Total Maximum Daily Load for Bacteria in San Pedro Creek and at Pacifica State Beach

Final Staff Report for Proposed Basin Plan Amendment

California Regional Water Quality Control Board

San Francisco Bay Region

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1. INTRODUCTION

This report presents the supporting documentation for a proposed amendment of the San Francisco Bay Basin Water Quality Control Plan (Basin Plan) that will be considered by the California Regional Water Quality Control Board, San Francisco Bay Region (Water Board). The Basin Plan amendment would establish: (1) a Total Maximum Daily Load (TMDL) and an implementation plan for bacteria in San Pedro Creek and at Pacifica State Beach; and (2) new implementation provisions for the Basin Plan's existing water contact recreation bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to all future bacteria TMDLs in the Region. These new implementation provisions account for bacteria loading from natural uncontrollable sources within the context of a TMDL. This report contains the results of analyses of bacteria impairment assessments, sources and loadings, linkage analyses, proposed acceptable bacterial load allocations, and implementation actions.

1.1 Regulatory Background

The Clean Water Act (CWA) requires California to adopt and enforce water quality standards to protect all water bodies within the State. The Basin Plan delineates these standards for the Region. The standards include beneficial uses of waters in the Region, numeric and narrative water quality objectives to protect those uses, provisions to enhance and protect existing water quality (antidegradation), and other plans and policies necessary to implement water quality objectives, such as the proposed new implementation provisions for the water contact recreation bacteria water quality objectives. CWA Section 303(d) requires states to compile a list of "impaired" water bodies that do not meet water quality standards and to establish a TMDL for the pollutant that causes impairment. The proposed TMDL and implementation plan are designed to resolve bacterial impairment in San Pedro Creek and at Pacifica State Beach.

A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates the acceptable pollutant load to point and nonpoint sources. A TMDL is defined as the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background such that the capacity of the water body to assimilate pollutant loads (the loading capacity) is not exceeded. The Water Board is also required to develop a TMDL taking into account seasonal variations and including a margin of safety to address uncertainty in the analysis. In addition, the Water Board must develop a water quality management plan ("implementation plan") to implement the TMDL. Finally, TMDLs must be included in the State's water quality management plan (i.e., the Basin Plan).

The U.S. EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the state's 303(d) list and each TMDL developed by the state.

In addition, the scientific basis of the Basin Plan amendment is currently undergoing external scientific peer review. This step is required under section §57004 of the Health and Safety Code, which specifies that an external review is required for work products that serve as the basis for a rule, "…establishing a regulatory level, standard, or other requirements for the protection of public health or the environment." The scientific basis of the San Pedro Creek and Pacifica State

Beach Bacteria TMDL, as presented in the Staff Report, has undergone evaluation by a peer reviewer whose comments have been considered in finalizing this staff report and the proposed Basin Plan amendment.

1.2 Document Organization

The process for establishing a TMDL includes compiling and considering available data and information, conducting appropriate analyses relevant to defining the impairment problem, identifying sources, and allocating responsibility for actions to resolve the impairment. This report is organized into sections that reflect the key elements of the TMDL and the new implementation provisions for bacterial water quality objectives. Section 2 presents the background information about the physical setting of San Pedro Creek and Pacifica State Beach. Section 3 presents the problem definition that the project is based on and defines the project, why it is necessary, and its objectives. Section 4 includes the applicable water quality standards and the results of past and recent bacterial water quality studies.

Section 5 presents the proposed implementation provisions for the Basin Plan's bacteria objectives. Section 6 presents the proposed numeric targets. Section 7 provides our understanding of the potential sources of loading of bacteria to San Pedro Creek and Pacifica State Beach.

Section 8 presents the proposed pollutant load and wasteload allocations to identified pollutant sources. Section 9 presents the linkage analysis, which describes the relationship between indicator bacteria sources, load allocations, and the proposed targets. Section 10 presents the Implementation Plan, which includes actions and requirements deemed necessary to resolve the water quality impairment.

Section 11 specifies monitoring activities to demonstrate attainment of numeric targets and pollutant load and wasteload allocations. Section 12 presents the Regulatory Analyses, including the CEQA analysis and CEQA checklist and a consideration of economics. Section 13, References, lists all the information sources cited and relied upon in preparation of this report.

The proposed Basin Plan Amendment is contained in Appendix A.

2. BACKGROUND

2.1 Pacifica State Beach

Pacifica State Beach is a 0.75-mile-long crescent-shaped beach located at the mouth of the San Pedro Valley in downtown Pacifica, adjacent to State Route 1 (Figure 2.1). Pacifica State Beach is the most-used beach in San Mateo County (Smith 2009). It is frequently referred to as Linda Mar Beach because it fronts Pacifica's Linda Mar subdivision. Though it is technically a California State Beach, it is operated by the City of Pacifica (Pacifica) as a public park.

Figure 2.1. Pacifica State Beach, Pacifica, California

2.2 San Pedro Creek

San Pedro Creek is a perennial stream in Pacifica that runs from the Santa Cruz Mountains through the San Pedro Valley to its mouth at Pacifica State Beach at the southern end of Pacifica (Figure 2.2). It drains a 5,114-acre (about 8-square mile) basin and is composed of five main tributaries that delineate seven subwatersheds (McDonald, 2004). The Creek has four major forks: the North, Middle, South, and Sanchez Forks.

The San Pedro Creek watershed is bordered by the Pacific Ocean to the northwest and by mountains on the three remaining sides. Pacific Coast Highway crosses the watershed at its northwestern edge. Urban development covers most of the valley floor, and extends up onto

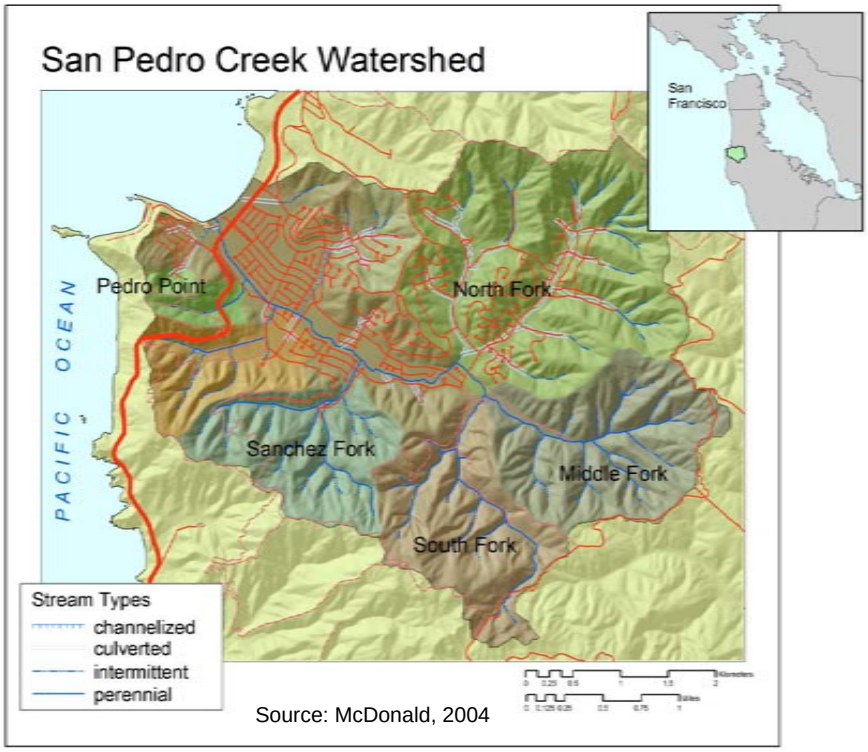
some hillsides. The watershed is approximately 33% developed (residential, commercial, mixed urban or built-up, and other urban or built-up) (Matuk 2001).

To the east and south, the watershed contains the parklands of the Golden Gate National Recreation Area, San Pedro Valley County Park, and McNee Ranch State Park. Open areas and parklands in and around the watershed harbor wildlife such as deer, bobcats, fox, and turkey vultures.

Aside from its North Fork, which is mostly culverted, the other branches of San Pedro Creek generally support a vegetated riparian corridor. The Creek provides the only good habitat for a native steelhead population between San Francisco and Half Moon Bay (McDonald 2004).

There are currently three commercial horse facilities in the San Pedro Creek watershed: Park Pacifica Stables, Millwood Ranch, and Shamrock Ranch (see figure 2.3). These facilities provide horse boarding, horseback riding trips, riding lessons, and other services. Additionally, Shamrock Ranch provides dog boarding.

Figure 2.2. San Pedro Creek Watershed, Pacifica, California



Source: McDonald, 2004

Approximately 2,200 acres of the San Pedro Creek watershed are located in unincorporated San Mateo County. Within the unincorporated County, approximately 85% of the watershed land is large, undeveloped open space parcels owned by public agencies, including the County, City of Pacifica, City and County of San Francisco Water Department (SFPUC), State of California, and North Coast County' Water District. Land use within these parcels is park (McNee Ranch State Park, San Pedro Valley County Park, and Golden Gate National Recreation Area) and public

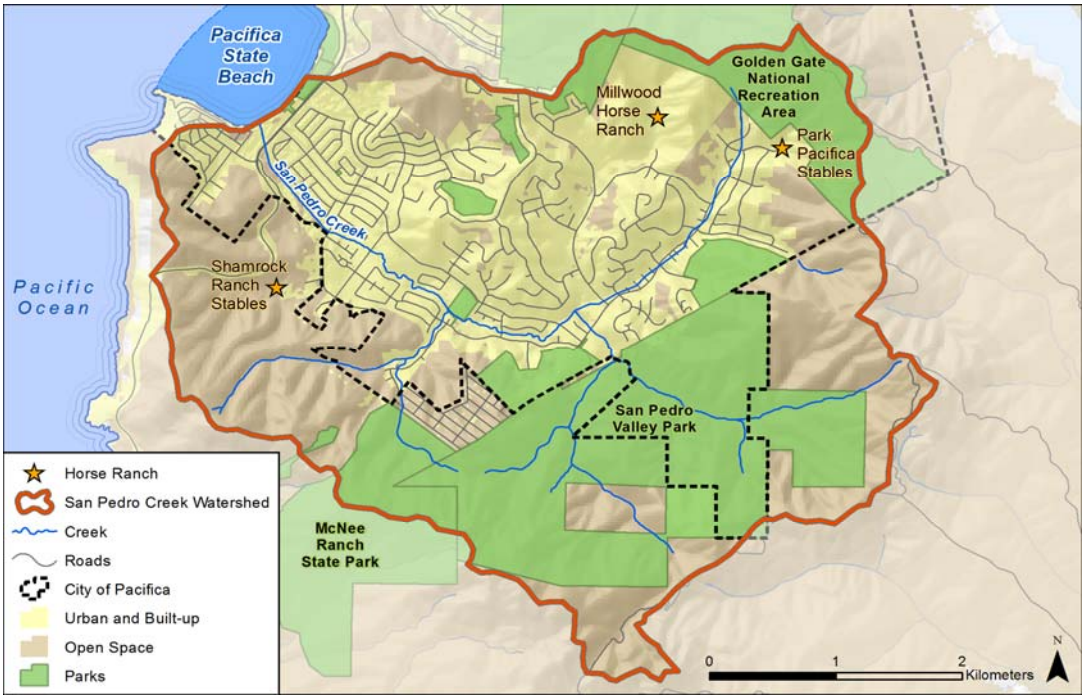
utility/water supply (public access in these areas is generally restricted). The remaining 15% of the unincorporated area within the watershed is privately owned. Of the privately owned lands, approximately 50% is the Shamrock Ranch property, 25% is owned by the Linda Mar Land Company, and the remaining 25% (3% of total watershed area) is smaller, undeveloped, privately-owned parcels.

There are no County maintained roads or storm drains, nor any urban or residential development within the unincorporated portion of the watershed, except within Shamrock Ranch and San Pedro Valley County Park.

Land Use

San Pedro Creek is located in one of the most populous sections of Pacifica. Although its headwaters and most of its south slope remain relatively undisturbed, covered in native shrub and brush, urban land uses dominate the lower hillsides and the land uses in the lower reach include four shopping centers, extensive residential development (i.e., the Linda Mar, Sun Valley and Pack Pacifica neighborhoods), several schools, and numerous commercial properties, as well as an extensive network of paved roads and parking lots (Creek Coalition 2012).

Figure 2.3. San Pedro Creek Watershed Land Use



2.2.1 San Pedro Creek Watershed Coalition

In 1999, a group of Pacifica residents formed the nonprofit San Pedro Creek Watershed Coalition, with the goal of protecting and enhancing the health of San Pedro Creek and its watershed. Their activities include monitoring, restoration, adaptive management, and education programs.

3. PROJECT DEFINITION

This section presents the problem statement upon which the proposed Basin Plan amendment project is based. It also presents the project definition and objectives by which the project is evaluated under the California Environmental Quality Act (CEQA).

3.1 Problem Statement

San Pedro Creek and Pacifica State Beach are impaired by the types of pathogens that are found in warm-blooded animal (e.g., human) waste. We infer the presence of pathogens from high indicator bacteria (e.g., fecal coliform, enterococcus, and *E. coli*) concentrations. Pathogens pose potential health risks to people who recreate in contaminated waters.

San Pedro Creek and Pacifica State Beach are listed as impaired water bodies under CWA section 303(d) due to high indicator bacteria levels. The listing of these water bodies as impaired is based on exceedances of bacterial water quality objectives for the water contact recreation beneficial use.

3.2 Project Definition

The project is the adoption of a proposed Basin Plan Amendment to: (1) establish a Total Maximum Daily Load (TMDL) and an implementation plan for indicator bacteria in San Pedro Creek and at Pacifica State Beach; and, (2) incorporate new implementation provisions for the Basin Plan's existing indicator bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to all future indicator bacteria TMDLs in the Region. The Water Board is obligated under CWA Section 303(d) to develop a TMDL for these water bodies to address their impairment. The following components form the basis of the proposed regulatory provisions and define the project:

- Numeric targets for indicator bacteria concentrations in water column;
- Allocation of the allowable exceedance days of bacteria objectives to various indicator bacteria source categories as load and wasteload allocations;
- A plan to implement the TMDL that includes actions to reduce bacteria loads to achieve load and wasteload allocations in the San Pedro Creek watershed that recognizes that there are natural sources of bacteria that are not controllable;
- A monitoring program to evaluate progress in meeting the numeric targets and load and wasteload allocations; and
- Implementation provisions for Basin Plan's numeric bacteria water quality objectives that address natural sources of bacteria, specifically, the reference system and antidegradation approach.

3.3 Project Objectives

The objectives of the proposed Basin plan amendment are consistent with the mission of the Water Board and the requirements of the CWA and Water Code. The objectives are to:

- Comply with the CWA requirement to adopt a TMDL for Section 303(d)-listed water bodies;
- Protect existing recreational uses in San Pedro Creek and at Pacifica State Beach;
- Attain the bacteria objectives for water contact recreation in San Pedro Creek and at Pacifica State Beach, as quickly as feasible;
- Set numeric targets to attain relevant water quality standards in San Pedro Creek and at Pacifica State Beach;
- Ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of water quality is permitted where existing water quality is better than that of a reference site;
- Develop implementation provisions for Basin Plan's numeric bacteria water quality objectives that address natural sources of bacteria;
- Avoid imposing regulatory requirements that mandate the diversion and treatment of water from receiving waters to address uncontrollable natural sources of indicator bacteria from undeveloped areas;
- Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; and
- Complete implementation of needed bacteria abatement measures in as short a time as is feasible.

4. WATER QUALITY STANDARDS AND MONITORING RESULTS

This section discusses the bacterial water quality standards applicable to this TMDL and results of past and recent bacteriological studies.

4.1 Use of Indicator Organisms as Indicators of Pathogens

More than 100 types of pathogenic microorganisms can occur in water polluted by fecal matter and cause outbreaks of waterborne disease (Havelaar 1993).

The detection and enumeration of all pathogens of concern is impractical in most circumstances. Many different pathogens can reside in a single water body, and organism-specific detection methods are costly and time consuming (U.S. EPA 2002). Therefore, indicator organisms are commonly used to assess microbial water quality for recreational uses. Several types of indicator bacteria colonize the intestinal tracts of warm-blooded animals and are routinely shed in their feces. These organisms are not necessarily pathogenic, but are abundant in wastes from warm-blooded animals and are easily detected in the environment. The detection of indicator organisms indicates that the environment is contaminated with fecal waste and that pathogenic organisms may be present.

Commonly used bacterial indicators of fecal contamination include total coliform, fecal coliform, *E. coli*, and enterococcus.

- Total coliform include several genera of bacteria commonly found in the intestines of warm-blooded animals. However, many types of coliform bacteria grow naturally in the environment—that is, outside the bodies of warm-blooded animals.
- Fecal coliform are a subset of total coliform and are more specific than total coliform to wastes from warm-blooded animals, but not necessarily to humans.
- *E. coli* are a subset of fecal coliform, and are thought to be more closely related to the presence of human pathogens than fecal coliform (U.S. EPA 2002).
- Enterococcus represents a different bacterial group from coliform, and is also regarded to be a good indicator of fecal contamination from warm-blooded animal sources, especially in salt water (*ibid.*).

4.2 Bacterial Source Tracking Techniques

Knowing the source(s) of bacteria in a water body is of great value in taking actions to prevent further bacterial contamination. Bacterial Source Tracking (BST) is a relatively new and developing methodology used to determine the source of fecal pathogen contamination in environmental samples. The first step in BST is to select a differentiable characteristic, or fingerprint, to identify various strains of bacteria. Then a representative library of bacterial strains and their fingerprints must be generated from all sources (i.e., human and animals) that may impact the water body. Lastly, indicator bacteria fingerprints from the polluted water body are compared to those in the library and assigned to the appropriate source category based on fingerprint similarity.

BST methods are divided into three basic groups: chemical, phenotypic, and genotypic. Chemical methods detect compounds linked to human wastewater. It is assumed that if these chemicals (e.g., optical brighteners commonly present in laundry detergents) are detected, there must be a human wastewater source associated with the contamination of the water body. Phenotypic methods (e.g., antibiotic resistance analysis) detect the type and quantity of substances produced by fecal bacteria. Genotypic methods, which are commonly referred to as "DNA fingerprinting," rely on the unique genetic characteristics of different strains of fecal bacteria. The distinctions between fecal bacteria from different animals (including humans) occur because of the differences between the diet and intestinal environments of their host animals. These bacteria have, therefore, developed differentiable characteristics that can be related to their sources.

There have been significant improvements in BST methods in recent years. However, at this point, no single BST method is capable of identifying specific bacterial sources in all situations. BST methods are typically 65-85% accurate (Risse, et. al. 2009). Future research should enhance the accuracy of BST methods.

As discussed in Section 4.4.2, the findings from a BST study conducted by the San Pedro Creek Watershed Coalition (Creek Coalition) in the San Pedro Creek watershed have been used to partially identify and assess potential contributing sources of bacteria in this TMDL project.

4.3 Water Quality Standards

Under the authority of the CWA, the Water Board has established water quality standards for recreational uses. Water quality standards consist of: The beneficial uses of the water body in question, water quality objectives (numeric or narrative) to protect those beneficial uses, and the state of California's antidegradation policy, which requires continued maintenance of existing high-quality waters.

4.3.1 Beneficial Uses

The Basin Plan designates beneficial uses for each water body in the Region and the water quality objectives and implementation measures necessary to protect those uses. The designated beneficial uses of San Pedro Creek that could be negatively impacted (impaired) by high levels of pathogens (as inferred from high concentrations of indicator bacteria) are water contact recreation (REC-1), non-contact water recreation (REC-2), and municipal and domestic water supply (MUN). The designated beneficial uses of Pacifica State Beach that could be negatively impacted (impaired) by high levels of pathogens are water contact recreation (REC-1), non-contact water recreation (REC-2), and shellfish harvesting (SHELL)(Table 4.1). The impairment of MUN and SHELL beneficial uses will be addressed in a separate TMDL project and/or water quality standards action.

Water quality objectives for REC-2 are less stringent than the water quality objectives for REC-1. Therefore, attainment of REC-1 objectives through the implementation of TMDL will, *a fortiori*, also meet the water quality objectives for REC-2. The goal of this TMDL is to restore and protect REC-1 and REC-2 beneficial uses by reducing the levels of pathogens, as inferred from reduction in levels of indicator bacteria, in San Pedro Creek and at Pacifica State Beach.

Table 4.1. Beneficial Uses of San Pedro Creek and Pacifica State Beach Relevant to Bacteria TMDL

Designated Beneficial Uses	Description
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water such that ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.
Non-contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
Shellfish Harvesting (SHELL)	Uses of water that support habitats suitable for the collection of crustaceans and filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes.
Municipal and Domestic Water Supply (MUN)	Uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply.

4.3.2 Water Quality Objectives

The Basin Plan contains bacteria water quality objectives (WQOs) to protect REC-1 and REC-2 uses. Water quality objectives that are applicable are those for fecal and total coliform bacteria that apply to inland fresh waters (i.e., San Pedro Creek), and those for enterococcus bacteria that apply to marine and estuarine waters (i.e., Pacifica State Beach). Table 4.2 presents these WQOs.

The Basin Plan also contains U.S. EPA bacteriological criteria for REC-1. Criteria that are applicable and used in this TMDL are the ones for *E.coli* bacteria that apply to fresh waters (i.e., San Pedro Creek). These criteria are:

- *E.coli* geometric mean < 126 colonies/100 mL; and,
- *E.coli* single sample maximum < 235 colonies/100 mL.

In addition to the objectives established by the Regional Water Board, the State Water Resources Control Board (State Water Board) has established objectives to protect REC-1 in ocean waters (e.g., Pacifica State Beach) from bacterial contamination. These WQOs are contained in the State Water Board's Water Quality Control Plan for Ocean Waters of California (Ocean Plan) and are summarized in Table 4.3 (State Water Board 2009).

Since the Basin Plan's "90th-percentile" and the Ocean Plan's "single sample maximum" bacteria objectives for REC-1 are basically the same, to avoid confusion, throughout this document, these objectives are collectively referred to as the single-sample objectives.

Table 4.2. Basin Plan's Recreational Water Quality Objectives for Bacteria[a]

Beneficial Use	Fecal Coliform (MPN[b]/100 mL)	Total Coliform (MPN/100 mL)	Enterococcus (MPN/100mL)[c]
Water Contact Recreation (REC-1)	Geometric Mean < 200 90th percentile < 400	Median < 240 No sample > 10,000	Geometric Mean < 35 No sample > 104
Non-contact Water Recreation (REC-2)	Mean < 2000 90th percentile < 4000	Not Available	Not Available

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

b. Most Probable Number (MPN) is a statistical representation of the results of the standard coliform test.

c. Applicable to marine and estuarine waters only.

Table 4.3. Numeric Objectives for Water Contact Recreation in Ocean Waters

Objective Type	Indicator Bacteria	Standard
Single Sample Maximum*	Total Coliform	10,000 MPN/100 mL
	Fecal Coliform	400 MPN/100 mL
	Enterococcus	104 MPN/100 mL
30-day Geometric Mean**	Total Coliform	1,000 MPN/100 mL
	Fecal Coliform	200 MPN/100 mL
	Enterococcus	35 MPN/100 mL
Value cannot be exceeded if ratio of fecal/total coliform is greater than 0.1***	Total Coliform	1,000 MPN/100 mL

*The "single sample maximum" objective means that no sample can exceed the corresponding water quality standard value (e.g., 400 MPN/100 mL for fecal coliform).

**The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers. It is calculated by multiplying all the numbers in a data group, and taking the n^{th} root of the total. For the numeric objectives listed in this table, the geometric mean is calculated based on the five most recent samples from each site during a 30-day period

***If the ratio of the concentration of the fecal coliform sample to the concentration of the total coliform sample is higher than 0.1, then concentration of the total coliform sample must be no greater than 1000 MPN/100 mL.

4.4 Water Quality Impairment

Pacifica State Beach and San Pedro Creek are listed as impaired water bodies under CWA section 303(d) due to high indicator bacteria levels. The listing of these water bodies as impaired is based on exceedance of bacterial water quality objectives for recreational beneficial uses. The section below summarizes the data/results from some of the past and recent studies used to document water quality impairment in these water bodies.

4.4.1 Past Bacteriological Studies

Over the last decade or so, a number of studies have been conducted to evaluate the water quality of San Pedro Creek. In 1996, U.S. EPA began a two-year exploratory testing of the Creek's water. At the same time, some Pacifica residents conducted their own independent study of the Creek's water quality. The U.S. EPA and the Pacifica residents' data showed that the Creek's bacterial levels exceeded the standards for water contact recreational uses for most of the sampling period (Creek Coalition 2008). A 2001 San Francisco State University Master's student's study examined the Creek's biological characteristics. That study compared fecal bacteria sampling results to the Water Board and the U.S. EPA standards for water contact recreation. The study found that fecal bacteria levels in the North Fork and Main Stem of San Pedro Creek far exceeded the acceptable levels for water contact recreation as established by the State of California and the U.S. EPA (Matuk 2001).

4.4.2 San Pedro Creek Watershed Coalition Bacterial Analysis Project

In 2006, to address water quality concerns in San Pedro Creek, the Creek Coalition, a coalition of Pacifica Residents, conducted a Bacterial Source Tracking (BST) study aimed at identifying the sources of bacterial contamination in the watershed. The Creek Coalition collaborated with partners to complete this BST study. The objective of this study was to estimate the relative abundance of various human and animal sources of bacteria in the Creek. The State Water Board provided the funding for this study.

