets will be maintained by the responsible agency.

Once sample containers are filled, they will be placed on ice, in a cooler, in the dark and transported to the laboratory for processing. Chains-of-Custody (COCs) will accompany the collected water samples. Sampled water will be kept below 6 °C and transferred to an analytical laboratory within holding times. COC forms for the samples will be completed and transported to the analytical laboratory with the samples. The analytical laboratory will ensure that all samples are handled and analyzed within the proper holding time. Sample holding times are listed in table 11-1. Custody of all samples will be transferred from the field personnel to laboratories.

Table 11-1.
Sample Handling and Custody

Analysis	Container	Minimum Sample Volumes[(a)]	Initial Preservation	Holding Time
Enterococcus	Factory-sealed, pre-sterilized, 150 mL sterile plastic (high density polyethylene or polypropylene) container	150 mL	< 6°C in the dark[(b)]	6 hours
Fecal Coliform				
Total Coliform				

Notes:
°C degree Celsius
[(a)] Minimum sample volume is representative of total volume needed to analyze all three (3) FIB.
[(b)] Sodium thiosulfate may be used if chlorine is suspected in the water. Sodium thiosulfate is used for chlorine elimination.

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12.0 ANALYTICAL METHODS

The laboratory analyses and the analytical methods are provided in Table 12-1. The laboratory will be certified by the California DHS ELAP.

The field analyses and methods, which are optional analyses, are provided below in Table 12-2. If field measurements are collected, they will be measured using properly calibrated field meters.

Table 12-1.
Laboratory Analytical Methods

Analyte	Lead Laboratory	Project Action Limits-MPN/100mL[a][b]		Project Reporting Limit (per 100mL)[c]	Analytical Method	
		Dry Weather	Wet Weather		Analytical Method/SOP	Modified for Method (yes/no)
Enterococcus	City's EM&TS and Weck	33(0%)	61(22%)	10 colonies	SM 9230B*/ Enterolert[b]	No
Fecal Coliform	City's EM&TS and Weck	200(0%)	400(22%)	20 MPN	SM 9222D	No

Notes:
MDL method detection limit
[a] Indicator Bacteria TMDL, Receiving Water Limitation for Tecolote Creek (HU 905.00)
[b] The number preceding the parenthesis is the water quality objective. The number in parenthesis is the allowable exceedance frequency.
[c] The reporting limits are consistent with methodology of the Assembly Bill 411 Monitoring Program to facilitate comparable results throughout the region. However, reporting limits may be lower depending on the lab used to conduct the analysis.

Table 12-2.
Field Methods (Optional)

Analyte	Organization	Project Action Limit	SWAMP Reporting Limit	Analytical Method	
				Analytical Method/SOP	Modified for Method
Conductivity	Sampling Agency	NA	2 µS/cm	Field Meter	No
Flow	Sampling Agency	NA	NA	Calculated from Field Data	No
pH	Sampling Agency	NA	N/A	Field Meter	No
Temperature	Sampling Agency	NA	N/A	Field Meter	No
Turbidity	Sampling Agency	NA	5 NTU	Field Meter	No

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13.0 QUALITY CONTROL

This section addresses QA/QC activities associated with both field sampling and laboratory analyses. The field QC samples are used to evaluate potential contamination and sampling error introduced prior to submittal of samples to the analytical laboratory. Laboratory QA/QC activities provide information needed to assess laboratory contamination, analytical precision, and analytical accuracy. If any QA/QC standards are not met, the appropriate corrective actions will be taken in accordance with Section 22 of this document and the laboratories' QA Manuals. The Project Manager is responsible for making decisions on corrective actions pertaining to laboratory analysis. If issues are identified by Sampling Agency's staff, the laboratory Project Manager or Sampling Agency's Project Manager will be notified immediately and documentation of the issue and the corrective action will be made.