At the end of the study, the Creek Coalition concluded the following:

> *While avian inputs are most dominant, significant levels of input from horses, humans and dogs point to the need for management changes, such as addressing leaking sewer lines, and education and outreach.*
>
> *Horse E. coli inputs are much more abundant during the wet season, suggesting the need to address horse fecal runoff from stables and trails.*
>
> *Canine inputs are assumed to be from pet dogs, and are prominent as a percentage – second only to avian sources – in both wet and dry seasons. Runoff from impervious surfaces is likely to be a significant cause during both wet and dry seasons, from natural rains or sidewalk hosing. Education and outreach is an important need.*
>
> *Raccoons and rodent inputs follow similar patterns, supporting more direct contribution to creeks and storm drains by these animals, since concentrations are diluted instead of increased during the wet season.*
>
> *Human inputs are no doubt from leaking sewer lines, and these greatly increase downstream. Even the North Fork has relatively low total counts, so the place to focus*

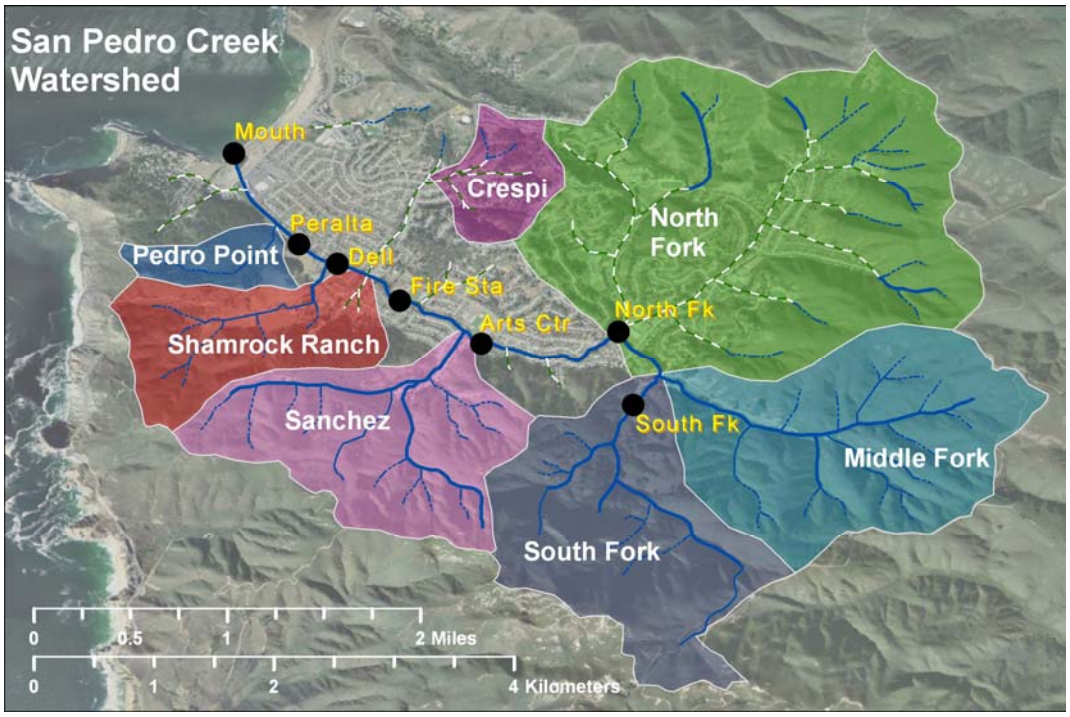
efforts is in downstream neighborhoods where laterals are old and poorly constructed (Creek Coalition 2008).

Study Design:

The Creek Coalition collected water samples on 10 wet-season and 10 dry-season dates in 2006, at seven locations on San Pedro Creek. One sample from each site was analyzed for *E.coli* and total coliform. Ten 2-minute increment water samples from each of the seven sites were used for BST analysis. Figure 4.1 shows the sampling sites (Creek Coalition 2008).

The Creek Coalition collected fecal samples to act as source samples for bacterial source identification from a variety of sources such as: humans, horses, dogs, cats, deer, raccoons, sea gulls and any other animals living in the San Pedro Creek watershed.

Figure 4.1. San Pedro Creek Watershed Coalition Sampling Sites



Dashed lines indicate sections of San Pedro Creek that are culverted and solid blue lines show the sections that are not.

Source: Creek Coalition 2008

Study Results:

Indicator Bacteria Concentrations

Tables 4.4 and 4.5 and Figures 4.2 through 4.5 summarize the study results. For every sampling event, one additional sample was collected at each site and analyzed for *E. coli* (E) and total coliform (T) concentrations. The *E. coli* and total coliform data provide a spatial and temporal analysis of microbial pollution sources (Creek Coalition 2008).

Analysis of site and seasonal differences in *E.coli* counts and *E.coli* / total coliform ratio

The data reveals significant spatial differences when observing the mean and error bars of *E. coli* and the *E.coli*/total coliform ratio at all sites (Figures 4.2 and 4.3).[1] In the wet season, lower sites have the highest counts, but show considerable variability. During the dry season, with the exception of the South Fork, greatest variability is observed upstream, and concentrations are somewhat higher upstream. However, bacterial counts are far lower than the large counts observed downstream during the wet season. As a reminder, the water quality objectives for *E.coli* and total coliform bacteria in recreational waters are 235 and 10,000 MPN/100 mL of water, respectively.

[1] The ratio of *E.coli*/total coliform is important because the number of cases of swimmers illness increases as the ratio of *E. coli*/total coliform exceeds 0.1 and the total coliform level exceeds 1000.

Table 4.4. San Pedro Creek Wet and Dry Season *E.coli* (E) and Total Coliform (T) Counts

Wet Season Bacteria Counts (Most Probable Number (MPN) per 100 ml of water)

	S. Fork		N. Fork		Arts Center		Fire Sta		Dell		Peralta		Mouth	
date	E	T	E	T	E	T	E	T	E	T	E	T	E	T
1/30/2006	10	201	231	2613	292	1223	253	2187	8164	24192	9208	24192	4884	24192
1/31/2006	10	472	134	2247	52	1669	63	1576	134	2359	408	2382	299	2723
2/6/2006	1	389	31	1918	10	1427	20	1374	31	1872	213	2909	31	3448
2/7/2006	1	288	30	1092	10	1376	41	1354	41	1500	110	1565	185	3255
2/13/2006	1	301	120	19862	52	9208	110	6867	52	3448	72	7701	216	4884
2/14/2006	1	185	197	24192	318	24192	262	24192	328	17328	292	24191	262	7701
2/21/2006	1	288	10	1483	31	1725	41	2098	20	3448	98	1789	31	2098
2/28/2006	10	265	728	6488	373	1935	413	2247	464	2909	12033	24192	6488	24191
3/6/2006	10	435	960	19862	1439	11198	933	11198	860	15530	521	17328	609	19862
3/7/2006	10	272	189	2909	1274	17328	780	14136	1515	24192	4611	24192	6488	24192

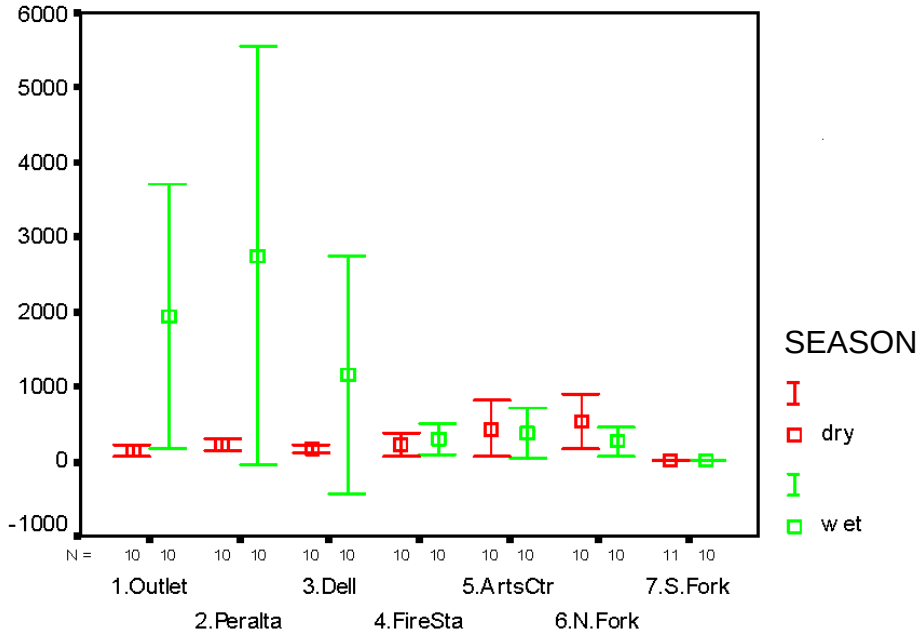
Dry Season Counts (Most Probable Number (MPN) per 100 ml of water)

	S. Fork		N. Fork		Arts Center		Fire Sta		Dell		Peralta		Mouth	
date	E	T	E	T	E	T	E	T	E	T	E	T	E	T
7/12/2006	20	382	717	19862	1989	10462	591	8664	216	2595	490	3044	399	3130
7/18/2006	1	216	98	5172	132	683	97	1198	336	1291	238	1725	328	4352
7/19/2006	10	259	160	8664	160	1396	717	2909	134	1722	122	1935	86	9208
7/24/2006	10	565	439	24191	932	4611	158	3654	122	4611	148	3873	135	4884
8/2/2006	1	96	63	2613	275	537	85	959	41	1017	143	1043	41	1112
8/3/2006	10	669	404	3448	309	4611	41	4352	201	4611	218	3654	41	3255
8/9/2006	10	272	331	3076	259	1789	122	1396	148	1722	216	1722	98	2143
8/15/2006	1	201	1842	24192	98	1989	74	2143	156	2481	146	2481	41	1793
8/17/2006	31	426	1274	24192	121	2755	160	3255	132	3448	318	1789	135	2046
8/22/2006	10	364	63	9804	86	7270	134	3968	246	7701	160	7701	158	2143

Note: when bacteria counts were <10, a value of 1 is displayed. Where bacteria counts were reported as >24192, a value of 24192 is assigned (Creek Coalition 2008).

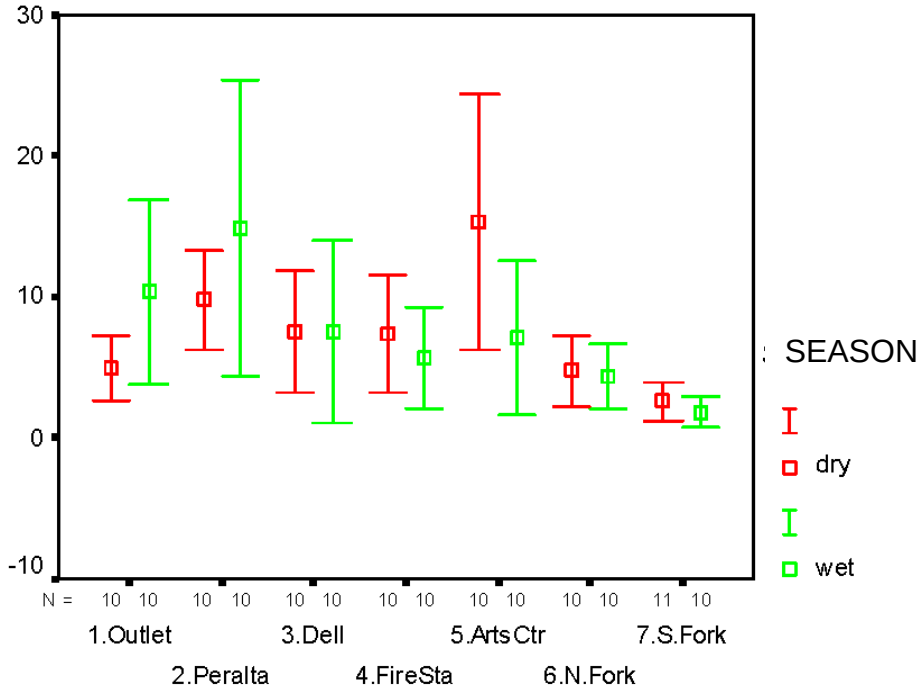
Source: Creek Coalition 2008

Figure 4.2. *E.coli* Concentrations at 7 Sampling Sites (Mean and +/- 2x Standard Error of the Mean)



Source: Creek Coalition 2008

Figure 4.3. *E.coli* / Total Coliform Ratio at 7 Sampling Sites (Mean and +/- 2x Standard Error of the mean)



Source: Creek Coalition 2008

Bacterial Source Tracking Analysis

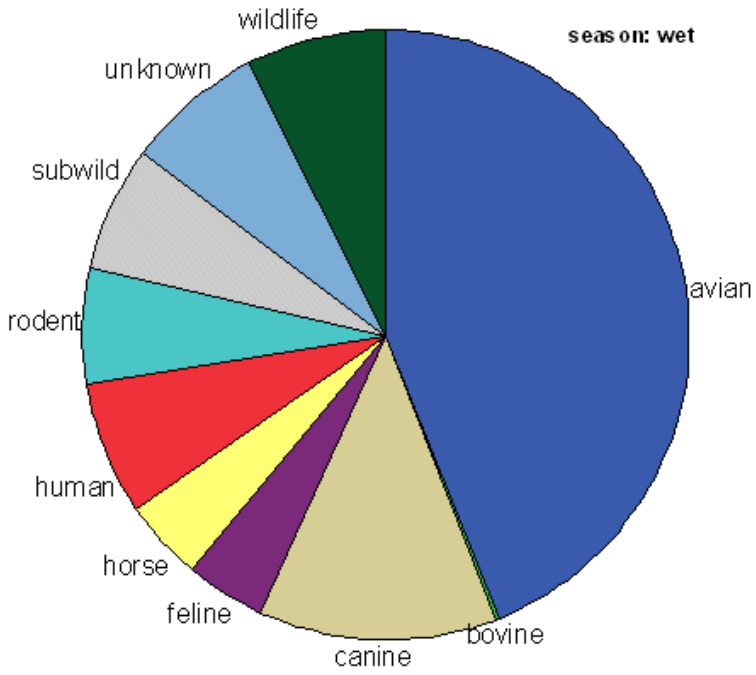
As discussed in Section 4.2, bacterial source tracking (BST) is a methodology that can be used to identify particular sources of fecal bacteria contamination in environmental samples. Table 4.5 lists the results of the BST analysis conducted by the Creek Coalition in the San Pedro Creek watershed. These results are grouped into dry, wet, and dry and wet seasons combined. Figures 4.4 and 4.5 show a graphical summary of the BST data. For clarity, the detailed sources from Table 4.5 were grouped into larger source type categories in Figures 4.4 and 4.5. For example, in these Figures, the source type category "Avian" includes all varieties of birds listed in Table 4.5 (i.e., avian, gulls, waterfowl, geese, and crows). It is important to keep in mind that these data do not represent bacteria concentrations, but the number of source matches, out of the *E.coli* isolates analyzed.

Table 4.5. Bacterial Source Tracking Analysis Results for San Pedro Creek

All Data Combined			Dry Season			Wet Season		
Source	**Frequency**	**Percent**	**Source**	**Frequency**	**Percent**	**Source**	**Frequency**	**Percent**
avian	505	29.8	avian	252	30.1	avian	253	29.6
raccoon	159	9.4	rodent	105	12.5	gull	71	8.3
rodent	157	9.3	raccoon	103	12.3	unknown	63	7.4
Dog	137	8.1	dog	80	9.5	dog	57	6.7
canine	106	6.3	human	59	7.0	raccoon	56	6.5
Deer	103	6.1	canine	54	6.4	deer	54	6.3
unknown	96	5.7	deer	49	5.8	sewage	53	6.2
sewage	78	4.6	unknown	33	3.9	canine	52	6.1
Gull	73	4.3	sewage	25	3.0	rodent	52	6.1
human	66	3.9	feline	18	2.1	horse	37	4.3
feline	53	3.1	cat	14	1.7	feline	35	4.1
horse	50	2.8	horse	11	1.3	waterfowl	31	3.6
waterfowl	31	1.8	opossum	8	1.0	crow	20	2.3
Crow	20	1.2	rabbit	8	1.0	human	7	0.8
Cat	15	0.9	goose	6	0.7	porcine	7	0.8
porcine	13	0.8	porcine	6	0.7	rabbit	2	0.2
rabbit	10	0.6	bovine	3	0.4	bovine	1	0.1
opossum	8	0.5	gull	2	0.2	cat	1	0.1
goose	7	0.4	coyote	1	0.1	coyote	1	0.1
bovine	4	0.2	skunk	1	0.1	goose	1	0.1
coyote	2	0.1	**Total**	**838**	**100.0**	skunk	1	0.1
skunk	2	0.1				**Total**	**855**	**100.0**
Total	**1694**	**100.0**						

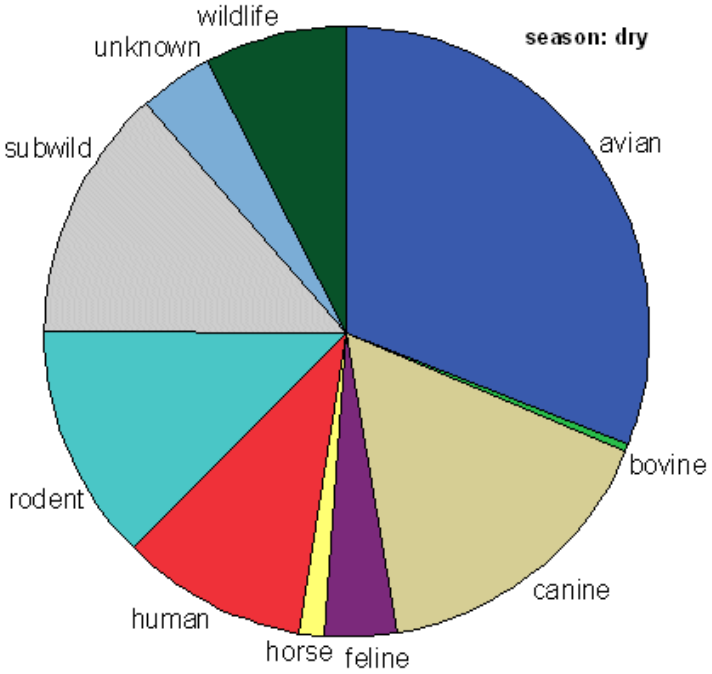
Source: Creek Coalition 2008

Figure 4.4. Combined BST Results for All Sites, Wet Season



Source: Creek Coalition 2008

Figure 4.5. Combined BST Results for All Sites, Dry Season



Source: Creek Coalition 2008

Discussion:

Wet season results were dominated by avian and canine sources, in that order, but significant numbers of human, deer, raccoon, rodent, horse and feline isolates were also detected.

Dry season results were still dominated by the avian source, but dogs, raccoons, rodents, and humans were also major sources. Given that, in the dry season, the highest *E. coli* concentrations were observed at the Arts Center and North Fork sites, the relatively high match rates for humans, dogs and raccoons at these sites suggest that these sources are more significant at these sites during the low flow periods of dry season. Dogs appear to be a major source in both the wet and dry seasons.

Runoff volumes appear to be a significant factor in producing high *E. coli* counts at the lower reaches of the Creek. Horse matches appear to be associated with the highest runoff events at most of the sampling locations, especially at the Arts Center and the North and South Forks. Canine and feline matches also appear to be somewhat associated with high runoff events, yet avian and deer sources are associated with lower runoff events, perhaps reflecting their consistent and fairly ubiquitous presence in the watershed (Creek Coalition 2008).

4.4.3 Recent Bacterial Monitoring Data

California law (Health and Safety Code section 115880 et. seq.) requires local health officers to conduct weekly bacterial testing, between April 1 and October 31, of waters adjacent to public beaches that have more than 50,000 visitors annually and are near storm drains that flow in the summer. Local health officers are required to test for three indicator organisms: total coliform, fecal coliform, and enterococcus. If any one of these indicator organisms exceeds the standards (Table 4.3) established by the State Department of Public Health, the county health officer is required to post warning signs at the beach. In the case of extended exceedances, the officer must make a determination whether to close that beach.

Table 4.6 contains the summary of monitoring data for San Pedro Creek and Pacifica State Beach from January 2006 through December 2010 (through September 2008 for the Linda Mar Beach #6 station). These data were analyzed using the following protocol.

Bacteria data from San Pedro Creek and Pacifica State Beach were compared to applicable water quality standards (Tables 4.2 and 4.3) to determine exceedance(s) of each water quality standard. Pacifica State Beach is characterized by two separate stations. Linda Mar Beach # 5 is located closer to the mouth of San Pedro Creek and Linda Mar Beach #6 is located near the north end of the Beach and further away from the San Pedro Creek mouth.

For the initial evaluations, each total coliform, *E.coli*, and enterococcus data record was compared with the associated single-sample objectives and all values exceeding the standard were tabulated as an exceedance. The number of exceedances was then divided by the number of samples to determine the percent exceedance (Table 4.6).

The State's Policy for developing California's impaired water body list (i.e., the CWA Section 303(d) list) specifies that "a water segment shall be placed on the section 303(d) list if bacteria water quality standards in the California Code of Regulations, Basin Plans, or statewide plans are exceeded more than 10 percent of the time, (assuming that water quality monitoring is conducted year-round)" (State Water Board 2004b).

Geometric means were then calculated for each indicator bacteria based on a minimum of five samples per rolling 30-day period. Total coliform, *E.coli*, and enterococcus geometric means were compared to the applicable geometric mean water quality standards. All values exceeding the geometric mean standards were counted as exceedances and were divided by the total number of geometric means calculated to determine the percent exceedance (Table 4.6).

Results:

This study's evaluation of the sampled bacterial water quality data reveals that, as the results in table 4.6 show, San Pedro Creek and Pacifica State Beach are currently impaired. However, Pacifica State Beach's water quality impairment (as inferred from exceedances of water quality objectives for bacterial indicators) is limited only to the segment of the Beach that is represented by the Linda Mar Beach #5 monitoring station. This is the section of the Beach that is located near the mouth of San Pedro Creek (Figure 4.6). The segment of the Beach that is represented by the Linda Mar Beach #6 monitoring station is not impaired. This section is located at the northeast end of the Beach and is further from the mouth of San Pedro Creek.

Figure 4.6. San Mateo Public Health Sampling Sites in San Pedro Creek and at Pacifica State Beach

Source: Creek Coalition 2008

Conclusion:

Based on the result of the recent bacterial water quality monitoring, San Pedro Creek and a portion of Pacifica State Beach are impaired due to exceedances of bacterial water quality standards for water contact recreation uses.

Further, given the proximity of the San Pedro Creek outlet to the impaired portion of the Pacifica State Beach, it is likely that San Pedro Creek discharges to the segment of Pacifica State Beach directly under its influence, Linda Mar Beach #5 monitoring station, are a significant cause of impairment in this stretch of the Beach. Therefore, in order to restore and protect the water quality at Pacifica State Beach, it is crucial to control the bacteria sources in the San Pedro Creek watershed.

The findings from the BST study conducted by the Creek Coalition lead us to conclude that humans (sanitary sewer systems), horses (horse facilities), dogs and cats (pets), and a variety of avian and wild animals (natural sources) contribute significant amounts of bacterial pollution to San Pedro Creek and Pacifica State Beach during both dry and wet weather. These findings reinforce the need to address sanitary sewer system failures, waste management practices at horse facilities, pet waste, and stormwater runoff and dry weather flows carrying bacterial pollution.

In addition, the fact that a significant portion of the identified bacteria samples were attributed to avian and wildlife sources, otherwise known as natural sources, suggests the need for an approach that accounts for bacterial contributions from these uncontrollable sources. Therefore, staff proposes in Section 5 to account for these natural contributions by employing an approach called the “reference system and antidegradation approach.”

Table 4.6. Summary of Bacterial Monitoring Results for San Pedro Creek and Pacifica State Beach

Water body	Station	Start Date	End Date	Summary Type	Total Coliform		*E.coli*		Enterococcus	
					SSM	Geomean/ Median	SSM	Geomean/ Mean	SSM	Geomean
San Pedro Creek	San Pedro Creek	01/03/06	12/27/10	Number of Values	233	177	233	177	N/A	N/A
				Number of Exceedences	46	177	134	146	N/A	N/A
				Percent Exceedence	19.7%	100.0%	57.5%	82.5%	N/A	N/A
Pacifica State Beach	Linda Mar Beach #5*	01/03/06	12/27/10	Number of Values	250	196	251	197	250	196
				Number of Exceedences	6	2	20	7	25	40
				Percent Exceedence	2.4%	1.0%	8.0%	3.6%	10.0%	20.4%
Pacifica State Beach	Linda Mar Beach #6**	01/03/06	09/29/08	Number of Values	133	103	133	103	133	103
				Number of Exceedences	0	0	1	0	0	0
				Percent Exceedence	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%

N/A: No sample was analyzed for these indicator bacteria.

*Linda Mar Beach Stations #5 and #6 are the only stations at the Pacifica State Beach that have been monitored by the County in the recent history.

**The County stopped monitoring this station in 2008 due to budgeting constraints and consistently good water quality observed at the station.

5. NEW IMPLEMENTATION PROVISIONS FOR BACTERIA OBJECTIVES

5.1 Overview

This section discusses the new implementation provisions for the bacteria objectives that this project proposes to adopt.

As required by the CWA and the California Water Code (Water Code), and presented in section 1.1 above, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, and an anti-degradation policy, collectively referred to as "water quality standards." Basin Plans also include other plans and policies necessary to implement water quality standards.

Exceedances of bacteria water quality objectives frequently occur at beaches or in creeks that receive runoff from predominately undeveloped watersheds (SDRWQCB 2010). This demonstrates that natural sources cause exceedances of bacteria water quality objectives on their own, without contributions from anthropogenic sources. Control of bacteria from natural sources can have negative effects, such as (1) unforeseen changes in aquatic ecosystems, (2) impacts to environmental resources resulting from construction of treatment controls, and (3) significant expenditures by public and private entities without parallel benefits to public health.

In order to avoid the potential negative effects associated with requiring dischargers to control natural sources of bacteria, an amendment of the Basin Plan is needed to allow for implementation of existing water quality objectives that accounts for bacteria contributions from natural uncontrollable sources in the context of Total Maximum Daily Loads (TMDLs). This approach requires dischargers to address only controllable sources of bacteria.

5.2 New Implementation Provisions

The Basin Plan amendment proposed in this project would establish new implementation provisions for the Basin Plan's existing bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to future bacteria TMDLs in the Region that address natural sources of bacteria. These implementation provisions would become part of Chapter 3, "Water Quality Objectives," of the Basin Plan.

The new implementation provisions would result in the following changes:

1. The bacteria water quality objectives would be strictly applied except when provided for in a TMDL.
2. In a TMDL, the Water Board may implement the bacteria water quality objectives in fresh and marine waters by using a "reference system and antidegradation approach" (from here on referred to as the "reference system approach") as discussed below. Implementation of water quality objectives for bacteria using a 'reference system and antidegradation approach' requires control of bacteria from all anthropogenic sources so that bacteriological water quality is consistent with that of a reference system. A reference system is defined as an area (e.g., a

subwatershed or catchment) and associated monitoring point(s) that is minimally impacted by human activities with the potential to affect bacteria densities in the reference receiving water body.

These proposed changes recognize that there are natural sources of bacteria that may cause or contribute to exceedances of the water quality objectives for bacteria that are not controllable. They also avoid requiring treatment or diversion of water bodies to address natural sources of bacteria from undeveloped areas. Such requirements, if imposed by the Water Board, could reduce bacteria numbers to below water quality objectives, but could have the potential to adversely affect valuable aquatic life and wildlife beneficial uses supported by water bodies in the Region.

Under the reference system approach, a certain frequency of exceedance of the bacterial water quality objectives shall be permitted. The permitted number of exceedances shall be based on the observed exceedance frequency in a selected reference system(s) or the targeted water body, whichever is less. The reference system approach ensures that bacteriological water quality is at least as good as that of a reference system and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of the selected reference system(s). This approach is consistent with the State Antidegradation Policy (State Water Board Resolution No. 68-16) and with federal antidegradation requirements (40 CFR 131.12).

TMDLs and associated wasteload allocations (WLAs) and load allocations (LAs) (see Section 8) incorporated into permits are the vehicles for implementation of our water quality standards. The appropriateness of this approach, the specific exceedance frequencies to be permitted under it, and the bacteria water quality objectives and permittees it would apply to will be evaluated within the TMDL developed for a specific water body or bodies (e.g., San Pedro Creek and Pacifica State Beach), as determined by the Water Board when considering adoption of a TMDL.

For this TMDL, Water Board staff intends to use the proposed implementation provisions for bacteria objectives (i.e., the ‘reference system approach’) in order to address uncontrollable bacterial contributions from natural sources.

5.3 Antidegradation

Both the State of California and the federal government have antidegradation policies for water quality. The State policy is formally referred to as the “Statement of Policy with Respect to Maintaining High Quality Waters in California.” This policy restricts degradation of surface or ground waters and protects water bodies where existing quality is higher than is necessary for the protection of beneficial uses. The federal Antidegradation Policy (40 CFR §131.12) was developed under the CWA. This project complies with the antidegradation policies because it does not allow degradation or lower water quality and does not approve an activity that produces or may produce a waste or increased volume or concentration of waste, or an activity that discharges or proposes to discharge to existing high quality waters.

6. NUMERIC TARGETS

6.1 Numeric Targets

The U.S. EPA defines numeric targets as appropriate measurable indicators, based on water quality standards that express the target, or desired, condition for designated beneficial uses of a water body. This TMDL will establish a desired, or target, condition for the water contact recreation use based on the water quality objectives for indicator bacteria. The target condition is a quantitative measure that allows us to evaluate the effectiveness of implementation actions and ensures that beneficial uses are protected.

The numeric targets for San Pedro Creek are based on the Basin Plan water quality objectives for coliform bacteria for water contact recreation use in fresh water (the *E.coli* targets are the U.S. EPA bacteriological criteria for water contact recreation in fresh waters that are also contained in the Basin Plan). The numeric targets for Pacifica State Beach are based on the Ocean Plan water quality objectives for water contact recreation use in marine waters. The water quality objectives for both marine and freshwater that form the basis of the numeric targets for this TMDL are listed in Table 6.1.

Table 6.1. Bacteriological Water Quality Objectives for San Pedro Creek and Pacifica State Beach

Indicator Type	Pacifica State Beach (Marine REC-1) MPN/ 100 mL	San Pedro Creek (Freshwater REC-1) MPN/ 100 mL[1]
	Single Sample Maximum	90th Percentile/No Sample Greater Than
E. coli	NA	235
Fecal coliform	400	400
Enterococcus	104	NA
Total coliform	10,000[2]	10,000
	Geometric Mean[3]	Geometric Mean/Log Mean/Median
E. coli	NA	126
Fecal coliform	200	200
Enterococcus	35	NA
Total coliform	1,000	240

1. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
2. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.
3. Calculated based on the five most recent samples from each site during a 30-day period.

NA: not applicable.

As explained in Section 5, it is not the intent of this TMDL to require treatment or diversion of water bodies or to require treatment of natural sources of indicator bacteria. Therefore, for this TMDL, a reference system approach has been incorporated in the numeric targets as an allowable number of times that the water quality objectives can be exceeded. The purpose of the allowable number of exceedances of the water quality objectives is to account for the natural, and largely uncontrollable sources of bacteria (e.g., birds and wildlife feces), which have been shown can, by themselves, cause exceedances of the REC-1 water quality objectives.

Hence, for this TMDL staff proposes "allowable exceedances" of the single-sample objectives as the numeric targets, as listed in Table 6.2. This is so, because the individual bacteria density measurements and exceedances of single-sample objectives are what is commonly used by public health officials to assess immediate water quality in recreational waters and, when necessary, suspend recreational uses to protect public health. The U.S. EPA allows states to select the most appropriate measure to express the TMDL; previously-adopted TMDLs in Water Board Regions 4 (Los Angeles) and 9 (San Diego) found that allowable exceedances are considered an appropriate measure consistent with the definition in 40 CFR 130.2(i)(LARWQCB 2002).

The number of allowable exceedances is based on two criteria: (1) bacteriological water quality at any site must be at least as good as at a designated reference system; and (2) there is no degradation of existing bacteriological water quality if historical water quality at a particular site is better than the designated reference system. Applying these two criteria allows the Water Board to avoid imposing requirements to treat natural sources of bacteria from undeveloped areas. This approach, including the allowable exceedances, is consistent with that used in other bacteria TMDLs previously approved in the State (LARQWCB 2002, 2007, and 2010, and SDRWQCB 2010)) and is explained further in Section 8.

Table 6.2. Numeric Targets Based on Allowable Exceedances of Single-Sample Objectives for San Pedro Creek and Pacifica State Beach

	San Pedro Creek		Pacifica State Beach		
	Dry Weather	Wet Weather	Summer Dry Weather (Apr. 1 to Oct. 31)	Winter Dry Weather (Nov. 1 to Mar. 31)	Wet Weather[5]
Allowable Exceedances of Single-Sample Objectives (assuming daily sampling is conducted) [1,2,3]	4	26	0	2	30
Allowable Exceedances of Single-Sample Objectives (assuming weekly sampling is conducted) [4]	1	4	0	1	5

1. Allowable exceedances are calculated by multiplying exceedance rates observed in the Reference System(s) by the Number of Days during each respective period in the reference year (1994).
2. To end up with whole numbers, where the fractional remainder for the calculated allowable exceedance days exceeds 0.1, then the number of days is rounded up.
3. The calculated number of exceedance days assumes that daily sampling is conducted.
4. To determine the allowable number of exceedance events given a weekly sampling regime, as practiced for monitoring San Pedro Creek and Pacifica State Beach, the number of exceedance days was adjusted by solving for "X" in the following equation: X = (exceedance days x 52 weeks) / 365 days.
5. Wet weather is defined as any day with 0.1" rain or more and the following three days.

The allowable exceedances in San Pedro Creek and at Pacifica State Beach equal the single-sample objective exceedance rates (i.e., number of samples exceeding the single-

sample objectives divided by the total number of samples collected in each respective water body) in their respective reference systems times the number of days in different time periods (i.e., the dry period, the wet period, summer dry period, and winter dry period) during the critical reference year.

Water Board staff is proposing 1994 as the critical reference year with 136 wet days and 229 dry days (176 summer dry days and 53 winter dry days). To determine allowable exceedances for each time period, the smaller of the two exceedance rates – that of the targeted water body (i.e., San Pedro Creek and Pacifica State Beach) or that of the reference system – is selected for use in subsequent calculations. Proposed reference systems for both San Pedro Creek (freshwater) and Pacifica State Beach (marine water) and their observed exceedance rates are described in Section 8.

The numeric targets based on the allowable exceedances of single-sample objectives are also the TMDLs and acceptable bacteria load and wasteload allocations presented in Section 8.

7. POLLUTANT SOURCE ASSESSMENT

7.1 Overview

This section provides our understanding of the potential sources of bacteria in the San Pedro Creek watershed. In general, these sources can be grouped into controllable and non-controllable categories. As discussed in Section 4, available data reveal that controllable sources of bacteria in the watershed are comprised of Pacifica's sanitary sewer system, horse facilities, and municipal stormwater runoff and dry weather flows. Additionally, reported sanitary sewer overflow data for Pacifica (Table 7.1) further implicate the sanitary sewer collection system as a source of bacteria in the watershed. These sources contribute controllable bacteria loads into San Pedro Creek and Pacifica State Beach and will, therefore, be addressed in the implementation plan presented later in this report. Even though wildlife (e.g., birds, raccoons, deer, etc.) is identified as a contributing source of bacteria in the watershed, since it is not believed to be a controllable source, it will not be explicitly addressed in the implementation plan. Instead, contributions from wildlife/natural background sources will be accounted for through use of a reference system approach.

Due to data and resource limitations, this report does not quantitatively estimate loads (i.e., the total number of bacteria discharged by each source per unit time) for the different bacteria sources in the San Pedro Creek watershed. However, as discussed above, recent and historic bacterial water quality studies in the watershed lead us to general conclusions about the likelihood and significance of different identified bacteria sources. These sources have been identified based on elevated bacteria levels at and/or downstream of the source, DNA fingerprinting of source-specific bacteria, and documentation of inadequately treated human waste discharges from the sanitary sewer system (as reported by the responsible sewer agency (Table 7.1)). The following sections discuss each one of these sources.

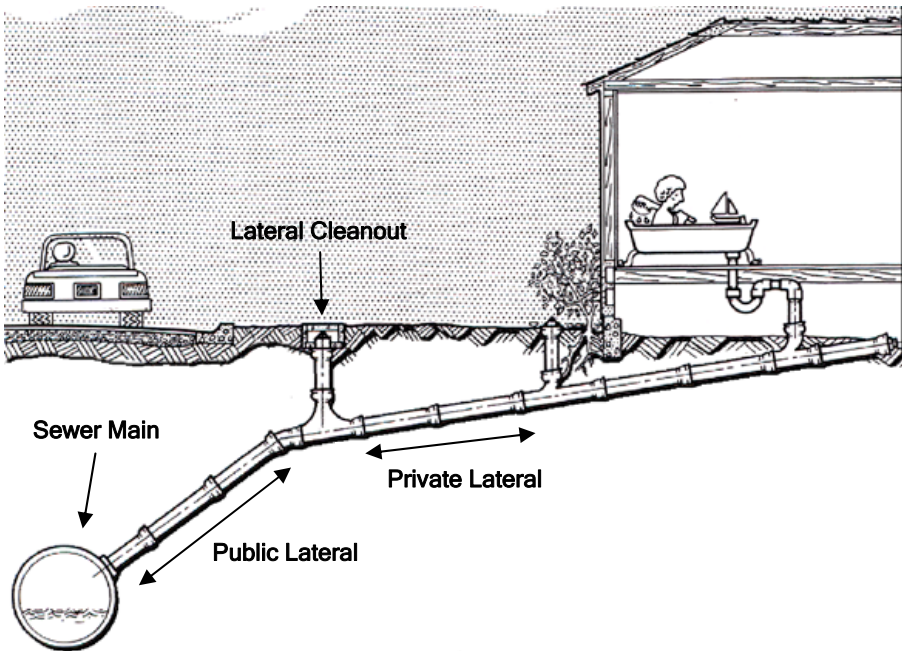
7.2 Sanitary Sewer System

Pacifica operates a domestic wastewater treatment plant, the Calera Creek Water Recycling Plant (WWTP), which serves a population of approximately 39,000. The WWTP receives sewage from a sanitary sewer collection system that includes 82 miles of gravity sewers, 50 miles of public laterals, and 4.2 miles of force mains. In addition, private sewer laterals (the proper maintenance, functioning, and, if needed, replacement of which are the responsibility of the private home or business owners) connect plumbing in a home or business to the sewer main, which is usually located in the street (Figure 7.1). There are an estimated 3,500 private sewer laterals in the San Pedro Creek watershed (Cosgrove, 2012). There are also five sewage pump stations with a total pumping capacity of 34,000 gallons per minute.

Sanitary sewer overflows from the sanitary sewer collection system are a potential source of bacteria pollution to San Pedro Creek and Pacifica State Beach. Sanitary sewer overflows can occur during and after rainstorms when stormwater infiltrates sanitary sewers and overloads system capacity. In addition to the wet-weather sanitary sewer

overflows, sewer line blockages and breaks can result in short-term discharges of untreated human waste.

Figure 7.1 Schematic Drawing of Public vs. Private Sewer Laterals



A private lateral is the pipe that connects indoor plumbing to the public sewer main.

Table 7.1 lists the number of reported sanitary sewer overflows from the publicly-owned portion of Pacifica's sanitary sewer collection system (i.e., it does not include any discharges from private laterals) for the period from May 1, 2007, to January 20, 2011. During this period, 94 sanitary sewer overflows with a total volume of 125,356 gallons were reported. Of this amount, a reported 110,340 gallons of wastewater reached surface waters.

As discussed in Section 4.4.2, the 2006 San Pedro Creek bacterial source tracking study concluded that "human inputs are no doubt from leaking sewer lines, and...greatly increase downstream. …so the places to focus efforts are in downstream neighborhoods where laterals are old and poorly constructed" (Creek Coalition 2008). Per the Creek Coalition's report, the sewer laterals in the older neighborhoods of the lower San Pedro Creek Valley are constructed of tarpaper-like materials that are more than 50 years old, have long exceeded their life expectancy, and are known to be leaking sewage into San Pedro Creek (Creek Coalition 2008).

Table 7.1. Summary Report of Sanitary Sewer Overflows (SSOs) for Pacifica (5/1/2007- 1/20/2011)

Total Number of SSO locations	94
Total Volume of SSOs (gallons)	125,356
Total Volume Recovered (gallons)	13,545
Total Volume Reached Surface Water (gallons)	110,340
Percent Recovered	10
Percent Reached Surface Water	88
Miles of Pressure Sewer	4.2
Miles of Gravity Sewer	82
Miles of Public Laterals	50
Average Number of SSO locations per 100 miles of Sewer	69
Volume of SSOs Reaching Surface Water per 100 miles of Sewer	81,013

7.3 Municipal Stormwater Runoff and Dry Weather Flows

As seen in Figure 2.3, residential and other urban land uses dominate the lower hillsides and the valley floor of the San Pedro Creek watershed. Municipal stormwater runoff and dry weather flows deliver indicator bacteria to surface waters from pets (e.g., dogs and cats), other domestic animals (e.g., horses), and wild animals (e.g., birds, raccoons, and deer); and in some cases human waste from sewage spills, cross-connections between the sanitary sewer and storm drains, trash, and homeless populations.

Pacifica operates two stormwater pump stations, Anza and Linda Mar, which are located adjacent to Pacifica State Beach. Both stations pump stormwater directly onto the Beach. The pumped stormwater then flows into the Pacific Ocean. During the wet weather months of January and February, these pump stations discharge an average of 24 and 53 million gallons per month, respectively.[2] In the wet season, Pacifica first tries to divert as much of the stormwater runoff as it can to its wastewater treatment plant for treatment and subsequent discharge. However, due to limited capacity at the treatment facility, the City can only divert a small amount of the overall runoff volume—approximately 5 percent, on average.

[2] Estimated from the pump usage data during January and February of 2008 through 2011.

During the dry season, dry weather flows are stored at each pump station in sumps with capacities of 62,000 and 43,000 gallons, respectively. The stored dry weather flows are routinely pumped to the wastewater treatment plant for treatment and subsequent discharge to Calera Creek. The City has also installed irrigation pumps at both stations so that during dry weather months a portion of the dry weather flows can be pumped onto the adjacent constructed vegetated swales to reduce the amount of stored dry weather flows. Despite these measures, occasionally the sumps run out of room and need to be emptied. At that point, the stored dry weather flows are discharged onto the adjacent Pacifica State Beach. Dry weather discharge events to the Beach occur very rarely at the Linda Mar station and at an average frequency of less than once per month at the Anza station. Pacifica is currently in the process of obtaining a larger transfer pump for the Anza station so that, like the Linda Mar station, almost all of the stored dry weather flows at that station can be diverted to the wastewater treatment plant for treatment prior to being discharged to the Calera Creek (City of Pacifica staff 2012).

The 2006 San Pedro Creek bacterial source tracking study showed that when comparing rainfall amounts with bacteria sources, rainfall was a significant influence, producing high *E. coli* counts in the lower reaches of the Creek. The study found that horse-specific bacteria matches appeared to be associated with the highest runoff events at most of the sites, especially at the Arts Center and at the North and South Forks. Canine and feline-specific bacteria matches appeared to be somewhat associated with high runoff events (Creek Coalition 2008).

Based on these results, the study concluded that:

- Horse *E. coli* inputs are much more abundant during the wet season, suggesting the need to address horse fecal runoff from stables and trails.
- Canine inputs are assumed to be from pet dogs, and are prominent as a percentage…in both wet and dry seasons. Runoff from impervious surfaces is likely to be a significant cause during both wet and dry seasons, from natural rains or sidewalk hosing (Creek Coalition 2008).

These findings suggest that both stormwater runoff and dry weather flows are transport mechanisms for, and thus under this TMDL are considered potential sources of, bacteria.

7.4 Horse Facilities

Horse waste contains pathogens and other pollutants that can contaminate surface and ground waters and result in human illness if ingested. The average horse produces about 45 pounds of waste each day. This waste can reach waterways through direct deposit or via runoff after rain events. There are currently three horse facilities in the San Pedro Creek watershed. They provide horse boarding, horse riding trips, riding lessons, and other services.

As discussed in Section 4.4.2, the 2006 San Pedro Creek microbial source tracking study revealed that horse waste was a significant source of pathogen indicator bacteria (*E.coli*) in the San Pedro Creek watershed during both the dry and wet seasons. While the study showed that horse *E. coli* inputs were more than three times more abundant during the

wet season than in the dry season, the inputs were significant year-round. This finding suggests the need to address horse waste contributions in general and in runoff from stables and trails in particular, regardless of season.

7.5 Horse Trails

On the east and south sides, the San Pedro Creek watershed contains the parklands of Golden Gate National Recreation Area, San Pedro Valley County Park, and McNee Ranch State Park. However, as seen in Figure 2.3, only the San Pedro Valley County Park contains a significant portion of the San Pedro Creek and its watershed. All three parks contain horse trails. Horse waste from these trails has the potential to discharge to water bodies either through direct deposit at creek crossings or indirect input via stormwater runoff. Bacteriological water quality monitoring data from the South Fork of the San Pedro Creek located within the San Pedro Valley County Park show low levels of indicator bacteria and no exceedances of water quality objectives. Therefore, horse trails are not now considered a significant source of bacteria input to the Creek or the Beach. However, should future work demonstrate they are a significant source, the Water Board would work with affected park operators to implement appropriate best management practices to address them.

7.6 Wildlife

A variety of terrestrial wildlife, such as the birds and rodents that inhabit the open space lands adjacent to San Pedro Creek and the Pacific Ocean, can contribute indicator bacteria to these water bodies through stormwater runoff or direct deposit of waste. No accurate information as to the magnitude and geographic distribution of this waste source is available. Marine birds are also present in and near the Ocean and the Creek mouth. Because of the great variety, complex distribution and dispersal patterns, and fluctuating populations of both terrestrial and marine wildlife, it is difficult to assess their exact impact on water quality in San Pedro Creek and Pacifica State Beach. However, the 2006 San Pedro Creek Microbial Source Tracking study found that birds (Avian category) had the highest number of source matches out of the *E.coli* isolates analyzed in the watershed.

Even though wildlife (e.g., birds, raccoons, and deer) is identified as a significant contributing source of indicator bacteria in the watershed, we do not think it is a controllable source. For that reason, it will not be explicitly addressed in the implementation plan. Instead, contributions from wildlife/natural background sources will be accounted for through use of a reference system approach, as discussed throughout this document.

8. TOTAL MAXIMUM DAILY LOAD AND POLLUTANT ALLOCATIONS

This Section discusses the approach used for expressing the TMDLs and pollutant load allocations in terms of allowable exceedance days of water quality objectives for bacteria, and presents the proposed bacteria TMDLs and load allocations (for nonpoint sources) and wasteload allocations (for point sources) to identified sources.

8.1 General Approach

For most pollutants, TMDLs and allocations are expressed on a mass-load basis (e.g., kilograms per year or kilograms per day). However, the TMDLs and wasteload allocations (WLAs) and load allocation (LAs) in this project are expressed as the number of daily or weekly sample days (depending on the sampling frequency) that may exceed single-sample objectives, identified in Section 4. The TMDLs and WLAs and LAs are expressed as such because the individual bacteria density measurements and exceedances of single-sample objectives are what are commonly used by public health officials to assess immediate water quality in recreational waters and, when necessary, suspend recreational uses to protect public health. Therefore, this alternative measure is more effective than using a daily mass load and it best serves the purpose of effective regulation of bacterial pollution levels in water bodies. As noted in Sections 5 and 6, allowable exceedance days are an "appropriate measure" consistent with the definition in 40 Code of Federal Regulations, section §130.2(i).

The following section is comprised of three parts. In the first, we further discuss why the TMDLs and WLAs and LAs are defined as allowable exceedance days. In the second, we introduce the criteria for determining allowable exceedance days. Finally, we describe the decision-making process used to set separate allowable exceedance days for San Pedro Creek and Pacifica State Beach.

For San Pedro Creek, allowable exceedance days are set for two time periods. These two periods are:

(1) Dry weather; and,

(2) Wet weather (defined as days of 0.1 inch of rain or more plus the three days following the rain event).

For Pacifica State Beach, allowable exceedance days are set for three time periods[3]. These three periods are:

(1) Winter dry weather (November 1 to March 31);

[3] These time periods are consistent with the California Assembly Bill 411 (Public Beach Act) implementing regulations (Health and Safety Code Section 115880(C)(4)).

(2) Summer dry weather (April 1 to October 31); and,

(3) Wet weather (defined as days of 0.1 inch of rain or more plus three days following the rain event).

Setting allowable exceedances for different time periods of the year gives us a better understanding of how these exceedances are spread out seasonally, as well as during wet and dry periods, and enables responsible parties to focus their corrective efforts accordingly.

8.2 Why TMDLs and Allocations Are Expressed As Allowable Exceedance Days

The TMDLs and allocations are expressed as allowable exceedance days of the single-sample objectives because those are a good measure of the immediate impact to beneficial uses, and they allow us to directly determine whether those uses are impaired or not.

The indicator bacteria used to assess water quality are not specific to human waste. Fecal matter from wildlife and birds can be a source of elevated levels of bacteria, and vegetation can be a source of elevated levels of total coliform bacteria. Approximately two-thirds of the San Pedro Creek watershed is open space or undeveloped land, and these areas contribute indicator bacteria loads to San Pedro Creek and Pacifica State Beach. The bacteria loads are from dispersed non-anthropogenic sources, such as wildlife, that is impractical to prevent via source control. In light of these findings, strictly applying the single-sample objectives identified in section 4 would likely require the capture and treatment of stormwater runoff from natural areas, either prior to discharge to the receiving water, or after the flow has entered the receiving water. It is likely that such treatment is either not practical, since it would involve significant alterations to the undeveloped parts of the catchment to address broadly-dispersed low levels of bacteria discharge, or risks significant impacts to San Pedro Creek's beneficial uses by reducing flows in the Creek. It is not the intent of this project to require diversion of the Creek or to require treatment of natural sources of bacteria from undeveloped areas. Therefore, the implementation procedure for the bacteria objectives for recreational waters (see Section 5) and the numeric targets (see Section 6) which form the basis of the TMDLs and WLAs and LAs proposed herein set allowable exceedance days based on bacteriological water quality conditions that are achievable at reference system(s) associated with largely undeveloped watershed(s) and based on antidegradation principles.