13.1 Quality Control Types

A set of QC samples will be submitted to the laboratory based on the frequencies discussed in Section 10. The analytical laboratory may also require more QC samples if one type of analysis is to be run in more than one batch. The main types of QC samples that will be utilized for this study include field blanks, field duplicates, laboratory replicates, and positive and negative controls. The field blanks, duplicate samples, and laboratory replicates may be collected from different sites during a particular sampling event. The number and frequency of field QC samples to be collected are presented in Table 13-1. Field QC samples will be submitted blind to the analytical laboratory. For laboratory replicates, additional sample volumes will be collected if needed.

13.2 Field Quality Control Samples

Field Blanks
Field blanks are samples of reagent-grade, analyte-free, deionized water collected in the field to verify the field conditions and air deposition are non-contaminating during field sampling activities. Field blanks will be analyzed for the same suite of analyses as regular samples. The project frequency for field blanks is 5 percent of the total sample count. Concentrations of field blanks should be below the Reporting Limit for each analyte.

Field Duplicates
Duplicate samples consist of two distinct samples (an original and a duplicate) of the same matrix collected at the same time and location using the same sampling technique. Field duplicate samples will be collected by filling two grab sample containers at the same time, or in rapid sequence. The purpose of field duplicates is to measure the consistency of field sampling. The project frequency for field duplicates is 5 percent of samples. The result for each field duplicate will be compared to the sample result to estimate a RPD between the two sample results. The RPD between the two results will be calculated using the RPD equation provided in Section 6.0.

Table 13-1.
Field QC

Field QC	Frequency	Acceptance Limits
Field Blank	5% of all project samples	Concentrations should be below the RL.
Field Duplicate	5% of all project samples	RPD range of 0-25% [a] [b]

Notes:
[a] For coliforms: within 95% confidence interval as defined by IDEXX Laboratories
[b] NA if native concentration of either sample is less than the reporting limit.

13.3 Laboratory Quality Control

Laboratory QC samples include laboratory duplicates, positive and negative controls as described below. Laboratory QC sample results will be provided in a laboratory report and SWAMP compatible electronic data deliverable (EDD) with a batch ID number to correlate with the corresponding environmental sample data set. Table 13-2 describes the frequency and types of quality control samples for each constituent category.

- **Laboratory Replicate –** For a laboratory replicate, a sample is prepared and analyzed twice to assess the repeatability (precision). The results are evaluated by calculating the RPD between the two sets of results. This serves as a measure of the reproducibility, or precision, of the sample analysis. A minimum of one laboratory replicate will be analyzed per batch.
- **Positive and Negative Controls** – A negative control is created as a separate plate count after the buffered rinse water is filtered and incubated the same way as a sample. There should be no bacteria growth on the filter after incubation. It is used to detect laboratory bacterial contamination of the sample. A positive control is created as a separate plate count after a water sample known to contain bacteria (such as wastewater treatment plant influent) is filtered and incubated the same way as a sample. There should be bacteria growth on the filter after incubation. It is used to detect procedural errors or the presence of contaminants in the laboratory analysis that might inhibit bacteria growth (USEPA, 2012).

Table 13-2.
Laboratory QC

Constituent Category	Method Blanks	
	Frequency	Acceptance Limits
Laboratory Replicate	One per 20 samples or analytical batch, whichever is more frequent	RPD<25%[a]
Positive and Negative Controls	Per batch of bottles or reagents	Positive Control = 80-120% Recovery; Negative Control = No growth on filter

Note:
[a] Not applicable if native concentration of either sample is less than reporting limit.

14.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

If optional monitoring is conducted, all field equipment will be tested, inspected, and maintained according to manufacturer specifications. Sample equipment testing, inspection, and maintenance shall be performed on a general schedule of semi-annually or on an event basis as-needed, no more than seven days before a monitoring event. Replacement parts will be installed as necessary and may be stored on site in the monitoring shed or brought to the site with field crews. General descriptions of field equipment to be used for the monitoring programs covered under this QAPP are presented in Table 14-1.

Table 14-1.
Testing, Inspection, Maintenance of Sampling Equipment and Analytical Instruments.