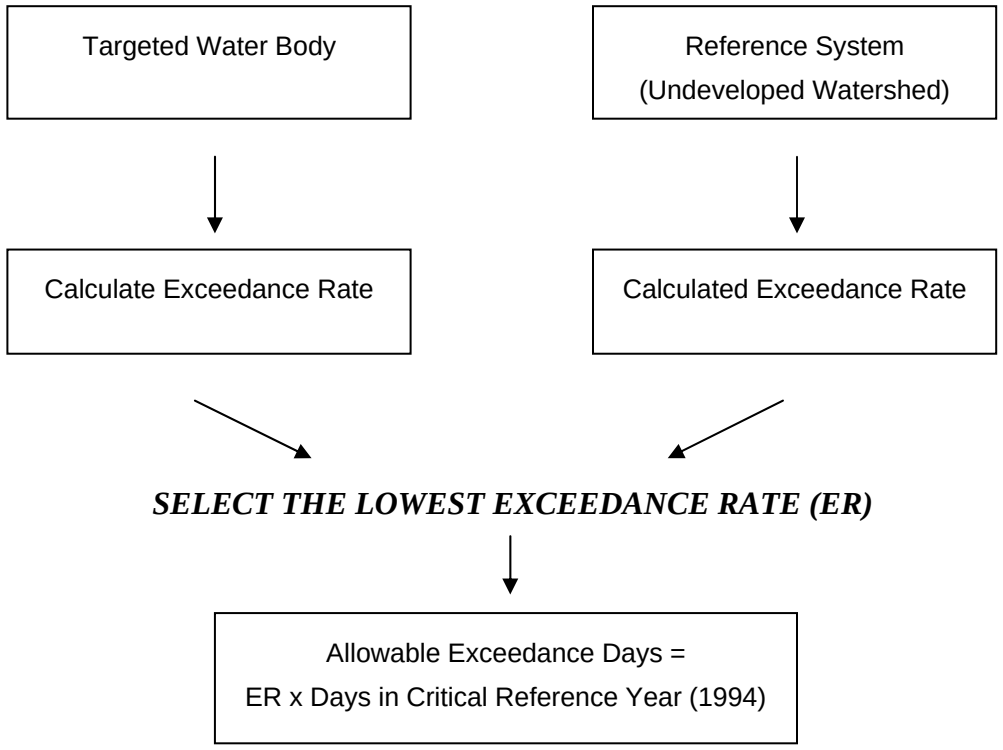
8.3 Criteria for Determining Allowable Exceedance Days

As previously discussed in section 5, staff proposes to set the number of allowable exceedance days for each water body (i.e., San Pedro Creek and Pacifica State Beach) to ensure that two criteria are met (1) bacteriological water quality is at least as good as that of a similar, largely undeveloped system and (2) there is no degradation of existing bacteriological water quality.

8.4 Determining Allowable Exceedance Days

Allowable exceedances are calculated by multiplying single-sample objective exceedance rate in the reference system(s) by number of days during each respective period (i.e., dry weather, wet weather, summer dry weather, and winter dry weather) in the critical reference year (see section 8.8 for discussion of the critical reference year).[4] Staff ensures that the two criteria above are met by multiplying the smaller of the two exceedance rates shown in figure 8.1 by the number of days in each of the time periods in the critical reference year. An exceedance rate, ER, is simply the number of samples that exceed one or more of the single-sample objectives described in section 4 divided by the total number of samples collected at a particular monitoring site, based on historical data. The flow diagram below illustrates the decision-making process for determining allowable exceedance days at a water quality monitoring site.

Figure 8.1 Decision-Making Process for Determining Allowable Exceedance Days



For any one monitoring site, two exceedance rates are compared and the lowest one is selected. The exceedance rates are:

[4] The critical reference year proposed is the 90th percentile storm year in terms of wet days. The storm year is defined as November 1-October 31, and wet days are defined as days with ≥0.1 inch of rain plus the three days following (LARWQCB 2002). The 90th percentile year based on historical rainfall data for Pacifica is 1994. In 1994, there were 136 wet days as measured at Pacifica 4 SSE meteorological station.

(1) The exceedance rate in the reference system, ER_R and

(2) The exceedance rate in the target water body (i.e., San Pedro Creek or Pacifica State Beach) based on historical bacteriological data, ER_T

In other words, if ER_R is greater than ER_T, then ER_T will be used (i.e., the target water body exceedance rate would override the "default" exceedance rate of the reference system). Next, the chosen exceedance rate is multiplied by the number of days in each time period (e.g., dry weather, wet weather, summer dry weather, and winter dry weather) in the critical reference year 1994. The number of days in each time period in 1994 is determined by examining the precipitation data for that year as recorded by the "Pacifica 4 SSE" rain gage.

The sections below describe how the exceedance rates for San Pedro Creek, Pacifica State Beach, and their respective reference systems were calculated as well as how these exceedance rates are translated into separate allowable exceedance days for San Pedro Creek and Pacifica State Beach. They also include justifications for the proposed reference system and the critical reference year.

8.4.1 Step 1: Calculating Exceedance Rates

The exceedance rates (for either the targeted water body or a reference water body) are simply the probability that one or more of the single-sample objectives (see Section 4) will be exceeded at a particular site. The most recent five years of bacterial water quality monitoring data (November 2006-October 2010) were used to determine the current exceedance rate for the targeted water bodies: Pacifica State Beach and San Pedro Creek.

Monitoring data from the Leo Carrillo State Beach from November 1, 1995, to October 31, 2001, were used in the Harbor Beaches of Ventura County Bacteria TMDL to determine the exceedance rate of the marine reference system (the reference system for Pacifica State Beach) for each of the three time periods of concern (i.e., summer dry-weather, winter dry-weather, and wet-weather). The Santa Clara River Estuary Bacteria TMDL combined and analyzed data from several Southern California Coastal Water Research Project's (SCCWRP) freshwater system studies to calculate the exceedance rates of the freshwater reference system (the reference system for San Pedro Creek) during dry weather and wet weather (see section 8.4.2.1 below for description of the reference systems). Table 8.1 lists the exceedance rates for targeted and reference water bodies.

8.4.2 Step 2: Calculating Allowable Exceedance Days at a Targeted site

To determine allowable exceedance days for each time period, the smaller of the two exceedance rates – that of the targeted water body or that of the reference system – is selected to use in subsequent calculations. Proposed reference systems for both San Pedro Creek (freshwater) and Pacifica State Beach (marine water) are described in Section 8.4.2.1 below.

To translate the exceedance rates into allowable exceedance days, staff proposes to use the number of days in the 90th percentile storm year (critical reference year). Justification for this decision is provided in Section 8.4.2.2 below.

8.4.2.1 Selection of Reference Systems

To determine appropriate reference systems for the San Pedro Creek (freshwater) and

Table 8.1. Exceedance Rates in the Targeted and Reference Water Bodies

Water body	Freshwater		Marine Water		
	Dry Weather	Wet Weather	Summer Dry Weather (April 1 - October 31)	Winter Dry Weather (November 1 to March 31)	Wet Weather
Reference Systems Exceedance Rate	1.6%[1]	19%[1]	0%[2]	3%[2]	22%[2]
Observed Exceedance Rates in San Pedro Creek[3]	42.8%	69.3%	--	--	--
Observed Exceedance rates at Pacifica State Beach Linda Mar #5[3]	--	--	2.7%	11.6%	22.1%

Source:
1. LARWQCB, 2010
2. LARWQCB, 2007
3. From San Mateo County weekly beach water quality monitoring data, analyzed by Water Board staff.

Pacifica State Beach (marine water), since none has been identified within the Region, staff considered technical reports prepared as part of the development of various bacteria TMDLs by the Los Angeles Regional Water Quality Control Board (LARWQCB). We reviewed the following TMDLs:

- Santa Monica Bay Beaches Bacteria TMDL (SMBB Bacteria TMDL)(LARWQCB 2002)
- Harbor Beaches of Ventura County Bacteria TMDL (HBVC Bacteria TMDL)(LARWQCB 2007), and
- Santa Clara River Estuary Bacteria TMDL (SCRE Bacteria TMDL)(LARWQCB 2010).

For freshwater systems, the SCRE Bacteria TMDL Technical Report suggested using a freshwater reference system based on monitoring by SCCWRP, which has conducted three studies that included bacteria monitoring of freshwater reference systems.

Those three studies are:

- "Assessment of Water Quality Concentrations and Loads from Natural Landscapes" (SCCWRP 2007)(22 freshwater sites);
- "Fecal Indicator Bacteria (FIB) Levels During Dry Weather from Southern California Reference Streams" (SCCWRP 2008)(12 freshwater sites); and,
- "Microbiological Water Quality at Reference Beaches in Southern California During Wet Weather" (SCCWRP 2005)(4 freshwater sites).

For these studies, samples were collected from fall 2004 to spring 2007. The SCRE Bacteria TMDL Technical Report combined and analyzed data from SCCWRP's freshwater sites to calculate the exceedance rates of the water quality objectives during dry weather and wet weather. The exceedance rates are equal to the total number of exceedances of the objective divided by the total number of samples collected from the 38 sites at the reference systems (see Table 8.1).

Since no San Francisco Bay Area freshwater reference system has currently been identified, staff proposes to use the average of the data from these Southern California reference freshwater systems to determine background exceedance rates for San Pedro Creek. Averaging this large number of observations from all major geologic and natural land cover settings is likely to result in the evening of effects on water quality due to variables including watershed size, land use distribution, soils, topography and geology. Therefore, using an average number for background exceedances from such a large dataset is an appropriate approach for determining the freshwater exceedances of bacteria objectives due to background sources for San Pedro Creek.

For Pacifica State Beach, staff proposes using Leo Carrillo State Beach in Southern California as the reference system. Leo Carrillo State Beach and its associated drainage, Arroyo Sequit Canyon are an appropriate reference system because they consist of 98% open space and have a drainage area (28 km^2) that is similar in size to the San Pedro Creek watershed (21 km^2). Further, field surveys by Los Angeles Regional Water Board staff confirmed that there is little evidence of anthropogenic impact in most of this watershed (LARWQCB 2002), although it includes some paved roads and a campground.

A study of several reference beaches in Southern California revealed that there are three factors that appear to affect the flux of indicator bacteria from undeveloped watersheds and the resulting frequency of water quality objectives exceedances at reference systems during wet weather (SCCWRP 2006). These included site-specific factors such as watershed size and storm size, and non-site specific factors such as early vs. late season storms. As discussed above, the catchments for the Pacifica and Leo Carrillo State Beaches are similar in size and both systems are believed to be similarly affected by early and late season storms. While the size and number of the storm events varies between the two systems, we think that the transport processes for pathogens are comparable. Staff has selected Leo Carrillo State Beach as a reference system for Pacifica State Beach.

Monitoring data from November 1, 1995, to October 31, 2001, were used in the HBVC Bacteria TMDL to determine the exceedance rate of the Leo Carrillo reference system for each of the three time periods of concern (i.e., summer dry-weather, winter dry-weather, and wet-weather). These exceedance rates are listed in Table 8.1.

8.4.2.2 Selection of Critical Condition (Reference Year)

Based on an examination of historical rainfall data from the "Pacifica 4 SSE" meteorological station, staff proposes using the 90th percentile storm year, in terms of wet-weather days, as the critical condition for determining the allowable exceedance days. The reference year of 1994 was chosen because it is the 90th percentile year in terms of wet-weather days, based on 25+ years (1983-2010) of rainfall data (Table 8.2).

Selecting the 90th-percentile wet year as the critical condition allows responsible parties to plan for a "near worst-case scenario" condition, as a critical condition is intended to do. Please see Section 8.8 for more discussion about the critical condition.

Table 8.2. Cumulative Frequency Table of Annual Wet Weather Days by Modified Storm Years (November 1 to October 31) as Measured at Pacifica 4 SSE Meteorological Station, 1984-2010

Storm Year[1]	Number of Wet Days	Percentile
2010[2]	68	0.0%
2007	76	3.7%
1986	77	7.4%
1989	79	11.1%
2000	87	14.8%
1993	89	18.5%
1990	90	22.2%
1991	100	25.9%
1988	102	29.6%
1984	104	33.3%
2002	104	33.3%
1987	108	40.7%
2001	111	44.4%
1995	116	48.1%
1996	118	51.8%
1999	123	55.5%
2004	123	55.5%
1998	124	62.9%
1983	125	66.6%
2005	126	70.3%
2003	128	74.0%
1992	129	77.7%
2009	130	81.4%
1985	131	85.1%
1994	136	88.8%
2006	141	92.5%
2008	141	92.5%
1997	161	100.0%

1. The 'storm year' is defined as November 1 through October 31 (i.e., November 1, 1994, through October 31, 1995, is referred to as the storm year 1994).
2. Partial year

8.4.3 Proposed Allowable Exceedance Days

The project proposes that the allowable exceedance days in San Pedro Creek and at Pacifica State Beach equal the water quality objective exceedance rates in their respective reference systems times the number of days in different time periods (i.e., dry weather period, wet weather period, summer dry weather period, and winter dry weather period) during the critical reference year.

As discussed above, Water Board staff is proposing 1994 as the critical reference year with 136 wet days and 229 dry days (176 summer dry days and 53 winter dry days). The proposed allowable exceedance days of single-sample objectives, the current exceedance days of single-sample objectives (see Section 8.6), and the required reduction in number of exceedance days of single-sample objectives for both San Pedro Creek and Pacifica State Beach are listed in Table 8.3. The allowable number of exceedances of the single-sample objectives listed in Table 8.3 represents the TMDLs and acceptable bacteria load and wasteload allocations for this TMDL as discussed in Section 8.5 and 8.6 below.

8.5 Total Maximum Daily Loads

The TMDLs for San Pedro Creek and Pacifica State Beach, which are the same as the proposed numeric targets, are listed in Table 8.3 and are expressed in terms of allowable exceedances of single-sample objectives.

8.6 Load and Wasteload Allocations

A Load Allocation (LA) is defined as the portion of the receiving water's pollutant loading capacity allocated to the nonpoint sources of pollutants to that receiving water. A Wasteload Allocation (WLA) is defined as the portion of the receiving water's pollutant loading capacity that is allocated to the point sources of pollutants to that receiving water. Table 8.4 presents the allocations and the related information for dischargers of indicator bacteria in San Pedro Creek watershed. As presented in Table 8.3, load allocations and wasteload allocations for this TMDL are expressed as the number of allowable exceedance days of the single-sample objectives. The Creek allocations apply at the "Creek Mouth" monitoring station. Permittees that discharge to San Pedro Creek have allocations based on allowable exceedance days for San Pedro Creek. Permittees that discharge to the Pacific Ocean at Pacifica State Beach have allocations based on allowable exceedance days for the Beach.

All permittees or entities that discharge indicator bacteria or have jurisdiction over such dischargers are collectively responsible for meeting these allocations. Water quality monitoring data in the receiving water bodies (i.e., at the mouth of San Pedro Creek and at the existing shoreline monitoring station #5, at the Pacifica State Beach) will be used to demonstrate achievement of the allocations.

Table 8.3. TMDLs and Allocations for San Pedro Creek and Pacifica State Beach Expressed As Allowable Exceedances of Single-Sample Objectives

	San Pedro Creek		Pacifica State Beach		
	Dry Weather	Wet Weather	Summer Dry Weather (Apr. 1 to Oct. 31)	Winter Dry Weather (Nov. 1 to Mar. 31)	Wet Weather
Number of Days (in critical reference year 1994)	229	136	176	53	136
WQO Exceedance rate (observed at the reference systems)	1.6%	19%	0%	3%	22%
Allowable Exceedances of Single-Sample Objectives (assuming daily sampling is conducted) [1,2,3]	4	26	0	2	30
Allowable Exceedances of Single-Sample Objectives (assuming weekly sampling is conducted) [4]	1	4	0	1	5
Current Exceedances of Single-Sample Objectives (assuming weekly sampling is conducted)[5]	14	14	1	1	5
Required Reduction in Number of Exceedances of Single-Sample Objectives (assuming weekly sampling is conducted)	13	10	1	0	0

1. Allowable exceedances are calculated by the following equation: Allowable Exceedances = WQO Exceedance rate in Reference System(s) x Number of Days during each respective period in 1994.
2. Consistent with the Santa Monica Bay Beaches Bacteria TMDL, and to end up with whole numbers, where the fractional remainder for the calculated allowable exceedance days exceeds 0.1, then the number of days are rounded up.
3. The calculated number of exceedance days assumes that daily sampling is conducted.
4. To estimate the number of exceedance days during the reference year given a weekly sampling regime, as practiced for monitoring San Pedro Creek and Pacifica State Beach, the number of exceedance days were adjusted by solving for "X" in the following equation: X = (exceedance days x 52 weeks) / 365 days.
5. For Pacifica State Beach, the current exceedance rate is based on the "Linda Mar Beach #5" monitoring station, where an exceedance of any single-sample objective on any day counts as an exceedance. For San Pedro Creek, the exceedance rate is based on the "Creek Mouth" station located near the mouth of the creek, where an exceedance of any single-sample objective on any day counts as an exceedance (see Table 8.1).

Table 8.4. Load and Wasteload Allocations for Dischargers of Bacteria in San Pedro Creek Watershed			
Indicator Bacteria Sources			
	Sanitary Sewer Systems	**Horse Facilities**	**Stormwater Runoff & Dry Weather Flows**
Load Allocation	Not Applicable	As Listed in Table 8.3	Not Applicable
Wasteload Allocation	Zero[1]	Not Applicable	As Listed in Table 8.3
Compliance Point	Existing Monitoring Stations in Receiving Water Bodies[2]	Existing Monitoring Stations in Receiving Water Bodies[2]	Existing Monitoring Stations in Receiving Water Bodies[2]
Responsible Parties	Pacifica; Private Home and Business Owners in the San Pedro Creek watershed[2]	Existing and Future Horse Facility Owners/Operators	Pacifica; San Mateo County; Caltrans[3]
Applicable Permits[4]	Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Order No. 2006-0003-DWQ)	General Waste Discharge Requirements for Confined Animal Facilities (Order No. R2-2003-0093)	Municipal Regional Stormwater NPDES Permit (Order No. R2-2009-0074, NPDES Permit No. CAS612008) Caltrans Stormwater NPDES Permit (No. CAS000003)

1. Sanitary Sewer Systems are given a load allocation of zero because discharges of untreated or partially treated wastewater from this source category are prohibited by the general WDRs for sanitary sewer systems. Further, bacterial concentrations in the sanitary sewer systems are not affected by contributions from natural bacteria sources (e.g., birds and wildlife).
2. Please see Figure 4.6 for the existing monitoring stations at the mouth of San Pedro Creek (i.e., Creek mouth) and at Pacifica State Beach (i.e., Station #5).
3. The private sewer lateral portion of the sanitary sewer system is the responsibility of private property owners.
4. Stormwater discharges from Caltrans' stretch of Highway 1 crossing the northwestern edge of the San Pedro Creek watershed are not believed to be a significant source of indicator bacteria because that section of the highway does not include any typical bacteria-generating sources such as homeless encampments, restroom facilities, garbage bins, etc. Therefore, we do not think that Caltrans would need to implement any additional pollution prevention measures in addition to what they currently are, but they are receiving a wasteload allocation.
5. Please see Section 10 for discussion of applicable Permits.
1.

8.7 Margin of Safety

TMDLs are required to include a margin of safety to account for data uncertainty, critical conditions, and lack of knowledge. For this TMDL, an implicit margin of safety has been

incorporated by directly applying the numeric water quality objectives and the proposed implementation procedures for bacteria objectives as pollutant load and wasteload allocations. This ensures that there is little uncertainty about whether meeting the pollutant allocations will result in meeting the water quality objectives and their proposed implementation procedure. Therefore, staff asserts that no additional or explicit margin of safety is needed for this TMDL.

8.8 Critical Conditions

The critical condition in a TMDL defines an extreme condition for the purpose of setting allocations to meet the TMDL's numeric target(s). While a separate element of the TMDL, it may be thought of as an additional margin of safety such that the allocations are set to meet the numeric target during an extreme (or above average) condition.[5]

Unlike many TMDLs, the critical condition for bacteria loading is not during low-flow conditions or summer months, but during wet weather. This is because intermittent or episodic loading sources, such as surface runoff, can be most significant during high flows (e.g., during and after rain events) (U.S. EPA 2001). Water quality monitoring data presented in Section 4 show a higher percentage of daily exceedances of the single-sample targets during wet weather, as well as more-severe bacteriological impairments then, indicated by higher-magnitude exceedances and exceedances of multiple indicators.

We propose using the 90th-percentile 'storm year' as the reference year for calculating the number of wet days, dry days, and associated allowable exceedance days.[6] We selected the 90th-percentile year for several reasons. First, the intent of this TMDL is to remove the existing impairment through the control of anthropogenic sources of bacteria. The lower the percentile (i.e., the more frequent the year) used as the reference year, the more exceedances during a given year will represent non-anthropogenic-sourced exceedances. As such, the lower the percentile, the more the TMDL becomes a requirement to control non-anthropogenic (i.e., natural) sources of bacteria. The 90th-percentile requirement is expected to focus implementation on anthropogenic sources.

Second, selecting the 90th-percentile wet year as the critical condition allows responsible parties to identify the range of conditions under which they will need to control bacterial inputs. For example, structural stormwater controls (e.g., bioretention cells, wet ponds, and constructed wetlands) are BMPs that could be used to reduce pathogen impacts (U.S.EPA 2012; Clary, et al. 2008; International Stormwater BMP Database 2012).[7]

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[5] Critical conditions are often defined in terms of flow, but may also be defined in terms of rainfall amount, days of measurable rain, etc.

[6] The 'storm year' is defined as November 1 to October 31 to be consistent with the periods specified in AB411.

[7] The effectiveness of stormwater control measures is BMP-specific. Therefore, control measures should be selected carefully. More information is being learned regarding design and effectiveness of various stormwater BMPs with respect to their effectiveness at controlling bacteria (Hathaway and Hunt 2008).

These controls must be designed and sized according to the volume of stormwater flows they are intended to treat.[8] The 90th-percentile wet year had 70 days with 0.1 inch or more of precipitation, and selection of this year pushes responsible parties to select and design appropriate structural stormwater controls that are sized properly to treat stormwater flows even during very wet years. Under this scenario, the stormwater controls would be able to handle the necessary stormwater volumes 9 years out of 10.

Third, we expect that there will be fewer exceedance days in drier years since bacteria control measures will be implemented to address exceedance days during the 90th-percentile year.

Lastly, selecting the 90th-percentile wet year results in a low number of allowable exceedance days during the highest-usage period (i.e., dry days), thereby being more protective of the recreational uses during peak use periods.

The 90th-percentile storm year in terms of wet days was identified by constructing a cumulative frequency distribution of annual wet weather days using historical rainfall data from Pacifica 4 SSE climate data station from 1983-2010. This means that only 10% of years should have more wet days than the 90th-percentile year. For the available record, the 90th-percentile year in terms of wet days was 1994, which had 136 wet days.

[8] Stormwater treatment systems must be designed and sized according to the existing requirements set forth in the NPDES Municipal Regional Stormwater Permit for the San Francisco Bay Region (Water Board 2011)

9. LINKAGE BETWEEN WATER QUALITY TARGETS AND POLLUTANT SOURCES

This section presents the linkage analysis, which establishes the relationship between the pollutant loadings from identified sources and existing water quality. This relationship can then be used to set numeric targets that ensure attainment of beneficial uses. For this TMDL, the proposed load and wasteload allocations will protect the water contact beneficial use because:

- Fecal waste from warm-blooded animals can contain pathogens;
- Indicator bacteria are present in fecal waste from warm-blooded animals and are routinely used as a monitoring surrogate for pathogens. Thus, it is appropriate to use indicator bacteria as a surrogate to measure pathogen impairment of beneficial uses;
- The proposed pollutant load and wasteload allocations are based on the proposed numeric targets for indicator bacteria for water contact recreation;
- The proposed numeric targets are based on the Basin Plan, Ocean Plan, and U.S. EPA's bacterial water quality objectives for water contact recreation waters; and,
- The Basin Plan, Ocean Plan, and U.S. EPA's bacterial water quality objectives are based on an acceptable health risk for recreational waters of 8-19 illnesses per 1,000 exposed individuals, as recommended by the U.S. EPA (USEPA 1986) and therefore are protective of the water contact beneficial use.

Therefore, achievement of the proposed pollutant load and wasteload allocations listed in Section 8 will ensure the protection of the water quality and water contact beneficial use of San Pedro Creek and Pacifica State Beach.

10. IMPLEMENTATION PLAN

10.1 Overview

TMDLs are strategies to restore clean water. Implementation plans, which specify actions needed to restore water quality and protect beneficial uses, are required under section 13242 of the Water Code. The implementation plan for reducing bacteria in the San Pedro Creek watershed relies on existing regulatory controls and the Water Board's authorities under the Water Code.

The intent of this implementation plan is to restore and protect the water contact beneficial use of San Pedro Creek and the Pacific Ocean waters adjacent to Pacifica State Beach by reducing bacteria loadings. Potentially significant bacteria sources in the watershed that are controllable include: sanitary sewer systems, stormwater runoff and dry weather flows, and horse facilities.

The implementation plan specifies actions needed to attain the TMDL and the allocations. The implementation plan includes actions for which requirements are already in place, and some additional new actions. The new actions include requirements for horse facilities and additional requirements for stormwater management. Those actions for which requirements are already in place include reduction of sanitary sewer discharges by the measures required under an existing Cease and Desist Order issued to the City of Pacifica; the General Waste Discharge Requirements (WDRs) for sanitary sewer systems; and a cleanup and abatement order issued to one of the horse facilities in the watershed. This implementation plan provides additional detail on the actions expected under existing authorities, while also explaining new requirements, such as requiring horse facility owners and operators to obtain WDRs to ensure the clean operation of their facilities, and requiring stormwater permittees (Pacifica and San Mateo County) to conduct additional water quality monitoring and provide a BMP-based plan to achieve the wasteload allocations listed in Section 8 above.

This implementation plan describes the Water Board's regulatory authority (Section 10.2) as well as other plans and policies in effect in the San Pedro Creek watershed that affect bacteria source management activities (Section 10.3). A description of the proposed implementation strategy is provided in Section 10.4. Section 10.5 summarizes the implementation plan in a tabular format. The implementation schedule is provided in Section 10.6.

10.2 Legal Authorities and Requirements

The Water Board has the responsibility and authority for regional water quality control and planning according to the Water Code. The Water Board regulates point source pollution and nonpoint sources of pollution. The Water Board regulates point sources by implementing the National Pollutant Discharge Elimination System (NPDES) permit program, which permits point sources of pollution that discharge into waters of the United States. Nonpoint sources of pollution are addressed in California's Policy for Implementation and Enforcement of the Nonpoint Source Program (State Water Board 2004) which requires regulation of current and proposed nonpoint source discharges

under WDRs, conditional waivers of WDRs, Basin Plan discharge prohibitions, or some combination of these tools. The Water Code gives the Water Board authority to issue WDRs for both point and nonpoint sources of contamination.

10.3 Plans & Policies in the San Pedro Creek Watershed

Below is a description of the current regulations, policies, and plans related to the sanitary sewer system, stormwater runoff and dry weather flows, and horse facility source categories in the San Pedro Creek watershed.

10.3.1 Sanitary Sewer Systems

The tools available to control discharges from sanitary sewer systems include the Basin Plan prohibition against discharges of raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin (Basin Plan, Table 4-1). General WDRs have been adopted by the State Water Board for sanitary sewer systems that address this source of bacteria to the San Pedro Creek Watershed. In addition, local ordinances exist that address the potential for discharge from private sewer laterals and a recent, 2011 cease-and-desist order issued to the City of Pacifica also addresses sanitary sewer overflows. We anticipate that the City of Pacifica's, and private homes and business owners' compliance with these permits, ordinances, and cease-and-desist order (CDO) requirements will minimize sanitary sewer overflows sufficiently to address their contribution to the identified bacterial impairment. Therefore, this TMDL does not include additional measures to address these discharges. More details on these requirements are provided in the following discussion.

General Waste Discharge Requirements for Sanitary Sewer Systems

On May 2, 2006, the State Water Board adopted general WDRs for sanitary sewer systems (Order No. 2006-0003, revised by Order No. 2008-0002). All public entities that own or operate sanitary sewer systems that are greater than one mile in length that collect and/or convey untreated or partially treated wastewater to a publicly owned treatment facility in the State of California were required to apply for coverage under these WDRs by November 2, 2006. The City of Pacifica applied for and is covered under the general WDRs for sanitary sewer systems (WDID No. 2SSO10100).

The WDRs contain provisions for sanitary sewer overflow (SSO) prevention and reduction measures, including development and implementation of sanitary sewer system management plans (SSMPs). Further, the WDRs prohibit any SSO that results in a discharge of untreated or partially treated wastewater to waters of the United States, or creates a nuisance as defined in Water Code Section 13050(m). In addition, the WDRs require the dischargers to take all feasible steps to eliminate SSOs and to properly manage, operate, and maintain all parts of the collection system. Lastly, the WDRs include a monitoring and reporting plan that establishes monitoring, record keeping, reporting, and public notification requirements for the dischargers.

Pacifica's Code of Ordinances contains regulations for private sewer laterals (the portion of the sanitary sewer system that connects plumbing from private homes and businesses to the public sewer system). The Sewer Laterals Ordinance (Ord. 784 C.S.) specifies that:

It shall be the responsibility of the property owner to perform all required maintenance, repairs and replacement of the sewer lateral in accordance with the following requirements:

> *(a) The sewer lateral shall be kept free from roots, grease deposits, and other solids, which may impede or obstruct the flow;*
>
> *(b) All joints shall be watertight and all pipes shall be sound;*
>
> *(c) The sewer lateral pipe shall be free of any structural defects such as fractures, cracks, breaks, openings, or missing portions;*
>
> *(d) All cleanouts shall be securely sealed with a proper cap or approved overflow device at all times;*
>
> *(e) There shall be no non-sanitary sewer connections to the sewer lateral or to any plumbing that connects to the sewer lateral; and,*
>
> *(f) All maintenance, repair or replacement shall conform to current City standards and specifications.*

The Ordinance further specifies that a compliance certificate with the above requirements will be required upon: title transfer; construction or remodeling; addition of drain or fixture; change in water services; an individually-owned unit in a multi-unit structure served by a single lateral or shared laterals such as a condominium or other common interest development; or, property developments other than those specified in "d" above with sewer laterals totaling greater than one thousand feet (1,000') in length.

Cease and Desist Order for Pacifica's Wastewater Discharges

On April 25, 2011, the Water Board approved the settlement of Administrative Civil Liability Complaint No. R2-2009-0075, which had been issued to Pacifica to address numerous sanitary sewer overflows (SSOs) and sewage treatment bypass violations. In the settlement, Pacifica agreed to complete a Private Sewer Lateral Grant Program that would rehabilitate or replace existing broken private laterals, likely reducing bacteria inputs to San Pedro Creek and Pacifica State Beach.

Additionally, to prevent future discharges of untreated or partially treated sewage to waters of the United States, on May 11, 2011, the Water Board issued Cease and Desist Order No. R2-2011-0031(CDO) to Pacifica, ordering the City to comply with the following requirements, which are also likely to reduce pathogen inputs to San Pedro Creek and Pacifica State Beach:

1. Prepare an SSO reduction plan;
2. Meet the recordkeeping requirements outlined in the Monitoring and Reporting Program for the general WDRs for sanitary sewer systems;
3. Purchase a computerized maintenance management system;
4. Develop and implement an enhanced system-wide cleaning program for the collection system and the collection system's ancillary equipment;
5. Develop and implement an enhanced root control program;

6. Develop and implement a program to detect and eliminate illicit discharges;
7. Complete a condition assessment of 100% of its collection system;
8. Complete a system evaluation and capacity assurance plan;
9. Prepare and implement a capital improvement plan;
10. Develop a 10-year and a 20-year financial plan to evaluate the costs of implementing the tasks required by the general WDRs for sanitary sewer systems and the 2011 CDO;
11. Develop and implement a private sewer lateral replacement program;
12. By January 1, 2020, achieve full compliance with Prohibitions C.1 and C.2 of the Sanitary Sewer Order, which prohibit any SSO that results in a discharge of untreated or partially treated wastewater to waters of the United States;
13. To minimize the volume of SSOs, maintain an SSO response time of no greater than 15 minutes;
14. By January 1, 2019, have no insufficient capacity-caused SSOs; and,
15. By June 30, 2011, complete an assessment of the competency of its collection system staff and develop a plan to provide training to them (completed).

The CDO also includes requirements for sanitary sewer management plan certification, various communications and reports, and audits.

10.3.2 Horse Facilities

We intend on regulating the horse facilities located in the San Pedro Creek Watershed using WDRs for confined animal facilities. In addition, there are existing city and county requirements that address concerns about potential discharges of bacteria from horse facilities, by requiring the control and management of waste materials. The specifics of Pacifica's municipal code and policies, and San Mateo's county ordinance are presented below. The WDRs and enforcement of local ordinances should address this source of bacteria in the watershed.

Section 6.k of Pacifica's Administrative Policy on "Standards for Keeping Animals" states that "[t]he surface of all corrals and paddocks shall be graded so as to prevent the ponding of a storm or casual waters and as to prevent drainage into streams." Further, Section 6-1.301 of Article 3 of Pacifica's municipal code on "Animal Excreta" states that "it is unlawful for any owner, keeper, or other person in possession of any animal to permit his or her animal to discharge such animal's excreta upon any public or private property within the City, other than the property of owner, keeper, or other person in possession of such animal, unless the owner, keeper, or other person in possession immediately removes such feces from area in a safe and sanitary manner by depositing it in a closed or sealed container in a sanitary receptacle. Owner, keeper, or other person in possession of the animal must carry, at all times a suitable container or other suitable instrument for the removal and disposal of feces." In addition, San Mateo County's Ordinance for Confined Animals also includes provisions to "protect water quality,

sensitive habitats, soil and other environmental resources from potential adverse impacts of confined animals."

Pursuant to provisions of the Water Code section 13267, which authorizes the Executive Officer of the Water Board to require the submittal of technical reports, we will require a report from Pacifica and San Mateo County that summarizes their current efforts to ensure compliance with these local ordinances for proper horse waste management in the watershed.

In addition to the above local ordinances, as stated in Section 10.2 above, the Water Code gives the Water Board authority to issue Waste Discharge Requirements for nonpoint sources of pollution, such as horse facilities. Water Board staff is currently in the process of updating and preparing for reissuance of an existing Order, the General Waste Discharge Requirements Order for Confined Animal Facilities, Order No. R2-2003-0093 (CAF Order), to refine the requirements for horse facilities, and regulate horse waste discharges. This reissued CAF would apply to the three existing and any future horse facilities in the San Pedro Creek watershed. Once the CAF Order is reissued, owners or operators of the existing or future horse facilities within the watershed will be required to obtain coverage under the Order and comply with its requirements. However, if the Order is not updated within two years of the effective date of the TMDL, horse facility owners or operators will be required to obtain coverage and comply with the requirements of the existing CAF Order which is applicable to horse facilities.

The management measures required by the updated CAF Order will likely be similar to those contained in the current version of the Order but are expected to clearly distinguish between different types of confined animal facilities. The CAF Order includes the following waste discharge prohibitions:

- The discharge of designated waste or hazardous waste, as defined in Section 2521(a) of Title 23, California Code of Regulation, at the Discharger's facility is prohibited.
- The treatment, storage, or disposal of waste, including the discharge of stormwater contacting wastes, at the facility shall not cause a condition of nuisance, contamination, or pollution of surface water or groundwater as defined in Section 13050 of the Water Code.

The CAF Order Provisions require facility owners to develop and implement a Waste Management Plan (WMP) that evaluates existing facilities and pollutant sources/problems and describe how these sources will be controlled utilizing best management practices (BMPs). At a minimum, the WMP must include a detailed analysis of the facility's waste management facilities, including: a) general site information and description of horse populations and land uses within the facility; b) a site assessment, including an assessment of the overall facility and effectiveness of waste containment and disposal and improvement schedule where needed; and c) a detailed operations and management plan.

Cleanup and Abatement Order for Millwood Ranch

On December 11, 2009, the Water Board issued Cleanup and Abatement Oder No. R2-2009-0045 (CAO) to Millwood [Horse] Ranch owners to address erosion and water

quality issues associated with their ongoing operations. The CAO was issued because the Water Board's Executive Officer found that, among other things, Millwood Ranch was not implementing BMPs sufficient to prevent animal waste from discharging into waterways on the site, nor to prevent the animal waste from leaving the site. As a result, the CAO required Millwood Ranch to complete an Equestrian Facilities Management Plan (EFMP) describing how the facility will be managed to appropriately prevent and minimize discharges of pollutants to creeks, ponds, and other wetlands. The CAO required that at a minimum, the EFMP:

- Include a site map describing all areas of the horse boarding facility, including stables, turnout, paddocks, arenas, manure storage, trails, areas where horse access is prohibited such as creeks, ponds, and other wetlands, and all other information, as appropriate;
- Describe how concentrated flows of water (e.g., flow from roof downspouts and runoff from roads and trails) across the facility will be managed to minimize transport and potential discharge of pollutants to creeks, ponds, and other wetlands;
- Include BMPs to control runoff from the corrals, paddocks, barns, and horse boarding area. The BMPs must be effective and consistently implemented to prevent runoff from these facilities from reaching the waters of the State and United States;
- Include a manure management plan that describes how, where, and on what schedule manure will be collected and disposed;
- Identify who is responsible for implementing the Equestrian Facilities Management Plan, including contact information for those responsible; and
- Be updated when there have been changes at the Site and when visual and water quality monitoring indicate that current BMPs are inadequate.

Millwood Ranch is currently working to come into compliance with the CAO.

10.3.3 Municipal Stormwater Runoff and Dry Weather Flows

The federal Clean Water Act (CWA) was amended in 1987 to address municipal stormwater runoff pollution of the nation's waters. One requirement of the amendment was that many municipalities throughout the United States were obligated for the first time to obtain NPDES permits for discharges of municipal runoff from their Municipal Separate Storm Sewer Systems (MS4s). In response to the CWA amendment, the Water Board issued municipal storm water permits in the early 1990s. These permits were issued to municipalities, including Pacifica and San Mateo County.

In 2009, the Water Board issued the Municipal Regional Stormwater NPDES permit (MRP) (Order No. R2-2009-0074; NPDES Permit No. CAS612008) to municipalities in the Region, including Pacifica and San Mateo County. Each MRP Permittee, including Pacifica and San Mateo County, is individually responsible for adoption and enforcement of ordinances and policies, for implementation of assigned control measures or BMPs needed to prevent or reduce pollutants in stormwater, and for funding its own capital,

operation, and maintenance expenditures necessary to implement such control measures or BMPs.

Specific provisions of the MRP which directly relate to pathogens/bacterial pollution prevention include some of the "illicit discharge detection and elimination" requirements that state:

- Permittees shall have adequate legal authority to address stormwater and non-stormwater pollution associated with, but not limited to sewage; wash water; discharges of pet waste, etc.; and
- Permittees shall have adequate legal authority to prohibit, discover through inspection and surveillance, and eliminate illicit connections and discharges to storm drains.

Further, Section C.1 of the MRP, in part, states that when discharges are causing or contributing to an exceedance of an applicable water quality standard, the permittee(s) shall submit a report to the Water Board that describes the best management practices that are currently being implemented, and additional best management practices that will be implemented to prevent or reduce the discharge of pollutants that are causing or contributing to the exceedance (Water Board 2011).

Lastly, the water quality monitoring provisions of the MRP (Section C.8) specifically require Pacifica and San Mateo County to conduct annual status monitoring for pathogen indicators (fecal coliform and *E.coli*) by selecting at least one water body per year from a predetermined list that includes San Pedro Creek.

The bacteria-related control measures required by the MRP can be helpful to identify and control bacteria inputs in stormwater discharges and dry weather flows. However, alone, they are not sufficient to address the entire problem. Implementation of additional source identification and control measures by Pacifica and San Mateo County is needed to address bacteria contributions from stormwater and dry weather discharges. As such, no later than six months prior to the expiration date of each MRP, the Board will require Pacifica and San Mateo County to submit a plan to the Water Board that describes best management practices (BMPs) that are currently being implemented and the current level of implementation, and additional BMPs that will be implemented, and/or an increased level of implementation of existing BMPs, to prevent or reduce discharges of bacteria from their storm drain systems that cause or contribute to exceedance of wasteload allocations. The plan will be required to include water quality monitoring and reporting sufficient to characterize bacteria contributions from stormwater runoff and dry weather flows and to evaluate the effect of bacteria reduction measures on water quality in the Creek and at the Beach, including determination of the annual number of exceedance days of the relevant bacterial water quality objectives cited in this TMDL, for each water body. The plan will also be required to include an implementation schedule to account for BMP implementation, and if necessary, trigger implementation of additional BMPs or increased level of implementation, sufficient to attain wasteload allocations.

The Water Board may establish permit requirements to implement wasteload allocations based on implementation of BMPs in lieu of numeric limits. The wasteload allocations

are not designed to be implemented directly as numeric effluent limitations applicable to a discharger, Pacifica, or San Mateo County. The Water Board will not include numeric limits, based on the wasteload allocations, in NPDES permits if the discharger demonstrates that it has fully implemented technically feasible, effective, and cost efficient BMPs to control all controllable sources to and discharges from their storm drain systems.

Some potential control measures to address bacteria discharges in municipal stormwater runoff and dry weather flows are discussed in Section 10.4.

10.3.4 Horse Trails

Because this source category is not considered a significant source of bacterial discharges to the Creek or Beach, we anticipate that no additional implementation actions by the parkland owners and operators within the San Pedro Creek watershed are needed.

10.4 Proposed Implementation Strategy for Achieving Load and Wasteload Allocations

This section describes the proposed implementation strategy to provide reasonable assurance the load allocations and wasteload allocations, which are expressed in terms of an allowable number of exceedances of bacteria objectives for San Pedro Creek and Pacifica State Beach, can be met. Below, we have identified some potential implementation measures. There is no requirement to follow the particular measures proposed herein as long as the allocations, expressed as maximum allowable exceedance days of single-sample objectives for each time period, are not exceeded.

10.4.1 Responsible Parties and Jurisdictions

Wasteload allocations for sanitary sewer systems will be implemented through the requirements and provisions of the General Waste Discharge Requirements Order for sanitary sewer systems, as well as Cease and Desist Order No. R2-2011-0031 issued by the Water Board to Pacifica, as discussed in Section 10.3.1. Pacifica is the responsible party for implementing these requirements and provisions.

Load allocations for horse facilities will be implemented through the requirements and provisions of the General Waste Discharge Requirements Order for Confined Animal Facilities. The owners of the three horse facilities within the San Pedro Creek watershed (i.e., Millwood Ranch, Park Pacifica Stables, and Shamrock Ranch Stables) are the responsible parties for these discharges and must implement these requirements and provisions. They must begin by obtaining coverage under the updated or existing General Waste Discharge Requirements Order for Confined Animal Facilities.

Wasteload allocations for municipal stormwater runoff and dry weather flows will be implemented through the Municipal Regional Stormwater NPDES Permit (MRP), as required by this TMDL. Pacifica and San Mateo County are the responsible parties for implementation of the necessary control measures to address bacteria discharges in municipal stormwater runoff and dry weather flows from their jurisdictions as discussed in section 10.3.3 and summarized in Table 10.1. Pacifica and San Mateo County may

jointly or individually decide how to address these discharges by employing one or more of the implementation strategies discussed below or by any other viable strategy. Staff expects that the required monitoring and source characterization outlined in Section 11 will assist them in focusing their implementation efforts on key land uses, critical sources, locations, and periods of the year.

10.4.2 Potential Implementation Measures to Control Indicator Bacteria Discharges in Municipal Stormwater Runoff and Dry Weather Flows

A variety of measures exist to reduce bacteria loadings to San Pedro Creek and Pacifica State Beach. Rather than any single measure, a combination of measures may be needed to reduce bacteria exceedances to acceptable levels. These measures are categorized as: 1) structural BMPs and 2) non-structural BMPs.

10.4.2.1 Structural BMPs

Structural BMPs are structural methods to treat or divert water at either the point of generation or point of discharge to either the storm system or to receiving waters. Structural BMPs may be sub-regional or regional in scope.

Sub-Regional Structural BMPs

Sub-regional structural BMPs consist of a single or a series of BMPs designed to treat flows for limited sub-regions within the watershed. Sub-regions can vary in size from small parking lots to several city blocks. These sub-regional implementation strategies typically have multiple pollutant treatment potential (McCoy et al. 2006). Listed below are sub-regional structural BMPs and a brief description of each.

Local Rainwater Capture Systems

Local rainwater capture systems contribute to the control of bacteria in the watershed by reducing the volume of runoff and reducing peak flows (CASQA 2003). BMPs within this category include rain barrels, cisterns, and other containers used to hold rainwater for reuse or recharge. These systems are usually designed to capture runoff from relatively clean surfaces, such as roofs, so that the water may be reused without treatment. Tank capacities vary depending on the rooftop area and can be above or below ground (CASQA 2003).

Vegetated Treatment Systems

Through a combination of biofiltration, retention, infiltration, and evapotranspiration, BMPs within this category can contribute to bacteria control for small areas and can be applied across the watershed. Understanding of these systems' performance with respect to reducing pathogens continues to develop. BMPs in this category include swales, filter strips, bioretention areas, and stormwater planters (McCoy et al. 2006). These can be installed as on-site features of developments or in street medians, parking lot islands, or curb extensions. Vegetated systems involve the use of soils and vegetation to filter and treat stormwater prior to discharge into surface or sub-surface water (CASQA 2003).

Infiltration, along with soil soaking and evapotranspiration, reduces the volume of storm water runoff, and can reduce the required size of downstream facilities.

Biofiltration can remove some particulates and the associated bacteria loading from storm water runoff. The results of a new study showed that bacteria removal can occur in biofilters utilizing an organic-based media. However, in areas with frequent rainfall where bacteria loading is likely to be greater and more frequent, regrowth and subsequent release of bacteria are likely. This is less likely to be as great a concern in drier climates where biofilter media drying between storms should be more pronounced (Pitt, et al. 2010). Additional infiltration trenches, soil grading alterations, bioretention ponds, and the use of selective vegetation can increase the efficiency of vegetative biofiltration systems. In areas where biofiltration is not practical, modification includes design of infiltration trenches, which utilize amended soil and promote subsurface flow.

Vegetated bioswales are constructed drainages used to convey stormwater runoff. Vegetation in bioswales allows for the filtering of pollutants and infiltration of runoff into groundwater. Broad swales on flat slopes with dense vegetation are the most effective at reducing the volume of runoff and pollutant removal. Bioswales planted with native vegetation offer higher resistance to flow and provide a better environment for filtering and trapping pollutants from stormwater. Vegetated bioswales generally have a trapezoidal or parabolic shape with relatively flat side slopes. Individual vegetated bioswales generally treat small drainage areas (i.e., areas of five acres or less) (CASQA 2003).

Local Infiltration Systems

Local infiltration systems contribute to bacteria control by reducing the potentially contaminated runoff from houses, streets, parking lots, and agriculture, and mitigating peak flows (CASQA 2003). Local infiltration systems utilize methods to increase on-site infiltration including the use of alternative paving materials, retention grading and infiltration pits, but effectiveness is based primarily on soil characteristics. Specific BMPs in this category include permeable paving, pervious concrete, pervious asphalt, pervious paving blocks, grass pavers, gravel pavers, pervious crushed stone, retention grading (creating depressions that hold rainwater on-site until it can percolate into the ground), and infiltration pits. Local infiltration systems can be effective for management of stormwater runoff from areas ranging from an individual lot to several city blocks (CASQA 2003).

Media Filtration

Media filtration in storm water is primarily used to separate fine particulates and associated pollutants, but might also be used for enhanced treatment to remove bacteria and nutrients (McCoy et al. 2006). To maximize bacteria removal benefits, these facilities should be strategically placed in locations with high observed or suspected bacteria loadings. In this process, stormwater is captured and either directed by gravity or pumped through media such as sand, anthracite, compost, zeolite and combinations of natural and engineered substrates. These systems do not provide volume reduction benefits, but may provide limited flow attenuation for small size storms depending on size and type of facility. Media filters could be integrated directly into existing storm drain systems, but are generally off-line facilities requiring a diversion structure (McCoy et al. 2006).

Regional Structural BMPs

Regional structural BMPs contain many similarities to sub-regional structural BMPs, but differ in both the scope and scale of implementation strategies. Treatment areas can range from several sub-regions to an entire watershed. Regional structural BMPs retain the multiple treatment potential of sub-regional BMPs. Listed below are regional structural BMPs and a brief description of each.

Regional Infiltration Systems

A regional infiltration facility is generally a large basin capable of detaining the entire volume of a design storm and infiltration volume over a specified period. Regional biofiltration systems, including sub-surface flow wetlands, promote hydrolysis, oxidation, and rhizodegradation from soil filtration through the aerobic and anaerobic zones of the soil matrix (Halverson 2004). These systems can treat a variety of different pollutants and can be utilized for flood mitigation. This is primarily accomplished by impounding water and allowing it to slowly percolate in surface soil and eventually to groundwater. These facilities can be applied as a stand-alone treatment feature for bacteria control on a subwatershed scale. In the event of a large storm, some flow would bypass infiltration and discharge to the receiving water untreated. However, treatment of a large percentage of flow would still be achieved. The placement of a regional facility depends on suitability of soils for infiltration and appropriately-located open space.

Regional Detention Facility

Regional detention systems help reduce flow volume and promote sedimentation (McCoy et al. 2006). However, they appear to have limited effectiveness as a stand-alone treatment option for bacteria (LARWQCB 2010). This type of facility consists of a large basin equipped with outlet structures that regulate rates of release. It can be used upstream of an infiltration facility, constructed wetland or disinfection plant to equalize flows and reduce sediment loads. As such, these facilities and their accompanying treatment features tend to require a relatively large contiguous area. This could constrain their use in highly developed areas with small open spaces, which includes portions of the San Pedro Creek watershed. These basins can be shallow, lined with vegetation, and separated into multiple bays to improve their water quality functions; unlike infiltration systems they do not require favorable soils. Detention facilities can also be deep, steep-wall basins, or underground vaults when space is a limiting factor (CASQA 2003).