Equipment/Instrument	Maintenance Activity, Testing Activity, or Inspection Activity	Responsible Person	Frequency	SOP Reference
Handheld Flow Meter	Maintenance and Inspection	Sampling Agency	Daily	Manufacturer O&M Manual
Field Water Quality Meter(s)	Maintenance and Inspection	Sampling Agency	Daily	Manufacturer(s) O&M Manual(s)

Note:
O&M Operations and Maintenance

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15.0 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Calibration of field meters will be performed every day prior to a sampling event, or as-needed. A calibration log will be maintained for all meters used in the field. All meters will be calibrated according to the manufacturer's operations and maintenance manual. Any parameters that do not require frequent calibration per manufacturer recommendation will be checked in a known standard for verification and documentation purposes. Calibration for all flow meters will be conducted prior to each monitoring event per the manufacturer's operations and maintenance manual. All field instrument calibration frequencies are consistent with the Electronic Template for SWAMP Comparable Quality Assurance Project Plan (SDRWQCB, 2008) and are presented in Table 15-1 below. Calibration logs will be kept on file at the Sampling Agency.

All laboratory equipment is calibrated based on manufacturer recommendations and accepted laboratory protocols. The laboratories maintain calibration practices as part of their method SOPs. Laboratory calibration documentation is maintained by the Laboratory Director/QA Officer and can be provided upon request.

Table 15-1.
Instrument/Equipment Calibration and Frequency

Equipment/Instrument	SOP Reference	Calibration Description and Criteria	Frequency of Calibration	Responsible Party
Handheld Flow Meter	Manufacturer O&M Manual	Manufacturer O&M Manual	Semi-annually or as needed	Sampling Agency
Field Water Quality Meter(s)	Manufacturer(s) O&M Manual(s)	Manufacturer(s) O&M Manual(s)	Before use or per manufacturer instructions	Sampling Agency

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16.0 INSPECTION/ACCEPTANCE OF CONSUMABLES AND SUPPLIES

All glassware, sample bottles, and collection equipment will be inspected prior to use. All ordered supplies will be examined for damage as they are received. Bottles and caps will be inspected for damage prior to sampling, and only sound bottles with intact threads will be used. The container caps will be tested for tightness prior to transport of samples.

The Sampling Agency will ensure sufficient field supplies are on hand prior to the start of sampling for each period. Field supplies will be stored at the Sampling Agency's offices. Laboratory supplies will be stored at the laboratories conducting the work. Table 16-1 presents the acceptance criteria for consumables and supplies that will be used for this study.

Table 16-1.
Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies/Consumables	Inspection/Testing Specifications	Acceptance Criteria	Frequency	Responsible Individual
Pre-cleaned sample containers	Open container	Lids screwed on bottles	100%	Sampling Agency
Laboratory glassware	Dirty	Clean	100%	Laboratories

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17.0 NON-DIRECT MEASUREMENTS

There are no non-direct measurements that will be fundamental to the success of this study.

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18.0 DATA MANAGEMENT

Data will be submitted in a standardized SWAMP-compatible format. The sampling agency will compile the monitoring data and the laboratory will compile the analytical data. A final data deliverable will be provided to the Responsible Party.

18.1 Field Observations and In-Situ Measurements

The Sampling Agency will review all field data sheets for completeness, maintain the original hardcopies, and scan electronic copies to Portable Document Format (*.pdf) for storage in the project file. Field data sheets will be transcribed into an electronic spreadsheet. Photographs of the monitoring sites taken by field personnel will be uploaded into the project file within three business days of field visits. Field team members will name the photographs using the site ID and the date the photo was taken. Copies of field data sheets and photographs for each event will be submitted to the Project Manager with the quarterly sampling summary.

18.2 Analytical Data

Laboratories will provide data in *.pdf, hardcopy, and SWAMP-compatible EDD. A SWAMP-compatible EDD will ensure that the data files can be uploaded to the SWAMP regional database. The Project Manager will review all lab reports and EDDs for accuracy, completeness, and SWAMP compatibility. Analytical results will be submitted to the Project Manager within three weeks of submittal of samples.