Regional Natural Treatment Systems

Regional Natural Treatment Systems (NTS) are vegetated treatment systems, and primarily constructed water quality treatment wetlands (CASQA 2003). Constructed wetlands imitate processes carried out by natural wetlands and waste water treatment plants. Unlike natural wetlands, regional NTS are vegetated treatment systems, which are constructed, designed and maintained primarily for water quality treatment. Constructed wetlands can be applied either as on-line or off-line facilities or can be integrated into other habitat enhancement projects. The two most common regional NTS are free surface flow (FSF) and sub-surface flow (SSF) wetlands. FSF wetlands are characterized by shallow ponded water at varying depths above the ground surface; solar irradiation is

supposedly the process involved in bacterial removal in this type of wetland. For the SSF wetlands, water flows through the sub-surface soil matrix, rarely surfacing; here the presence of the anoxic zone contributes to the bacterial removal mechanism. This method requires comparatively large areas of relatively flat land to mimic natural function. Also, these facilities are not intended to provide stand-alone treatment of storm water runoff. Often, a detention facility can be integrated upstream to mitigate peak flows and provide a more steady inflow, and biofiltration facilities, media filters or sedimentation basins can be integrated to reduce sedimentation loads and to further provide longevity and better performance of the NTS (McCoy et al. 2006).

Diversion and/or Treatment

A diversion and/or treatment BMP routes urban runoff away from the storm drain system or waterway and redirects it into the sanitary sewer system or other treatment system, where the contaminated runoff can be cleaned before being re-used or discharged (City of Los Angeles Storm Water Program website 2007). Diversion can be a particularly effective method of cleaning up dry weather flows in storm drains

After treatment, and subject to appropriate permitting, water can be channeled to receiving waters or reused. Challenges of diversion are that it can be constrained by the size of the existing sanitary sewer collection system; it is relatively more-expensive than passive treatment controls like bioretention cells; and it diverts flows away from the receiving water, so it can dewater creeks and/or wetlands for which the main source of water is stormwater runoff, with associated impacts to beneficial uses.

10.4.2.2 Non-structural BMPs

Non-structural BMPs include prevention practices designed to improve water quality by reducing bacteria sources. Non-structural BMPs provide for the development of bacteria control programs that include, but are not limited to prevention, education, and regulation. These programs are described below.

Administrative Controls

Administrative controls require less initial investment of time compared to structural BMPs. However, for continuous implementation, administrative actions may require greater time. These actions include better enforcement of existing pet or domestic animals waste disposal ordinances, better enforcement of existing litter ordinances, posting additional signage, proposing stricter penalties, and other actions of an administrative nature.

Outreach and Education

Education and outreach to residents may minimize the potential for contamination of stormwater runoff by encouraging residents to clean up after their pets, pick up litter, minimize runoff from agricultural, residential, and commercial facilities, and control excessive irrigation. The public is often unaware of the fact that excess water discharged on streets and lawns ends up in receiving waters, or of the contamination caused by the polluted runoff.

Local agencies can provide educational materials to the public via television, radio, online, and print media, distribute brochures, flyers, and community newsletters, create information hotlines to outreach to educators and schools, develop community events, and support volunteer monitoring and cleanup programs

Storm Drain Stenciling

Storm drain inlet stenciling is another means of educating the public about the direct discharge of stormwater to receiving waters and the effects of polluted runoff on receiving water quality. Stenciling can be conducted in partnership with other agencies and organizations to garner greater support for educational programs (U.S. EPA 2005). Storm drain stenciling is currently required by the MRP (Water Board 2011).

Street Cleaning

Street and parking lot cleaning may minimize trash and pollutant loading to urban storm drains (CASQA 2003). This management measure involves employing pavement cleaning practices such as street sweeping on a regular basis to minimize trash, sediment, debris and other pollutants that might end up in receiving waters.

Storm Drain Cleaning

Routine cleaning of the storm drain system can reduce the amount of trash and other pollutants that discharges to receiving waters, prevent clogging, and maintain the system's flood control capacity. An effective storm drain cleaning program includes regular inspection and cleaning of catch basins and storm drain inlets, increased inspection and cleaning in areas with high trash accumulation, accurate recordkeeping, cleaning immediately prior to the rainy season to remove accumulated trash and other pollutants, and proper storage and disposal of collected material (CASQA 2003).

10.5 Implementation Plan Summary and Schedule

Table 10.1 summarizes implementation requirements, and the responsible parties and the schedule for implementing those requirements. The implementation schedule allows time for the responsible parties to identify and implement measures that are necessary to control indicator bacteria discharges resulting in exceedances of water quality objectives. The schedule would allow 8 years from the effective date of the TMDL to meet the Pacifica State Beach load and wasteload allocations and 15 years from the effective date to meet the San Pedro Creek load and wasteload allocations.

Table 10.1. Implementation Plan Requirements and Schedule			
Source	**Implementation Requirements**	**Responsible Party**	**Schedule**
Sanitary Sewer Systems	Comply with Statewide General Waste Discharge Requirements for sanitary sewer systems	Pacifica	Ongoing
	Comply with the Cease and Desist Order (CDO) for Pacifica's Wastewater Discharges.	Pacifica	As required by the CDO
	Ensure compliance with Private Sewer Laterals Ordinance	Pacifica	Ongoing
	Comply with the Pacifica's Private Sewer Laterals Ordinance	Private Home and Business Owners	Ongoing
Horse Facilities	Obtain coverage under and comply with Water Board's updated General Waste Discharge Requirements for Confined Animal Facilities, when the Order is reissued (or the existing version, if an update to the Order is not made within two years of the effective date of the TMDL).	Existing and future horse facility owners or operators	No later than two years after the effective date of the TMDL
	Comply with the Cleanup and Abatement Order (CAO) for Millwood Ranch.	Millwood Ranch owners	As required by the CAO
	Ensure compliance with: Pacifica's Administrative Policy on "Standards for Keeping Animals" Pacifica's municipal code on "Animal Excreta" San Mateo County's Ordinance for Confined Animals	Pacifica and San Mateo County	Ongoing
	Provide a report summarizing current efforts to ensure compliance with local regulations for proper management of horse waste at horse facilities	Pacifica and San Mateo County	Annually

Table 10.1. Implementation Plan Requirements and Schedule			
Source	**Implementation Requirements**	**Responsible Party**	**Schedule**
Municipal Stormwater Runoff and Dry-Weather Flows	Submit a plan to the Water Board, acceptable to the Executive Officer, which describes BMPs being implemented and additional BMPs that will be implemented to prevent or reduce discharges of bacteria to storm drain systems to attain wasteload allocations. The plan shall include implementation methods, an implementation schedule and proposed milestones.	Pacifica and San Mateo County	As soon as possible and no later than June 2014
	Submit a bacteria water quality monitoring plan for the San Pedro Creek watershed to 1) better characterize their bacteria contributions; and 2) assess compliance with the wasteload allocations. The parties may submit plans separately, but are encouraged to collaborate on a single cooperative plan. The Plan(s) shall be acceptable to the Executive Officer.		As soon as possible and no later than June 2014
	If wasteload allocations are not achieved by the end of a permit term, submit a plan acceptable to the executive officer, which describes additional BMPs or increased levels of existing BMPs that will be implemented to prevent or reduce discharges of bacteria to storm drain systems to attain wasteload allocations. The plan shall include implementation methods, an implementation schedule, and proposed milestones.		Not later than six months prior to permit expiration
	Provide a report on the status of the implementation activities		Annually

Table 10.1. Implementation Plan Requirements and Schedule			
Source	**Implementation Requirements**	**Responsible Party**	**Schedule**
All Sources	For Pacifica State Beach: All dischargers shall achieve compliance with the applicable LAs and WLAs, expressed in terms of allowable exceedances of single-sample objectives for summer dry weather (April to October 31), winter dry weather (November 1- March 31), and wet weather.	All Parties	8 years after effective date of this TMDL
	For San Pedro Creek: All dischargers shall achieve compliance with the applicable LAs and WLAs, expressed in terms of allowable exceedances of single-sample objectives for dry and wet weather.		15 years after the effective date of this TMDL

The implementation schedule allows time for the responsible parties to identify and implement measures that are necessary to control indicator bacteria discharges resulting in exceedances of water quality objectives. The schedule would allow 8 years from the effective date of the TMDL to meet the Pacifica State Beach load and wasteload allocations and 15 years from the effective date to meet the San Pedro Creek load and wasteload allocations.

10.6 Adaptive Implementation

The Water Board will adapt the TMDL and implementation plan to incorporate new and relevant scientific information such that effective and efficient measures can be taken to achieve the allocations. The Water Board staff will periodically, in coordination with the implementation schedule, at 5, 8 and 15 years, evaluate new and relevant information from implementation actions, water quality monitoring results and the scientific literature, including any local reference system studies, U.S. EPA's revised recommended bacteria criteria, or new or revised State bacteria water quality objectives, and assess progress toward attaining TMDL targets and load allocations, and present that information to the Water Board. The Water Board will consider a Basin Plan amendment that reflects any necessary modifications to the targets or implementation.

11. MONITORING PROGRAM

11.1 Ambient Monitoring

Responsible parties for the stormwater runoff and dry weather flow discharges (i.e., Pacifica and San Mateo County) are individually or jointly responsible for developing and implementing a comprehensive monitoring plan to 1) better characterize indicator bacteria contributions from their source; and 2) assess compliance with the wasteload allocations in the TMDL as described in Section 11.2. The monitoring plan should include applicable bacteria water quality objectives and the sampling frequency must be adequate to assess compliance with the 30-day geometric mean objectives. Responsible parties may build upon existing monitoring program(s) for San Pedro Creek and Pacifica State Beach when developing the bacteria water quality monitoring plan. At a minimum, in addition to the existing San Mateo County sampling stations at the mouth of San Pedro Creek and at Pacifica State Beach, which will be used to evaluate achievement of the designated load and wasteload allocations, at least one sampling station should be located in each creek reach/subwatershed, such that bacteria contributions from each of the San Pedro Creek's forks/subwatersheds are distinguished. It is anticipated that a minimum monitoring frequency of 5 times a month for each monitoring site, twice a year, would be necessary. In addition, indicator bacteria concentrations in the stormwater and dry weather discharges from the Linda Mar and Anza pump stations must be monitored and characterized sufficient to determine their contribution to exceedances, and the effects of any corrective actions. Lastly, monitoring of some of the stormwater outfalls within the watershed may be needed to characterize and identify indicator bacteria loadings from different land uses and locations, and the effects of any corrective actions. Monitoring data shall be entered into the State Water Board's "Beach Watch" data base as appropriate.

11.2 Compliance Monitoring

Compliance monitoring will assess attainment of the TMDL numeric targets and allocations for San Pedro Creek and Pacifica State Beach. The compliance point for these assessments will be at the existing San Mateo County water quality monitoring stations in the receiving water bodies (i.e., at the "San Pedro Creek Mouth" and at the "Pacifica State Beach #5" monitoring stations, as shown on Figure 4.6).

12. REGULATORY ANALYSES

Overview

This section of the Staff Report provides the regulatory analyses required to adopt the Basin Plan amendment to establish (1) a Total Maximum Daily Load and its accompanying implementation plan for bacteria in San Pedro Creek and at Pacifica State Beach (referred to here as the TMDL); and (2) new implementation provisions for the Basin Plan's existing bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to future bacteria TMDLs in the Region. It includes a discussion of the results of an environmental analysis required under CEQA and a discussion of economic considerations. The environmental analysis is required under CEQA when the Water Board adopts a Basin Plan amendment under the Water Board's certified regulatory program (Pub. Res. Code § 15251 (g)). The environmental analysis also satisfies Public Resources Code section 21159, which applies when adopting rules or regulations requiring installation of pollution control equipment, compliance with a performance standard, or treatment requirement. It evaluates the reasonably foreseeable environmental impacts of the methods of compliance with the project. The discussion of economic considerations is provided in accordance with Public Resources Code section 21159 (a)(3)(c), which requires an analysis of economic factors related to costs of implementation of the new rules or regulations. This Staff Report, including the CEQA checklist and these analyses, constitutes a substitute environmental document (Cal. Code Regs., tit. 14, § 15252).

The results of the evaluation of environmental impacts and economic considerations indicate that the project would not result in long-term, significant impacts and will not cause immediate, large scale expenditures by the entities required to implement the TMDL. The implementation plan of the TMDL is built on management measures required by the existing regulations to reduce or eliminate waste discharges from sanitary sewer systems, horse facilities, stormwater runoff, and dry-weather flows. The environmental analysis analyzes environmental impacts for many of the potential individual projects that may be developed to implement the TMDL to the extent such impacts can be identified at this time.

New Implementation Provisions for Bacteria Objectives

The proposed Basin Plan amendment will also establish new implementation provisions for the Basin Plan's existing bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to future bacteria TMDLs in the Region, on a project-by-project basis. The environmental impact resulting from potential application of the proposed implementation provisions for bacteria objectives is also assessed as part of the environmental analysis. The environmental impacts associated with these new implementation provisions are expected to be the same as those identified for the TMDL. Should there be any additional environmental impacts associated with a project-specific application of these provisions in a future TMDL, they will be evaluated as a part of that future TMDL.

Section Organization

This section of the Staff Report is organized into three main parts: 1) Environmental Analysis, including the Environmental Checklist, 2) Alternatives Analysis; and 3) Economic Considerations.

12.1 Environmental Analysis

The Water Board is the Lead Agency responsible for evaluating the potential environmental impacts of the project. This section of the Staff Report contains a description of the project, presents the environmental checklist evaluating the environmental impacts of the projects and includes an explanation of the results of the analysis. Sections 2 and 3 of this Staff Report also provide details about the project definition, objectives and a description of the environmental setting that provide the basis for the CEQA evaluation. The environmental checklist frames the analysis, which includes a discussion of the potential environmental impacts as well as probable mitigation measures that could be used to eliminate or reduce those impacts.

Pursuant to section 13360 of the Water Code, the Water Board cannot dictate which compliance measures implementing parties may choose to adopt or which mitigation measures they would employ to implement the TMDL. However, the Water Board does recommend that appropriate compliance and mitigation measures as discussed herein, which are readily available and generally considered to be consistent with industry standards, be applied in order to reduce, and if possible avoid, potential environmental impacts, such that there is no significant impact. Since the decision to perform these measures is strictly within the responsibility of the individual implementing parties, such measures can and should be adopted by these parties. (Cal.Code Regs., tit. 14., § 15091(a)(2)).

12.1.1 Project Description

The project is composed of a Basin Plan amendment that establishes: (1) a Total Maximum Daily Load (TMDL) and its accompanying implementation plan for bacteria in San Pedro Creek and at Pacifica State Beach; and (2) implementation provisions for the Basin Plan's existing bacteria water quality objectives (bacteria objectives) that apply to this TMDL and could be applied to future bacteria TMDLs in the Region. The primary purpose of the project is to restore and protect the recreational beneficial uses in San Pedro Creek and at Pacifica State Beach and address the potential for natural sources of bacteria that may cause or contribute to exceedances of recreational contact water quality objectives. The project includes numeric targets to protect these recreational uses. The TMDL assigns load and wasteload allocations, expressed as exceedance-days of the single sample maximum water quality objective, to dischargers that, over time, are expected to result in attainment of the targets.

Bacteria sources identified in the TMDL include sanitary sewer systems, horse facilities, stormwater runoff, and dry-weather flows. The TMDL Implementation Plan includes existing regulatory programs and required management measures to reduce bacteria

discharges from all of these sources. These implementation actions are summarized in Table 12.1 below.

12.1.2 Project Objectives

The objectives of the proposed Basin Plan amendment with respect to bacteria in San Pedro Creek and at Pacifica State Beach are consistent with the mission of the Water Board and the requirements of the federal Clean Water Act (CWA) and California's Water Code. These objectives are:

- Comply with the CWA requirement to adopt a TMDL for Section 303(d)-listed water bodies;
- Protect existing recreational uses in San Pedro Creek and at Pacifica State Beach;
- Attain the bacteria objectives for water contact recreation in San Pedro Creek and at Pacifica State Beach, as quickly as feasible;
- Set numeric targets to attain relevant water quality standards in San Pedro Creek and at Pacifica State Beach;
- Ensure that bacteriological water quality is at least as good as that of a reference site and that no degradation of water quality is permitted where existing water quality is better than that of a reference site
- Develop implementation provisions for Basin Plan's numeric bacteria water quality objectives that address natural sources of bacteria;
- Avoid imposing regulatory requirements that mandate the diversion and treatment of water from receiving waters to address uncontrollable natural sources of indicator bacteria from undeveloped areas; and
- Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards.

12.1.3 Baseline Conditions

To satisfy CEQA's recommendation to engage the public and interested parties in early consultation about the scope of the environmental analysis, Board staff held a CEQA scoping meeting on May 23, 2012, at the Pacifica Community Center to receive input into the environmental analysis. The environmental analysis commenced at this time and the impact assessment below is evaluated with respect to these baseline environmental conditions. It should be noted that the City of Pacifica is currently in the process of updating the City's General Plan, however the updated General Plan has not been approved and for the purpose of this analysis the current, 1980 General Plan, is in effect.

The water quality regulatory framework and existing Water Board orders and other local, regional, and statewide regulations that were in effect in May 2012 will result in many actions that reduce bacteria loading. These actions would occur with or without the TMDL in accordance with the following existing regulations and Orders (the regulatory baseline).

Water Board Orders and Discharge Prohibition

- State Water Board Statewide General Waste Discharge Requirements for Sanitary Sewers Systems (Order No. 2006-0003) and revisions
- State Water Board Statewide Construction Stormwater General NPDES Permit (Order No. 2009-0009-DWQ; NPDES Permit No. CAS000002)
- Regional Water Board Municipal Regional Stormwater NPDES Permit (Order No. R2-2009-0074) and amendments (Order No. R2-2011-0083)(NPDES Permit NO. CAS612008)
- Regional Water Board General Waste Discharge Requirements for Confined Animal Facilities (Order No. R2-2003-0093)
- Basin Plan Discharge Prohibition No. 15 (Basin Plan Table 4.1), which states "it shall be prohibited to discharge raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin."

Water Board Enforcement Orders

- Regional Water Board Cease and Desist Order for Pacifica's Wastewater Discharges (Order No. R2-2011-0031)
- Regional Water Board Cleanup and Abatement Order for Millwood Ranch (Order No. R2-2009-0045)

Local Regulations

- San Mateo County Confined Animal Ordinance (Section 7700)
- City of Pacifica Administrative Policy on "Standards for Keeping Animals"
- City of Pacifica Municipal Code for Animal Excreta (Section 6-1.301)
- City of Pacifica Municipal Code for Regulation of Sewer Laterals (Section 6-13.601)

12.1.4 Reasonably Foreseeable Methods of Compliance

Implementation measures that are proposed in the TMDL are consistent with existing local, regional, and statewide regulations and are identified in Table 12.1, below. The potential environmental impacts of these measures as well as management practices to reduce bacterial loading and mitigate water quality impacts of construction activities are evaluated in the environmental analysis (checklist and explanations below). The cumulative effects of potential implementation actions are also evaluated below.

Table 12.1. Implementation Plan Actions Evaluated in the CEQA Analysis

Source	Implementation Actions	Compliance Measures
Sanitary Sewer Systems	Continue to comply with: • Statewide General Waste Discharge Requirements Order for sanitary sewer systems (which aims to prevent sanitary sewer overflows[1]) • Pacifica's Private Sewer Laterals Ordinance	Continuation of ongoing activities of sanitary sewer agency in Pacifica, regulated under federal and state permits issued by the Water Board; continuation of ongoing activities required by Pacifica's Private Sewer Laterals Ordinance. Examples of activities that would bring parties into compliance include: • Actions to inspect and clean existing sewer lines • Actions to repair and replace existing leaky sewer lines • Actions to control tree roots to prevent them from damaging the sewer lines
Horse Facilities	Continue to comply with: • Pacifica's Administrative Policy on "Standards for Keeping Animals" • Pacifica's municipal code on "Animal Excreta" • San Mateo County's Ordinance for Confined Animals, and Obtain coverage under and comply with: • The Water Board's General Waste Discharge Requirements for Confined Animal Facilities (updated or current version).	Continuation of ongoing activities required by local and regional regulations. Examples of activities that would bring parties into compliance include: • Measures to restrict animal access to creeks (e.g., fencing) • Measures to divert clean runoff from manure areas (e.g., roofs, gutters, berms, minor grading) • Measures to manage polluted runoff on-site (e.g., vegetated strips, berms, storage ponds) • Measures to manage manure (e.g., collection, storage, composting, off-site use or disposal).
Stormwater Runoff and Dry-Weather Flows	• Continue to comply with Municipal Regional Stormwater Permit. • Comply with MRP requirements to identify and implement additional specific measures, as needed, to reduce bacteria in stormwater runoff and dry-weather flows to achieve wasteload allocations.	Continuation of ongoing activities required by the Municipal Regional Stormwater Permit. Examples of activities that would bring parties into compliance include: • Additional storm drain cleaning • Detection and elimination of illicit discharges • Installation of additional pet waste receptacles and signage • Construction of facilities to detain, divert, infiltrate, or treat stormwater runoff and dry-weather flows.

1. The ongoing activities relied on for achievement of the TMDL are those specified in the General WDRs for sanitary sewer systems that pertain to sanitary sewer overflow prevention, not to other aspects of sanitary district operations.

Individual property owners and responsible parties will choose management practices necessary and most effective to reduce bacteria loads in their discharges. For example, Pacifica and San Mateo County are required under the MRP to develop and submit a plan that includes specific measures to reduce bacteria in stormwater runoff and dry weather flows sufficient to achieve the wasteload allocations. Since many of the implementation projects have yet to be designed, it is not possible to know the location, proposed activities, or construction specification at this time and therefore, the environmental analysis considers these impacts on a general level. Some projects proposed to implement the TMDL would require additional permitting, and environmental analysis will occur at that time. Projects that would involve construction affecting an area of one acre or more would be required to obtain coverage under the statewide General Construction Stormwater Permit. Projects that could result in dredge or fill of streams, wetlands, or coastal waters would be required to comply with Sections 401 and 404 of the CWA and obtain applicable permits from the U.S. Army Corp of Engineers and the Water Board. In addition, projects west of Highway 1 may require a Costal Development Permit issued by the California Coastal Commission.

All construction projects within the City of Pacifica would comply with local building, grading, and other requirements of the municipal code. Any construction activities undertaken in San Mateo County's jurisdiction would comply with applicable County regulations.

12.1.5 Environmental Analysis

The Environmental Checklist and discussion that follows is based on questions provided in the CEQA Guidelines (Appendix G) which focus on various individual concerns within 17 broad environmental categories, such as air quality, cultural resources, land use, traffic, etc. The Environmental Checklist will focus on the implementation activities described in Table 12.1. Some of the TMDL Implementation Plan activities solely involve planning or assessment; public outreach and education; and water quality monitoring. These activities are not evaluated in this analysis because they do not cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment.

Each question in the Checklist requires a reply as to whether or not the project will have a potentially significant environmental impact of a certain type, and information and discussion that supports that determination. The possible responses to the questions in the Checklist and the types of discussion required are summarized below:

Potentially Significant Impact. Checked if a discussion of the existing setting (including relevant regulations or policies pertaining to the subject) and project characteristics with regard to the environmental topic demonstrate, based on substantial evidence, supporting information, previously prepared and adopted environmental analysis documents, and specific criteria or thresholds used to assess significance, that the Project will have a potentially significant impact of the type described in the question.

Less Than Significant With Mitigation. Checked if the discussion of existing setting and specific project characteristics, adequately supported with relevant research or

documents, indicate that the project clearly will or is likely to have particular physical impacts that will exceed the given threshold or criteria of significance, and that with the incorporation of clearly defined mitigation measures into the Project, such impacts will be avoided or reduced to less-than-significant levels.

Less Than Significant Impact. Checked if a more detailed discussion of existing conditions and specific project features, based on relevant information, reports or studies, demonstrates that, while some effects may be discernible with regard to the individual environmental topic of the question, the effect would not exceed a threshold of significance which has been established by the appropriate agencies. The discussion may note that due to the evidence that a given impact would not occur or would be less than significant, no mitigation measures are required.

No Impact. Checked if brief statements (one or two sentences) or cited reference materials (maps, reports or studies) clearly show that the type of impact could not be reasonably expected to occur due to the specific characteristics of the project or its location.

ENVIRONMENTAL CHECKLIST

1. Project Title:	Proposed Basin Plan amendment for a Total Maximum Daily Load (TMDL) for Bacteria in San Pedro Creek and at Pacifica State Beach
2. Lead Agency Name and Address:	California Regional Water Quality Control Board, San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, California 94612
3. Contact Person and Phone Number:	Farhad Ghodrati (510) 622-2331
4. Project Location:	San Pedro Creek watershed, San Mateo County, California
5. Project Sponsor's Name & Address:	California Regional Water Quality Control Board, San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, California 94612
6. General Plan Designation:	Not Applicable
7. Zoning:	Not Applicable

8. Description of Project:

The project is a proposed Basin Plan amendment for a TMDL and implementation plan for San Pedro Creek and Pacifica State Beach; and implementation provisions to be added to implement the Basin Plan's existing bacteria water quality objectives.

9. Surrounding Land Uses and Setting:

The proposed Basin Plan amendment would affect San Pedro Creek and Pacifica State Beach, as described in Section 2 of the Staff Report. Implementation is likely to involve the Beach itself and upland urban and rural watershed areas that drain to the Beach. San Pedro Creek watershed land uses include a mix of urban, rural residential, recreational uses, and open space uses. The new implementation provisions would apply to the entire San Francisco Bay region. However, the focus of the CEQA checklist analysis is their implementation for San Pedro Creek and Pacifica State Beach as the impacts are expected to be the same as those if applied to the whole region. Thus, the new implementation provisions have been analyzed as a part of the CEQA checklist review.

10. Other Public Agencies Whose Approval is Required:

(e.g., permits, financing approval, or participation agreement.): The State Water Board, the California Office of Administrative Law, and the U.S. EPA must approve the Basin Plan amendment following adoption by the Water Board.

I. AESTHETICS

Background:

The San Pedro Creek watershed is situated in northern San Mateo County along the coast of the Pacific Ocean. The City of Pacifica is nestled in several small valleys spanning between Sweeney Ridge above on the east, Montara Mountain to the south, and the Pacific Ocean's beaches and rocky cliffs. The watershed and beach are accessible from U.S. Highway 1, which is not officially designated as a State Scenic Highway, though it is eligible for designation.

Discussion of Impacts:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	X
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	X

a) Any physical changes to the aesthetic environment as a result of the Bacteria TMDL would be small in scale. No actions or projects associated with implementation of the TMDL would result in tall or massive structures that could obstruct views from, or of scenic vistas. Construction of detention basins or other facilities could result in minor changes to the scenic views; however, these are likely to be situated in disturbed urban areas. These aesthetic affects are considered less than significant.

b) Actions or projects implemented for the TMDL would occur in localized areas throughout the watershed and would not occur within a designated state scenic highway, and therefore do not result in adverse aesthetic impacts to state scenic highways.

c) Actions to implement the TMDL would not substantially affect or degrade the existing visual character or quality of any site or its surroundings and are expected to

be less than significant because physical changes to the aesthetic environment would be small in scale.

d) Actions and projects that could result from the TMDL would not include new lighting or installation of large structures that could generate reflected sunlight or glare, and therefore do not result in adverse light and glare impacts.

II. AGRICULTURE RESOURCES

Background:

Land uses in the San Pedro Creek watershed are mainly urban, rural residential and opens space. While small urban and rural gardens are present, the watershed supports only a few commercial agriculture operations, including a commercial nursery on Linda Mar Drive. Several land parcels within the City limits are under Williamson Act contracts; however, these areas are proposed for development and are not in active agricultural uses.

Discussion of Impacts:

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland.

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	X
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	X

a-c) The TMDL would mainly affect urban land in the area that drains to San Pedro Creek and the Pacific Ocean, not land designated as Prime, Unique, or Farmland of

Statewide Importance by the California Resources Agency. The TMDL would not affect existing agricultural zoning or any aspects of Williamson Act contract nor would it result in the conversion of farmland to non-agricultural uses. Therefore, no impacts would result.

III. AIR QUALITY

Background

The San Pedro Creek watershed is located in the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). San Mateo County is bounded on the west by the Pacific Ocean, on the east by San Francisco Bay, on the south by the Santa Cruz Mountains and on the north by the City and County of San Francisco and the Golden Gate. In the summer months, areas along the coast are usually subject to onshore movement of cool marine air. In the winter, proximity to the ocean keeps the coastal regions relatively warm, with temperatures varying little throughout the year. The average annual precipitation is about 27 inches, with 87 percent of the rainfall occurring between November and April. Coastal high temperatures are usually in the 50's in the winter and the 60's in the summer. The warmest months are September and October. In the Pacifica, the influence of marine air keeps pollution levels low (BAAQMD 1999).

According to BAAQMD, a project would conflict with or obstruct implementation of the regional air quality plans if it would be inconsistent with the growth assumptions, in terms of population, employment or regional growth in vehicle miles traveled. The growth assumptions used for the regional air quality plans are based upon the growth assumptions provided in local general plans.

Discussion of Impacts

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	X	☐

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	X
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	X
e) Create objectionable odors affecting a substantial number of people?	☐	☐	X	☐

a) Because the TMDL would not cause any significant changes in population or employment, it is not expected to generate ongoing traffic-related emissions. It does not require construction of any permanent emissions sources. For these reasons, no permanent change in air emissions would occur, and the TMDL would not conflict with applicable air quality plans. Therefore, no air quality impacts would result.

b) Construction of stormwater detention/treatment facilities and repair and replacement of sewer pipelines could result in temporary construction-related emissions. However, these emissions would not "violate any air quality standard or contribute substantially to an existing or project air quality standard." Nor would it involve the construction of any permanent emissions sources or generate ongoing traffic-related emissions. Construction and minor earthmoving that would occur as a result of Bacteria TMDL implementation actions would be of short-term duration and would likely involve discrete, small-scale projects as opposed to extensive earthmoving activities.

   If specific construction projects were proposed to comply with requirements derived from the proposed TMDL, such projects would have to comply with the Bay Area Air Quality Management District's (BAAQMD) requirements with respect to the operation of portable equipment. Moreover, BAAQMD has identified readily available measures, routinely employed at most construction sites, to control construction-related air quality emissions (BAAQMD 1999). These measures include watering active construction areas; covering trucks hauling soil; and applying water or applying soil stabilizers on unpaved areas. Therefore, the TMDL would not violate any air quality standard or contribute substantially to any air quality violation, and its temporary construction-related air quality impacts would be less than significant.

c) Because the TMDL would not generate ongoing traffic-related emissions or involve the construction of any permanent emissions sources, it would not result in a cumulatively considerable net increase of any pollutant for which the project region is in non-attainment of air quality standards. No air quality impact would result.

d) Because the TMDL would not require the construction of any permanent emissions sources but rather involves short-term and discrete construction activities, it would

not expose sensitive receptors to substantial pollutant concentrations. No air quality impact would result.

e) The Bacteria TMDL would include actions to manage manure at horse facilities so that animal waste does not enter San Pedro Creek. Manure management activities could include the collection, storage and transport of manure at horse facilities which could result in odor. However, because manure stockpiling would be limited to the three horse facilities in the watershed, Millwood Ranch, Park Pacific, and Shamrock stables, which are areas of low-density population, possible odors would not affect substantial numbers of people and impacts would be less than significant.

IV. BIOLOGICAL RESOURCES

Background

The San Pedro Creek watershed is an 8-square mile watershed that extends from Montara Mountain in the east to the Pacific Ocean to the west. San Pedro Creek, a perennial stream, is comprised of the mainstem and four major forks: the North, Middle, South, and Sanchez Forks. The upper reaches of San Pedro Creek have healthy riparian areas and winter flows that support migrating steelhead trout. In this area of the Central California Coast, steelhead is listed as Threatened under the Endangered Species Act.

San Pedro Creek empties into the Pacific Ocean at Pacifica State Beach, a 0.75 mile-long crescent-shaped beach located at the mouth of the San Pedro Valley in downtown Pacifica. Pacifica State Beach is a heavily used recreational destination for beach-goers, surfers, and fisherman. Pacifica State Beach provides habitat for the Western Snowy Plover, a shorebird which is designated as Threatened under the Endangered Species Act.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	X	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the				

California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	X	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	X	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	X	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	X

a) Actions proposed under the Bacteria TMDL are likely to be small in scale and are located in areas that are currently developed. Actions, such as repair and replacement of pipelines and construction of stormwater detention/treatment facilities area likely to be located in existing disturbed areas such as in roadways or other paved urban areas. Implementation actions would cause direct impacts to San Pedro Creek or Pacifica State Beach and no adverse impacts to steelhead or Western Snowy Plover would result. Therefore, the TMDL would not have significant adverse effect, either directly or through habitat modifications, on any sensitive or special-status species.

b) Implementation measures that involve repair of sewage systems or minor construction in the San Pedro Creek watershed are not expected to have a significant impact on sensitive natural communities because they would be located in already disturbed areas away from creeks and the beach.

In addition, in discharging its regulatory program responsibilities, the Water Board is expected to require mitigation measures for work it approves that may impact coastal ecosystems or other sensitive natural communities. Such requirements include but are not limited to pre-construction surveys; construction buffers and setbacks; restrictions

on construction during sensitive periods of time; employment of on-site biologists to oversee work; and avoidance of construction in known sensitive habitat areas or relocation and restoration of sensitive habitats, but only if avoidance is impossible. Therefore, the TMDL would not have a substantial adverse effect, either directly or through habitat modifications to sensitive natural communities.

c) The TMDL does not include construction of new fill in riparian or wetland areas or in the Ocean. Implementation actions are likely to occur in existing roadways, at horse facilities and at existing stormwater facilities. Horse facilities are currently regulated by the Water Board to prevent fill of riparian and wetland areas. Therefore, the TMDL would result in less than significant adverse impacts on wetlands.

d) TMDL implementation actions could include installation of fences at horse facilities to keep horses out of creeks. These fences could potentially affect wildlife migration; however these effects would be localized and are not likely to result in significant disturbance to wildlife. Livestock fencing is typically fairly open and generally does not exceed heights of 5 to 6 feet. In addition, fencing would be limited to areas within the ranch facility and would be constructed on isolated segments of creek corridors, not along long continuous corridors. Wildlife in the ranch/open space interface would be able to navigate around these fences. Therefore, impacts would be less-than-significant.

e) The TMDL does not conflict with any local policies or ordinances protecting biological resources such as trees. Projects to comply with the TMDL would not affect riparian zones, nor would they include tree removal, and would not conflict with local policies or ordinances.

f) The TMDL does not conflict with any adopted Habitat Conservation Plan, Natural Community Plan, or other approved local, regional or state habitat conservation plan. Actions to implement the TMDL are consistent with the City of Pacifica General Plan Conservation Element Policies to protect riparian habitat and to promote improved water quality.

V. CULTURAL RESOURCES

Background

The San Pedro Creek watershed is located in an environment that would have been suitable for early inhabitants to live or gather resources, and therefore is considered sensitive for prehistoric cultural resources. Potentially attractive natural resources during the prehistoric period would have included fresh water sources, including San Pedro Creek and its tributaries and the Pacific Ocean, which provided a bounty of coastal resources for early inhabitants of the area, including marine fish, marine mammals, shellfish, and waterfowl.

The town of Pacifica has a number of historic buildings dating to the late 1800s and early 1900s, including the Sanchez Adobe (an historic landmark), Anderson's Store, and structures at Shamrock Ranch.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	X
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?	☐	☐	X	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	X	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	X

a) TMDL compliance measures would include only minor construction and would not require changes to historic buildings or structures. Nor would Basin Plan-related projects involve construction of structures that could alter the value of historic resources in Pacifica. Therefore, the TMDL would have no impacts on historic resources.

b) Implementation of the TMDL would involve minor construction that would not include large scale grading or deep excavations in areas that are likely to contain significant archeological resources. Therefore, the TMDL would have less than significant impacts on archeological resources.

c) Actions to implement the TMDL would involve minor construction in paved, urban areas and would not destroy a unique paleontological resource or areas containing unique geologic features. The City of Pacifica grading and building requirements and standard construction practices that include pre-surveying for utilities and careful geologic observation prior to and during excavation. Therefore, impacts to paleontological resources would be less than significant impacts.

d) The TMDL would result in minor construction in paved, urban areas. No deep excavation is foreseeable and it is very unlikely that human remains would be encountered or disturbed.

VI. GEOLOGY AND SOILS

Background

The San Pedro Creek watershed is located within the Coast Ranges Geomorphic Province, a relatively geologically young and seismically active region. Topography in the watershed is steep, with elevations ranging from over 1,000 feet above mean sea level in the upper portion of the watershed to sea level and below at Pacifica State Beach. The mountains in this area are characterized by northwest-trending faults, mountain ranges, and valleys. In general, the Coast Ranges are composed of Franciscan Complex sedimentary bedrock. However, the land west of the San Andreas Fault in San Mateo County, including the City of Pacifica, is underlain by granitic bedrock. In places the bedrock is overlain by younger materials with layers of recent alluvium filling the intervening valleys.

Pacifica is located in proximity to two major regional active faults, the San Andreas Fault and the San Gregorio fault, and the area is identified on Association of Bay Area Government maps as having the potential of strong ground shaking in the event of an earthquake. The hills above Pacifica are subject to erosion and landslides may occur, particularly during heavy rainfall seasons. In addition, there is the potential for coastal erosion and wind erosion of beach sand near the coast. Some low-lying areas of Pacifica are underlain by clean sand may be susceptible to liquefaction during strong ground shaking.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	X
ii) Strong seismic ground shaking?	☐	☐	☐	X
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	X
iv) Landslides?	☐	☐	☐	X

b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	X	☐
c) Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	X	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	X

a) Implementation of the TMDL would not require construction of habitable structures or addition of new population; therefore, it would not result in any human safety risks related to fault rupture, seismic ground-shaking, ground failure, or landslides.

b) Action to comply with the TMDL may result in minor construction and earthmoving. Such activities are not likely to result in substantial soil erosion or loss of topsoil because they are small in size. Construction of stormwater facilities could occur in low-lying areas and soil erosion could be a risk during construction. During large scale earthmoving and construction, landowners must implement erosion control practices per the Construction General Permit (see above).

c) Actions to comply with the TMDL would generally be located in existing disturbed areas such as streets, backyards, and stable areas. While these areas may contain localized areas that are prone to instability, the type of construction that would be required under the TMDL such as replacement of pipes and installation of fences would be small in scale and would be very unlikely to trigger land instability. Construction of stormwater facilities would occur in low-lying urban areas and would not be at risk of land sliding. No adverse impacts to local geologic conditions, including on- or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse are expected to occur as a result of adoption of this Basin Plan amendment.

d) Construction of buildings (as defined in the Uniform Building Code) or any habitable structures is not reasonably foreseeable due to the TMDL. Minor grading could occur in areas with expansive soils but this activity would not create a substantial risk to life or property. Therefore, the TMDL would not result in impacts related to expansive soils or risks to life or property.

e) The TMDL would not require construction of new septic systems; therefore, affected soils need not be capable of supporting the use of septic tanks or alternative wastewater disposal systems. No impacts from septic tanks or alternative wastewater disposal systems would result from the project.

VII. GREENHOUSE GAS EMISSIONS

Background:

In 2006, California passed the California Global Warming Solutions Act of 2006, which requires the California Air Resources Board (CARB) to design and implement emission limits, regulations, and other measures, such that feasible and cost-effective statewide greenhouse gas (GHG) emissions are reduced to 1990 levels by 2020 (representing an approximate 25 percent reduction in emissions). California now recognizes seven GHG: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) (California Health and Safety Code section 38505(g)), and nitrogen trifluoride (NF3). Carbon dioxide is the reference gas for climate change because it gets the most attention and is considered the most important GHG. To account for the warming potential of different GHGs, GHG emissions are quantified and reported as CO2 equivalents (CO2E). The effects of GHG emission sources (i.e., individual projects) are reported in metric tons/year of CO2E.

State law requires local agencies to analyze the environmental impact of GHG under CEQA. The Natural Resources Agency adopted the CEQA Guidelines Amendments in December 2009. San Mateo County is currently considering adoption of the San Mateo Energy Efficiency Climate Action Plan.

Discussion of Impacts:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	X	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	X

a) Although actions to implement the TMDL would result in short term, temporary greenhouse gas emissions none of the actions listed in Table 12.1 would be associated with permanent greenhouse gas emissions from new vehicular or energy loads.

b) As stated in response to item VII a) above, the proposed project would not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHG and no impact would occur.

VIII. HAZARDS AND HAZARDOUS MATERIALS

Background

Hazardous materials can threaten human health and/or the environment through routine emissions and/or accidental releases. Hazardous materials include materials that are toxic, corrosive, flammable, reactive, irritating, and strongly sensitizing. According to the State of California, a hazardous material is defined as a substance or combination of substances which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either: 1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating irreversible illness; or 2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of or otherwise managed. Hazardous waste (a subset of hazardous material) refers to a hazardous material that is to be abandoned, discarded or recycled.

Discussion of Impacts:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	X
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	X	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a				

	significant hazard to the public or the environment?	☐	☐	☐	X
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	X
f)	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	X
g)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	X
h)	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	X

a) The TMDL is not expected to involve the routine transport, use, or disposal of hazardous materials. Therefore, no impacts from the use, transport or disposal of hazardous materials would result.

b) Actions to implement the TMDL, such as repair of pipelines, installation of fences, and construction of stormwater facilities are not expected to result in upset or accident conditions involving the release of hazardous materials. Sewage is not considered a hazardous material. Laws and regulations restrict handling and disposal of sewage during repair and replacement of holding tanks and sewer pipes. Small amounts of cement, grease or solvents may be used for repairs or minor construction. These materials would be handled in accordance with relevant laws and regulations, which would minimize hazards to the public or the environment, and the potential for accidents or upsets. Therefore, hazardous waste transport and disposal would not create any significant public or environmental hazard or environmental impact.

c) As indicated in response to item VIII b), above, actions to implement the TMDL would not be associated with emission of hazardous materials or handling of significant quantities of hazardous or acutely hazardous materials, substances. Therefore, no impact from hazardous materials would occur within one-quarter mile of an existing or proposed school.

d) There are no sites located within the San Pedro Creek watershed identified on the hazardous waste and substance material sites compiled pursuant to Government Code Section 65962.5, (Cortese List). Therefore, minor construction that may be undertaken to implement the TMDL would have no impact to hazardous waste sites.

e) The TMDL does not include actions that would result in a safety hazard for people residing or working within two miles of a public airport or vicinity. There are no airports located in the vicinity of Pacifica.

f) The TMDL would not result in construction of buildings or others structures that could result in safety hazards for people residing or working near a private air strip and no impact would result because not private airstrips are located in this area.

g) Hazardous waste management activities resulting from the TMDL would not interfere with any emergency response plans or emergency evacuation plans, and no impacts would result.

h) The TMDL would not affect the potential for wildland fires. Therefore no impacts from wildfires would result.

XI. HYDROLOGY AND WATER QUALITY

Background

San Pedro Creek is a perennial stream, meaning that it flows year-round, and is the largest surface water channel within the City of Pacifica, draining approximately eight square miles of the western side of Montara Mountain and discharging into the Pacific Ocean. San Pedro Creek has five major tributaries, all of which support perennial spring-fed flows. The north, middle and south forks of San Pedro Creek extend into the upper reaches of the watershed. Two smaller tributaries, Brooks/Sanchez Creek and an unnamed tributary flowing through Shamrock Ranch, drain into the lower reaches of the main stem.

About one-fifth of the total watershed area is urbanized (the urbanized areas are within the City of Pacifica) with the remainder comprised mainly of open space and lands used for recreation. The overall imperviousness of the watershed is approximately 15 percent, and about 64 percent of the creek channel is unmodified. Direct alterations and changing hydrology from urban development have resulted in a deeply incised channel with steep banks in much of the main channel. Aside from its North Fork, which flows mainly through culverts, the other branches of San Pedro Creek generally support a vegetated riparian corridor.

Beneficial uses for San Pedro Creek and its tributaries designated in the Basin Plan include cold freshwater habitat; fish migration; fish spawning; warm freshwater habitat; wildlife habitat; non-contact and contact water recreation. San Pedro Creek provides critical habitat for a state and federally threatened species, steelhead trout, and is the only stream with a steelhead population along a 30 mile reach of the coast between the Golden Gate Bridge and Half Moon Bay.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	X
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation on- or off-site?	☐	☐	X	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	X	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	X
f) Otherwise substantially degrade water quality?	☐	☐	☐	X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	X

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	X
j) Inundation of seiche, tsunami, or mudflow?	☐	☐	☐	X

a) TMDL implementation actions listed in Table 12.1 would not result in violations of water quality standards or waste discharge requirements. The purpose of the project is to attain applicable water quality standards; therefore, it would not violate standards or waste discharge requirements.

b) The TMDL would not deplete groundwater supplies or interfere with groundwater recharge. No adverse impacts to groundwater would result.

c) Actions to comply with the TMDL would not include large scale grading, deep excavation, construction on unpaved areas, vegetation removal, or stream course alteration. They would not result in substantial erosion or siltation, either on- or off-site.

d) Compliance with the TMDL could involve minor construction and earthmoving, which could have minor effects on existing drainage patterns, particularly for conveyance of urban storm water. Actions could include construction of drainage swales or other changes to storm water systems. Projects would be described in municipal storm water permit applications that would be subject to Water Board review and/or approval; the Water Board will ensure that these projects are designed to not adversely affect upstream areas or contribute to flooding. Therefore, the TMDL would not result in significant impacts related to flooding.

e) Bacteria TMDL-related activities are, by design, intended to decrease peak runoff rates from upland land uses, as needed to reduce fine sediment inputs to channels and channel erosion. Therefore, the bacteria TMDL would not increase the rate or amount of runoff or exceed the capacity of storm water drainage systems and no adverse impacts to channels would occur.

f) Bacteria TMDL-related activities are intended to reduce bacteria in San Pedro Creek watershed and improve water quality. No adverse water quality impacts would occur.

g-j) No new housing would be constructed as a result of the TMDL and no flood hazard would be create. Actions to implement the TMDL would not affect existing flood hazard areas or otherwise impede or redirect stream flows. As indicated in item IX d), actions taken to implement the bacteria TMDL are limited to minor construction to repair and replace pipelines and install other stormwater and equestrian bacteria management features and would not create significant flooding hazards.

X. LAND USE AND PLANNING

Background

The San Pedro Creek watershed is within the City of Pacifica, which has a population of about 37,000, and is surrounded by unincorporated San Mateo County. In addition, open space land in the watershed is owned and operated and under the jurisdiction of the County Departments of Parks (San Pedro Valley County Park), State Department of Parks and Recreation (McNee Ranch State Park), and the federal Golden Gate National Recreation Area (Sweeney Ridge Park).

Urban development covers most of the San Pedro Valley floor in Pacifica and extends up onto some hillsides. The City of Pacifica General Plan was approved in 1980 and is currently in the process of being updates.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Physically divide an established community?	☐	☐	☐	X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	X	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	X

a) Implementation actions of the TMDL would include small-scale repairs and construction and would not result in physical dividing of any established community.

b) The Bacteria TMDL is consistent with existing General Plan Conservation policies and goals and would not conflict with any land use plan, policy, or regulation. Many actions to comply with TMDL requirements would be either subject to regional or local agency review and significant structures, such as detention basins or other

stormwater facilities would be subject to local agency review and therefore would not conflict with local land use plans or policies.

c) The TMDL would not conflict with any habitat conservation plan or natural community conservation plan. Projects proposed to comply with the TMDL requirements would be implemented to improve water quality and would not conflict with habitat conservation plans or natural community conservation plans.

XI. MINERAL RESOURCES

Background

Areas of San Pedro Creek watershed may be, or have been, locally mined for building. Review of State and County maps do not indicate any significant mineral reserves in the watershed.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	X

a-b) TMDL-related excavation and construction would be small in scale and would not result in loss of availability of any known mineral resources that would be of value to the region or the residents of the State. The City of Pacifica and surrounding areas do not contain areas of mineral resources of local importance.

XII. NOISE

Background

The Pacifica General Plan indicates that the primary source of surface noise in Pacifica is generated by vehicular traffic on the arterial/collector street system and on Highway 1.

No stationary noise sources have been identified, since Pacifica has no significant industrial areas where fixed noise sources are usually located. Aircraft noise is not considered a problem for Pacifica.

The City Municipal Code section 5-10.03 regulates noise and prohibits noise that is loud, disturbing, unnecessary, and unusual. Specifically, the Municipal Code limits the operation of construction to the hours between 7:00 am and 8:00 pm.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	X	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	X	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	X	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X

a) Earthmoving and construction could temporarily generate noise. Projects that local agencies propose to comply with the TMDL would be required to comply with the City of Pacifica and San Mateo County's noise and nuisance standards.

b) To comply with the TMDL, specific projects could involve minor construction and the use of some heavy equipment, including pump trucks, which could result in temporary ground-borne vibration or noise. These activities would typically last no more than a few days, and would be carried out in compliance with local standards. Therefore, the TMDL would not result in substantial noise, and noise impacts would be less-than-significant.

c) The bacteria TMDL would not cause any permanent increase in ambient noise levels. Any noise would be short-term in nature.

d) As indicated in response to XI b), above, specific projects would have to comply with local Pacifica and San Mateo County's noise standards and would not result in substantial noise impacts.

e) San Pedro Creek and Pacifica State Beach are not within two miles of an airport land use plan area. The TMDL would not result in increased population in the watershed and no impacts from airport noise exposure to residents or workers would result.

f) The San Pedro Creek watershed does not contain any private airports.

XIII. POPULATION AND HOUSING

Background

The City of Pacifica has a population of 37,200 living in about 14,000 housing units, the majority of which are single-family houses. The City, incorporated in 1957, has experienced little population growth since 1975.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	X

c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	X

a) The TMDL would not result in population growth in Pacifica. It would not induce growth through construction of new housing or businesses, or by extending roads or infrastructure.

b) The TMDL would not affect the population of the San Pedro Creek watershed. It would not displace any existing housing or any people who would need replacement housing, and no adverse housing impacts would occur.

c) The TMDL would not displace people or create a need for construction of replacement housing.

XIV. PUBLIC SERVICES

Background

The City of Pacifica is a full service city, providing police protection, recreation services, public works, and city management. Fire protection is provided by the North Coast Fire Authority. The Pacifica School District provides Kindergarten through 8th grade education at five elementary schools and one middle school. Terra Nova High School, located in Pacifica, is administered by the Jefferson Union High School District.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the Project:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	X
Police protection?	☐	☐	☐	X
Schools?	☐	☐	☐	X
Parks?	☐	☐	☐	X
Other public facilities?	☐	☐	☐	X

a) The TMDL would not affect any governmental facilities or service ratios, response times, or other performance objectives for any public services, including fire protection, police protection, schools, or parks.

XV. RECREATION

Background

Pacifica State Beach is a 0.75 mile-long crescent-shaped beach located at the mouth of the San Pedro Valley in downtown Pacifica. Pacifica State Beach is a popular surfing spots in the San Francisco area. Fishermen frequent the local beaches, and the Pacifica Pier, catching fish including striped bass and salmon. The State Beach is managed by the City of Pacifica through an operating agreement with California State Parks.