Within two weeks of receipt, the Project Manager will screen preliminary data deliverables for the following major items:

- A 100-percent check between electronic data provided by the laboratory and the hard copy reports.
- Conformity check between the COC Forms and laboratory reports.
- A check for laboratory data report completeness.
- A check for typographical errors on the laboratory reports.
- A check for suspect values, data qualifiers, and review of laboratory QC data.

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GROUP C: ASSESSMENT AND OVERSIGHT

19.0 ASSESSMENT AND RESPONSE ACTIONS

The Project Manager will be responsible for the day-to-day oversight of monitoring activities, laboratory analyses, and/or data reporting. Any failures (e.g., instrument failures) that occur during data collection and/or laboratory analyses will be the responsibility of the field crew or laboratory conducting the work, respectively. It is the responsibility of the Laboratory's QA Officer and Sampling Agency's Project Manager to report any assessments and proposed corrective actions to the Lead Agency's Project Manager. The Project Manager will relay deviations to the Project's QA Officer. The Project's QA Officer has the authority to stop all sampling, and analytical work if the deviations noted are considered detrimental to data quality. The following section describes how deviations from the QAPP will be identified.

Three types of assessments will be performed as part of this project to ensure that the sampling and analysis activities are in accordance with the approved QAPP. Assessment activities and results will be documented in writing first by field or laboratory reports, then in final reporting. They are as follows:

- **Surveillance of Sample Collection Activities:** The Sampling Agency's Project Manager will be responsible for oversight of sampling activities and will review field data sheets to verify that the samples were collected in accordance with QAPP requirements. If the Sampling Agency identifies any of the field activities to be in violation of QAPP requirements, the Project Manager will be contacted immediately. The Project Manager has the authority to stop field activities until corrective actions are successfully implemented. Corrective actions may include additional training to improve field team performance and QAPP compliance, or appropriate re-sampling of monitoring locations, as needed. Any corrective actions will be documented. Any actions necessary will be communicated to the Project Manager. Assessment of wet weather sample collection will be conducted by the Sampling Agency's Project Manager once per field season; while assessment of dry weather sample collection will be conducted at the beginning and end of dry weather collection.
- **Data Quality Assessment:** Each Laboratory Manager will be responsible for providing a summary of QC data to the Sampling Agency's Project Manager. If it is determined that the precision and accuracy objectives were not met, the Sampling Agency's Project Manager will notify the Laboratory Manager. Laboratory techniques will be reviewed to minimize errors, and samples will be re-analyzed, if possible.
- **Assessment of Data Entry:** Once the performance criteria are met, the Sampling Agency's Project Manager will review data files to ensure that errors are detected and corrected. The Project Manager will retain original data files and qualified data will be retained in the Stakeholder's database. Data are qualified in the database according to SWAMP protocols.

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20.0 REPORTS TO MANAGEMENT

AMEC will provide post-wet event sampling summaries to the the City of San Diego Project Manager as a status of monitoring activities.

The City of San Diego will generate an Annual CLRP Monitoring Summary, which will be included in the following WURMP Annual Report as an appendix.

The project reports are detailed within the Monitoring Plan. Table 18-1 presents the management reports.

Table 18-1.
Management Reports

Type of Report	Frequency (Daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Dates	Person(s) Responsible for Report Preparation	Report Recipients[(a)]
Wet Weather Sampling Summary	Post-event Summary	Post-event Summary	Project Manager, AMEC	City of San Diego
CLRP Monitoring Summary	Annual	June 30, 2014	Project Manager, AMEC	City of San Diego

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GROUP D: DATA VALIDATION AND USABILITY

21.0 DATA REVIEW, VERIFICATION, AND VALIDATION

All analytical data will be reviewed and compared to the DQOs described in Section 6 of this QAPP, along with the applicable QA/QC practices. If results fail to meet any DQO, the Sampling Agency's Project Manager will flag them for further review. Batch QC samples will be reviewed to determine the potential cause of failure to meet the DQO. Data will be separated into three categories: data meeting all DQOs (acceptable data), data failing precision or recovery criteria (further investigation warranted), and data failing to meet accuracy criteria (further investigation warranted).