Pacifica is also a popular mountain biking destination, with many trails crossing the hillsides that surround the city, including, Pedro Mountain Road, and Sweeney Ridge, a part of the Golden Gate National Recreation Area. Pacifica is also a popular place to hike, either along the many beaches and bluffs including Mori Point, or on the hillsides including San Pedro Valley County Park, the Sanchez Adobe and Milagra Ridge. Some trails are also open to equestrians.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the Project:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	X

a) Projects to implement the TMDL could include: minor excavation and grading to repair or replace sewer pipes; and installation of additional pet waste receptacles at Pacifica State Beach and in parks and open space. However, these activities would not result in physical deterioration of park or recreational facilities. No recreational facilities would need to be constructed or expanded and no recreational impacts would occur.

b) The TMDL would not result in the need for construction or expansion of recreational facilities that could have an adverse effect on the environment. Any short-term changes would be less than significant.

XVI. TRANSPORTATION / TRAFFIC

Background

The City of Pacifica and San Pedro Creek watershed are accessible from Highway 1 and an arterial/collector street system that serves commercial, residential, and open space areas within the watershed. The main traffic concerns in the area are Highway 1 safety, and parking for recreational areas, mainly Pacifica State Beach.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	X
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	X
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	X	☐
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	X
e) Result in inadequate emergency access?	☐	☐	☐	X
f) Result in inadequate parking capacity?	☐	☐	☐	X
g) Conflict with adopted policies, plans, or programs supporting alternative				

transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	X

a) Actions to implement the TMDL could result in minor construction requiring the use of heavy equipment to repair sewer pipelines, construct stormwater facilities, and to install fencing. Any increase in traffic would be temporary and would be limited to local areas and would not create substantial traffic in relation to the existing load and capacity of existing street systems.

b) Because the TMDL would not increase population or provide employment, it would not generate any ongoing motor vehicle trips and would not affect level of service standards established by the county congestion management agency. Therefore, the TMDL would not result in permanent, substantial increases in traffic above existing conditions. Impacts would be less than significant.

c) The TMDL would not affect air traffic and no impacts are anticipated.

d) The TMDL does not include provisions for construction of new roads. No new hazards due to the design or engineering of the road network in the San Pedro watershed would occur.

e) The TMDL would not result in changes to roads used for emergency access. Therefore, the project would not result in inadequate emergency access.

f) Because the TMDL would not increase population or provide employment, it would not affect parking demand or supply.

g) Because the TMDL would not generate ongoing motor vehicle trips, it would not conflict with adopted policies, plans, or programs supporting alternative transportation.

XVII. UTILITIES AND SERVICE SYSTEMS

Background

The City of Pacifica is within the jurisdiction of the San Francisco Bay Regional Water Quality Control Board, lead agency for this TMDL. The Water Board regulates waste water and storm water quality. The City of Pacifica is currently implementing a sewer lateral replacement ordinance and provides grants to property owners as an incentive to repair private sewer laterals. Solid waste collection, recycling, and waste disposal are provided by Recology of the Coast.

Discussion of Impacts

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	X	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	X	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	X
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	X
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	X
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	X

a) The project would amend the Basin Plan, which is the basis for wastewater treatment requirements to improve water quality and the environment in the Bay Area; therefore, the TMDL would be consistent with such requirements.

b) The TMDL includes changes to local wastewater collection and conveyance systems but does not require construction of any new wastewater treatment facilities.

c) TMDL implementation actions could result in improvements to urban storm water runoff systems designed to reduce bacteria discharges to San Pedro Creek and the Pacific Ocean. These facilities are likely to include small stormwater detention ponds, holding tanks, or treatment wetlands. It is likely that stormwater facilities would be constructed at the bottom of the collection system, in the low-lying areas near Highway 1. The need, location and specification for such facilities has not been determined, it is not possible to evaluate specific impact at this time. Future projects to improve stormwater quality would be subject to environmental analysis by the City of Pacifica regulations and environmental analysis process and would be reviewed by state, local, and federal resources agencies, including the Regional Water Board.

d) Because the TMDL would not increase population or provide employment, it would not require ongoing additional water supply or entitlements.

e) Because the TMDL addresses a pollution problem linked to the wastewater conveyance system, not the treatment plants themselves, compliance would not require any increased wastewater treatment capacity or construction.

f) TMDL implementation would not substantially affect municipal solid waste generation or landfill capacities. No impacts would occur.

g) TMDL implementation would not substantially affect municipal solid waste generation or landfill capacities and no impacts would occur.

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	X
b) Does the project have impacts that are individually limited, but cumulative considerable? ("Cumulative				

considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	X
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	X

a) Taken as a whole, the TMDL would not degrade the quality of the environment. The proposed TMDL is intended to benefit water quality and the future of recreational uses in San Pedro Creek and at Pacifica State Beach.

b) As discussed above, the TMDL could pose some less-than-significant adverse environmental impacts related to minor sewage system repair, replacement, and re-construction, and other small construction projects, such as stormwater retention facilities. These impacts from repair and construction activities would be individually limited and of short-term duration. Therefore, these future projects would not lead to cumulatively considerable significant impacts.

c) The TMDL would not cause any substantial adverse effects to human beings, either directly or indirectly. The TMDL is intended to benefit human beings through implementation of actions to improve water quality in San Pedro Creek and at Pacifica State Beach.

12.1.6 Cumulative Impact Analysis

This section provides an analysis of the significant cumulative impacts of the proposed basin plan amendment (CEQA Guidelines § 15130). Cumulative impacts refers to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."

The cumulative impact that results from several closely related projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present and reasonably foreseeable probable future projects, in this case the impacts from other municipal and private projects to reduce bacteria, which would occur in the San Pedro Creek watershed during the period of implementation.

As noted above, the TMDL would not result in significant adverse impacts to the environment and no cumulative impacts are anticipated. This analysis considers past, present, and reasonably foreseeable future projects that could have similar environmental impacts, to determine that no significant cumulative impacts would occur. These include projects that would involve reduction of animal waste in creeks at horse facilities or substantial changes to urban stormwater infrastructure. This cumulative analysis

considers projects located in the San Pedro Creek watershed covered by the proposed Basin Plan amendment.

Projects implemented to comply with Regional Water Board Cease and Desist Order for Pacifica's Wastewater Discharges and the Cleanup and Abatement Order for Millwood Ranch (described in the Project Description, above) would have a beneficial cumulative effect on the TMDL. Other future Water Board regulations or enforcement actions, to be prepared and adopted by the Water Board, would improve overall water quality in the San Pedro Creek watershed and could include implementation actions that would further reduce bacteria in San Pedro Creek and at Pacifica State Beach.

The cumulative impact of the TMDL with these other projects would be beneficial to the environment and would not result in significant adverse environmental impacts. Our review of other planned, proposed, and ongoing projects reveals none that would lead to significant environmental impacts.

12.2 Alternatives Analysis

This section presents three Program Alternatives that encompass actions within the jurisdiction of the Water Board and implementing parties. An evaluation of the alternatives is required under CEQA Section 15252 (a)(2)(A) in order to avoid or reduce any significant or potentially significant effects on the environment.

The program alternatives that we have considered are:

1. The bacteria TMDL as it is proposed for Water Board adoption;
2. A bacteria TMDL that strictly applies Basin Plan WQOs; and,
3. A "No TMDL" alternative in which a bacteria TMDL is not implemented.

Because a TMDL is required by Section 303(d) of the Clean Water Act, the "No TMDL" alternative is only analyzed to allow decision makers to compare the impacts of approving a proposed alternative and its components compared with the impacts of not approving a proposed alternative. The specifics of the many projects which would make up a program alternative are discussed in detail in Section 10 (summarized in Table 12.1) and include structural and nonstructural bacteria control measures that are reasonably foreseeable to be implemented under the bacteria TMDL program alternatives.

The components assessed at a program-level generally are program elements that would be implemented as part of the bacteria TMDL, but these elements do not have specific locations or design details identified. The components assessed at a project-level have specific locations which will be determined by implementing parties. The project-level components will be subject to additional future environmental analysis, including review by cities and municipalities implementing bacteria control projects.

12.2.1 Alternative 1-Water Board TMDL As Proposed

This program alternative is based on the TMDL that is presently proposed for Water Board consideration. The TMDL assigns both wasteload allocations (WLAs) and load allocations (LAs). The WLAs focus on reductions in bacteria discharges from stormwater runoff and dry-weather flows and will be implemented through Municipal Regional

Stormwater NPDES Permit. The TMDL LAs focus on reductions of bacteria from sanitary sewer systems and horse facilities. The LAs will be implemented primarily through Waste Discharge Requirements, ongoing enforcement actions, and local regulations.

The Water Board TMDL provides a plan for addressing the adverse impacts of bacteria through a phased reduction in bacteria contamination in the San Pedro Creek and at Pacifica State Beach. The plan uses the reference system approach and allows a certain number of exceedances of the single-samples objectives to account for indicator bacteria contributions from background sources such as wildlife, soil, sediment, and vegetation. The reference system approach ensures that bacteriological water quality is at least as good as that of a reference system and that no degradation of existing bacteriological water quality is permitted where existing bacteriological water quality is better than that of the selected reference system(s). This approach is consistent with the State Antidegradation Policy (State Water Board Resolution No. 68-16) and with federal antidegradation requirements (40 CFR 131.12). The plan also distinguishes between the dry- and wet-weather bacterial exceedances. The TMDL proposes an eight-year schedule for compliance with allowable exceedances at the beach, and a twelve-year schedule for compliance with allowable exceedances in the San Pedro Creek. Once adopted into the Basin Plan, WLAs and LAs will be considered when developing permit limits and other regulatory mechanisms that are adopted in separate actions by the Water Board.

Although the Water Board cannot mandate the manner of compliance, foreseeable environmental impacts from methods of compliance are well known. During the development of the TMDL, a CEQA scoping meeting was held during which the manner of compliance was discussed and reasonably foreseeable means of compliance were examined.

This TMDL program alternative anticipates compliance through implementation of control measures as discussed in Section 10and summarized in Table 12.1. Potential adverse impacts to the environment stem principally from the installation, operation, and maintenance of these control measures. This document analyzes these impacts and concludes that installation of implementation projects are of relatively short duration and typical of "baseline" construction and maintenance projects that occur presently in the TMDL area. It also concludes that the TMDL would not result in significant adverse impacts to the environment and no cumulative impacts are anticipated.

12.2.2 Alternative 2-A TMDL with Strict Application of Basin Plan WQOs

This program alternative is based on a TMDL that would strictly apply existing Basin Plan bacteriological WQOs for recreational uses. In other words, unlike alternative 1, this alternative would not allow any exceedances of bacteriological WQOs to account for indicator bacteria contributions from background sources such as wildlife, soil, sediment, and vegetation.

Because of background or natural inputs, it is very likely that San Pedro Creek and Pacifica State Beach would experience exceedances of bacteriological WQOs in the absence of any anthropogenic sources. In this alternative, the exceedances of

bacteriological WQOs due to background sources could be addressed by treating or diverting the Creek flow or treating background sources of bacteria from undeveloped areas. While such measures could address the impairment of the recreational beneficial use, they likely would cause more environmental impacts than not doing so, because they are likely to adversely affect important aquatic life and wildlife beneficial uses in the San Pedro Creek catchment.

This alternative would also result in additional costs due to implementation of control measures needed to avoid exceedances of bacteriological WQOs caused by background sources. These additional costs would likely take resources away from implementation of control measures to address anthropogenic contributions to exceedances of WQOs.

12.2.3 Alternative 3-No TMDL

This program alternative assumes that the Water Board would not implement a bacteria TMDL. While responsible parties could implement bacteria control measures on a discretionary basis, this CEQA analysis is based on the assumption that no additional bacterial control measures would be implemented in addition to those that are presently in place. However, the No TMDL alternative is contrary to state and federal laws. Therefore, the failure to implement a bacteria TMDL is unlawful.

In addition, while impact to the environment from construction or maintenance of structural BMPs would be avoided in this No TMDL alternative, this alternative would not restore beneficial uses in San Pedro Creek and at Pacifica State Beach. TMDL program alternative 1 or 2 will restore water quality to meet beneficial uses in San Pedro Creek and at Pacifica State Beach. As such, both program alternatives 1 and 2 represent a benefit to the environment and the No TMDL program alternative represents a continued bacteria impairment of the environment.

12.2.4 Recommended Program Alternative

This environmental analysis finds that Program Alternative 1 is the most environmentally advantageous alternative.

Alternative 3 is not a feasible alternative. While it avoids potential impacts due to discrete implementation projects, bacterial impairment of San Pedro Creek and Pacific Ocean waters adjacent to Pacifica State Beach will continue. Both program alternatives 1 and 2 will comply with the law and remove the bacterial impairment in San Pedro Creek and at Pacifica State Beach.

The key difference between program alternatives 1 and 2 is the application of existing bacteriological WQOs and the resultant difference in the magnitude and type of bacteria control measures needed to achieve those WQOs. Alternative 1 would allow some exceedances of bacteriological WQOs based on those observed at a reference catchment with very little human impact. Alternative 2, in contrast, will require strict compliance with the bacteriological WQOs. The environmental impacts due to alternative 2 would be of greater severity as the magnitude of implementation actions will be greater to strictly comply with the bacteriological WQOs. In addition, alternative 1 would result in more efficient use of funds and lower overall costs.

12.3 Economic Considerations

The objective of this analysis is to estimate the costs of various implementation measures for bacteria reduction in the San Pedro Creek watershed. The implementation plan calls for reductions in the discharge of bacteria from sanitary sewer systems, horse facilities, and stormwater runoff and dry weather flows. In the implementation Section, staff describes existing plans and policies as well as possible implementation measures that may be used to control each potential bacteria source.

Our discussion of economic considerations or costs associated with various measures described in the implementation Section is limited to those actions that are currently technically feasible and likely, in our view, to be implemented by dischargers. The TMDL is not prescriptive; no specific actions to achieve the numeric targets are required. Rather dischargers are allowed to independently select implementation actions that will allow them to meet their allocations, based on their own considerations of need, budget, feasibility, or other criteria.

This section provides cost estimates for each reasonably foreseeable TMDL implementation measure. In most cases, specific elements of the implementation action will be determined at some point in the future, and therefore the specifics are unknown. In other cases, where it is possible to make educated guesses about the likely elements of an implementation action, cost estimates are included. In instances where estimating the elements of a program would be decidedly speculative, no cost estimates are developed. Costs of implementing existing requirements are also not included in this report.

In reviewing the cost estimates, it should be noted that there are multiple additional benefits associated with the implementation of these strategies. For example, many of the structural and non-structural BMPs to address bacteria loading could also reduce the loading of other contaminants, which could assist in protecting other beneficial uses of San Pedro Creek and Pacifica State Beach.

12.3.1 Sanitary Sewer Systems

As described in the implementation section (Section 10), we think that Pacifica's and private home and business owners' compliance with the existing permits, ordinances, and cease-and-desist order (CDO) requirements will appropriately minimize sanitary sewer discharges sufficient to address their contribution to the identified bacterial impairment. Therefore, this TMDL does not include additional measures to address these discharges.

The above programs and enforcement actions for reducing sanitary sewer discharges are being implemented independent of this proposed Basin Plan amendment. The Basin Plan amendment would not impose any new requirements or actions for sanitary sewer systems; therefore, no additional costs to sanitary sewer collection agency and Pacifica's home and business owners would be incurred as result of this Basin Plan amendment.

12.3.2 Horse Facilities

The San Pedro Creek watershed contains 3 horse facilities. The proposed Basin Plan amendment relies in part on the implementation of the requirements contained in the

existing ordinances, regulations, and an enforcement action to address bacteria discharges from this source category. Since these requirements are being implemented independent of this proposed Basin Plan amendment, their cost is not included in this report.

The proposed Basin Plan amendment, however, does require that these facilities obtain coverage under a reissued Waste Discharge Requirements Order for Confined Animal Facilities (CAFs Order). The reissued CAFs Order is likely to require implementation of certain management measures to prevent bacteria discharges from horse facilities. These management measures include maintenance activities such as increased collection, composting, and hauling of manure. Other physical improvements can vary and may include construction of covered manure areas; berms; fencing, and planting of vegetative buffers. Many of the typical management measures are likely being implemented by the horse facilities. The hauling costs for individual sites vary depending upon the size of the facility, manure storage methods, and hauling distance to a manure facility. Based on a recent survey of 30 horse farms in Marin County, the manure management costs averaged $6,600 per ranch (Nicolson and Murphy 2004). The physical improvement costs were estimated to average from $15,000 to $25,000 per facility in a previous bacteria TMDL developed for the Tomales Bay watershed (Water Board 2005). As a low-range cost estimate, we assumed all facilities would pay $6,600 for manure management per year and $15,000 for one-time physical improvements. As a high-range cost estimate, we assumed that all facilities would pay $6,600 for manure management per year and $25,000 for one-time physical improvements. Table 11-2 summarizes these cost estimates.

Table 12.2. Estimated Implementation Cost for Horse Facilities

	One-Time Cost		Annual Cost
	Low	High	
Implementation Measure Cost	$15,000	$25,000	$6,600
Number of Facilities	3	3	3
Total Cost	$45,000	$75,000	$19,800

12.3.3 Stormwater Runoff and Dry Weather Flows

The cost estimate for this source category attempts to account for a range of economic factors and requires a number of assumptions regarding the extent and cost of implementing many of the control measures. This section describes how the costs were derived for various implementation measures and provides a summary of costs for each measure. In many cases, cost estimates for previous bacteria TMDLs within the State, such as the Santa Clara River Estuary Bacteria TMDL (LARWQCB 2010), are extrapolated to the San Pedro Creek watershed. While land use data and other conditions were specific to the San Pedro Creek watershed, some of the unit costs and other assumptions were pulled from previous bacteria TMDLs.

12.3.3.1 Non-Structural BMPs

The costs for a number of non-structural source control measures have been estimated for the entire Los Angeles Region (Devinny et al. 2004), which has an area of 3,100 square

miles. The source control measure costs for the San Pedro Creek watershed were scaled down proportionally. The San Pedro Creek watershed is approximately 8.2 square miles. The watershed is 33% developed, resulting in 2.7 square miles of developed area that could need to be treated to comply with the TMDL. The following represent the approximate values for the San Pedro Creek watershed for source control measures:

- Enforcement of litter and pet waste ordinances - $8,000 per year
- Improved Public education - $4,500 per year
- Increased storm drain cleaning - $24,000 per year
- Illicit discharge detection and elimination – $70,000

Summary: Annual Costs: $106,500 per year

12.3.3.2 Structural BMPs

In the implementation section of this report (section 10), structural BMPs were discussed in terms of regional and sub-regional BMPs. Regional and sub-regional BMPs are very similar except that they differ in scope and scale (e.g., regional infiltration systems vs. local infiltration systems). Therefore, for the purposes of the cost analysis, costs are estimated for general BMP types, which could be scaled up or down depending on if sub-regional or regional BMPs were implemented. In all cases, land acquisition costs were excluded from the cost estimate.

Local Capture Systems

Cisterns are a common type of local capture system. To estimate costs of cisterns, it is assumed that cisterns will be installed only at 20% of the developed portion of the watershed (e.g., at schools, public facilities, etc.) resulting in an area of 0.54 square miles treated with cisterns.

In the Santa Clara River Estuary Bacteria TMDL, it was estimated that it would take up to 11,126 cisterns to treat 20% of the urbanized portion of the Santa Clara River watershed or 19.2 square miles. Scaling this to the San Pedro Creek watershed, up to 313 cisterns could be installed in the Watershed to manage the flow from 20% of the urbanized portion of the Watershed. Assuming a unit cost of $1/gallon and a cistern size of 10,000 gallons, the total cost would be $3,130,000.

Operation and maintenance costs for cisterns are based on the amount of water captured and pumped by each cistern. Based on the Santa Clara River Estuary Bacteria TMDL estimate of $300,000 for operation and maintenance of 11,126 cisterns, the total operation and maintenance cost for the 313 cisterns for the San Pedro Creek Watershed is estimated at $8,500 per year.

Summary:

- Capital costs – $3,130,000
- Operation and Maintenance Costs - $8,500 per year

Vegetated Treatment Systems

Bioretention cells, including curb planters (curb extensions) and infiltration planters, are a typical vegetated treatment system. Based on staff's review of case studies completed in Portland, Oregon in the early to mid-2000s, the cost of installing bioretention cells to treat stormwater runoff is estimated at about $12.50 to $125 per square foot of bioretention cell constructed, or about $2 to $5.50 per square foot, or $71,000 to $203,000 per acre, of impervious area treated (adjusted to 2012 dollars) (Portland Bureau of Environmental Services 2012).

The Alameda Countywide Clean Water Program (ACCWP) estimates that bioretention areas should be sized at about 4% of the contributing impervious area, or 1,740 square feet of bioretention per acre of impervious surface treated (ACCWP 2012). The 2003 CASQA BMP Handbook for New Development and Redevelopment estimates bioretention costs at about $3.80 to $5 per square foot for residential and as much as $10-40 per square foot of bioretention cell constructed for commercial and industrial land use (adjusted to 2012 dollars). After adjusting for inflation, in 2012 dollars, the bioretention cost is about $6,500 to $8,800 per acre of impervious surface treated in residential areas, or about $12,600 to $88,000 in certain industrial and commercial settings. The cost for retrofitting a site is typically more because of the need to remove existing asphalt, concrete, paving, drainage structures. For new construction, however, there may be cost savings due to avoiding or reducing construction of traditional underground storm drain infrastructure.

The City of Pacifica reported its costs for two vegetated treatment system projects: a bioswale and a tree filter box, completed within the last few years, as $24,825 and $24,475, respectively. However, information that would allow us to better understand the costs, such as contributing catchment size and BMP area, was not provided. As a result, we were unable to include them in the unit cost estimates above.

Media Filtration

The construction cost of a sand/organic filter system depends on the drainage areas, expected efficiency, and other design parameters. Case studies conducted in 1997 indicate cost ranges from $6,600 to $11,000 to treat a drainage area of 5 acres or less (LARWQCB 2010). Assuming that 20% of the urbanized portion of the watershed will be treated with sand filters designed for a 5-acre drainage area and a unit construction price of $11,000 dollars, the estimated construction cost of sand/organic filters for 20% of the urbanized portion of the San Pedro Creek watershed would be $760,000 dollars. Annual maintenance costs average approximately 5% of construction costs or $38,000 dollars.

Summary

- Capital Costs - $760,000
- Operation and Maintenance Costs - $38,000 per year

Diversion and/or Treatment

The Santa Clara Estuary River Bacteria TMDL estimated the annualized capital cost to construct 10 low-flow storm drain diversions at $717,386, assuming financing for 20 years at 7 percent (LARWQCB 2010). It also estimated the operation and maintenance costs for 27 existing diversions at $1.7 million. The number of low-flow diversions necessary to attain the TMDL allocations in the San Pedro Creek watershed is unknown at this point. However, from above numbers, we can estimate the annualized capital and operation and maintenance costs for a single low-flow diversion as follows:

- Annualized Capital Costs - $72,000
- Operation and Maintenance Costs - $63,000 per year

Costs of Monitoring

The costs of monitoring are based on the additional receiving water body monitoring requirements proposed in this TMDL. The specifics of this monitoring, such as the exact number of monitoring stations and sampling frequency, have not yet been determined. For the purpose of a cost estimate, it is assumed that in addition to the existing water quality monitoring conducted at Pacifica State Beach (including at the mouth of San Pedro Creek), 5 different reaches of San Pedro Creek will also be monitored. Based on the prices for bacteriological analyses provided by a local laboratory, the cost per sample for analyzing *E.coli* and fecal coliform is $50. Assuming a monitoring frequency of 5 times a month for each monitoring site, twice a year, the annual cost for additional monitoring in the Creek is estimated at $2,740 to $8,250 as shown in Table 12.3 below.

Table 12.3 Water Quality Monitoring Cost Estimate

Activity	Unit Cost	Cost
Collecting and transporting samples by lab personnel [(1)]	$450	$450
Reviewing lab reports by City/County staff	$0	$0
Interacting with lab by City/County Staff	$0	$0
Laboratory Analysis	$50/sample [(2)]	$250
Basic reporting of data by lab [(3)]	$0	$0
Analyzing of data by City/County staff	$0	$0
Analyzing, interpretation, and certified reporting of results by lab	$125	$125
Millage for sample transportation by City/County staff	$0.6/mile	$24
Total Cost Range For Five Samples (One Sampling Event):		$274[(4)] to $825[(5)]
Total Cost Range For Ten Sampling Events (5 samples each):		$2,740[(4)] to $8,250[(5)]

1. Sample collection, transport, and all supplies are included as one lump sum cost if they were to be completed by the laboratory.
2. This is the combined cost for both *E.coli* and fecal coliform analyses which is expected to be sufficient for the proposed monitoring. The lab will provide an additional 15% discount on this price on the 11th sample and beyond, submitted over any period of time. In other words, after the 10th sample is submitted to the lab, the price of analysis will drop to $42.50 per sample.
3. Basic reporting of results is included in the sample analysis cost and is expected to be sufficient for the purposes of the proposed monitoring.
4. Estimated cost if sample collection and transportation, and data analysis is conducted by the City Staff
5. Estimated cost if samples collection and transportation and data analysis and certified reporting is conducted by the lab personnel.

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