If further investigation is warranted based on data failing precision or recovery criteria, all aspects of the data will be assessed for data quality by the Project Manager. At that point, the data will either be accepted or rejected. If accepted, the data will be flagged with a "J" qualifier per the United States Environmental Protection Agency (USEPA) specifications (USEPA, 2002). If data fails to meet accuracy criteria, or the cause of the failure cannot be identified and rectified, the data will be excluded from the results. All rejected data will be retained in the project database, and qualified as "rejected". The ultimate decision of whether to accept or reject a data point will be made by the Project Manager in consultation with the Project QA Officer.

If the analysis for more than ten percent of data fails to meet the DQO, the Project Manager and Project QA Officer will meet to discuss the appropriateness of the DQO and any potential modifications. All proposed modifications of DQOs will require a reissuance of the QAPP.

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22.0 VERIFICATION AND VALIDATION METHODS

Data verification is the process of evaluating the completeness, correctness, and conformance of the dataset against the method, procedural, or contractual requirements. The goal of data validation is to evaluate whether the data quality goals established during the planning phase have been achieved. Data quality indicators will be continuously monitored by the analyst producing the data (i.e., field and lab personnel), as well as the Laboratory or Sampling Agency's Project Manager throughout the project to ensure that corrective actions are taken in a timely manner. Data validation is an analyte-specific and sample-specific process that extends verification to determine the analytical quality of the dataset. Laboratory and field personnel responsible for conducting QC analysis will be responsible for documenting when data do not meet measurement quality objectives as determined by data quality indicators.

22.1 Data Verification and Validation Responsibilities

Data collected in the field will be verified by the Project Manager. The laboratories will maintain COCs and sample manifests.

Verification and validation of laboratory data is the responsibility of the laboratory section supervisor and Project Manager. Laboratories will maintain analytical reports including QC documentation. The Laboratory QA Officer will perform checks of all of its records.

The Project QA Officer and Project Manager are responsible for oversight of field data and laboratory data obtained from the contracted laboratory and sampling agency. All data records will be checked visually and recorded as checked by initials and dates.

Reconciliation and correction of any data that fails to meet the DQOs will be done by the Project Manager in consultation with the Laboratory QA Officer and/or Sampling Agency's Project Manager. Any corrections require a unanimous agreement that the correction is appropriate.

22.2 Process for Data Verification and Validation

Data verification and validation for sample collection and handling activities will consist of the following tasks:

- Verification that the sampling activities, sample locations, number of samples collected, and type of analysis performed is in accordance with QAPP requirements.
- Documentation of any field changes or discrepancies.
- Verification that the field activities and field data (including sample location, sample type, sample date and time, name of field personnel, etc.) were properly documented.
- Verification of proper completion of sample labels and COC forms, and secure storage of samples.
- Verification that all samples recorded on COC forms were received by the laboratory.

Data verification and validation for the sample analysis activities will include all of the following:

- Verification that appropriate methodology has been followed.
- Verification that instrument calibrations have been adequately conducted.
- Verification that QC samples meet performance criteria.
- Verification that analytical results are complete.
- Verification that documentation is complete.

Verification and validation of data entry includes:

- Sorting data to identify missing or mistyped (too large or too small) values.
- Double-checking all typed values.
- Verification that correct data types correspond to database fields (i.e., text for text, integers for integers, number for numbers, dates for dates, times for times, etc.).

23.0 RECONCILIATION WITH USER REQUIREMENTS

Water quality data collected during this project will provide a means of determining compliance with the Bacteria TMDL. The results of this project will provide valuable information for evaluating compliance with numeric targets and load allocations defined in the TMDL. Data from this study will also be used to support decisions regarding possible amendments to the TMDL and implementation of management measures and BMPs.

The data will be qualified if QA issues are identified. Statistics and reporting of standard deviation and relative error will be used to quantify the uncertainty associated with the data. Uncertainty and limitations on data use will be described in the Annual CLRP Monitoring Summary.

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24.0 REFERENCES

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