California Regional Water Quality Control Board
Central Coast Region

Total Maximum Daily Loads for Fecal Coliform in Soquel Lagoon, Soquel Creek, and Noble Gulch, Santa Cruz County, California

Final Project Report
For the May 8, 2009 Water Board Meeting

Item No. 18 Attachment No. 2
May 8, 2009 Meeting
TMDLs for Pathogens –
Soquel Lagoon Watershed

Adopted by the
California Regional Water Quality Control Board
Central Coast Region
on _____, 200x

Approved by the
State Water Resources Control Board
on _____, 200x
and the
Office of Administrative Law
on _____,200x
and the
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on _____. 200x

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To request copies of the Basin Plan Amendment and Total Maximum Daily Loads for Fecal coliform in Soquel Lagoon, Soquel Creek, and Noble Gulch, please contact Christopher Rose at (805) 592-4770, or by email at crose@waterboards.ca.gov.
Documents also are available at: http://www.waterboards.ca.gov/centralcoast/TMDL/index.htm

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1. PROJECT DEFINITION

1.1. Introduction

Soquel Lagoon was identified as impaired for pathogens and was placed on the 1996 Clean Water Act 303(d) list of impaired waters. Based on historic and recent data, concentrations exceeded the water quality objectives for fecal coliform. Staff proposed allocations and implementation actions for identified controllable sources in Soquel Lagoon.

Soquel Creek and Noble Gulch are located in the Soquel Lagoon Watershed and were not listed on the Clean Water Act section 303(d) list of impaired waters for pathogens. The Central Coast Water Board found that Soquel Creek and Noble Gulch were impaired for fecal coliform. Therefore, staff also proposed allocations and implementation actions for identified controllable sources in Soquel Creek and Noble Gulch.

The California Regional Water Quality Control Board, Central Coast Region (Water Board) staff is proposing to remove the shellfish harvesting beneficial use in the Soquel Lagoon as part of this project. Supporting documentation is included in the Use Attainability Analysis contained in Appendix-D.

Clean Water Act Section 303(d) requires the State to establish TMDLs at levels that attain water quality objectives. The State must also incorporate seasonal variations and a margin of safety into TMDLs to account for any lack of knowledge concerning the relationship between load limits and water quality.

1.2. Listing Basis

According to the USEPA Protocol for Developing Pathogen TMDLs, "the numbers of pathogenic organisms present in polluted waters generally are few and difficult to isolate and identify, as well as highly varied in their characteristic and type (United States Environmental Protection Agency, *Protocol for Developing Pathogen TMDLs*, January 2001)." Therefore, scientists and public health officials typically choose to monitor nonpathogenic bacteria that are usually associated with pathogens transmitted by fecal contamination but are more easily sampled and measured. These associated bacteria are called indicator organisms, or fecal indicator bacteria (FIB). Indicator organisms indicate the potential presence of human and animal pathogenic organisms. When large fecal coliform populations are present in the water, it is assumed that there is a greater likelihood that pathogens are present. The Basin Plan uses fecal coliform concentrations as water quality objectives to represent pathogenic organisms.

Soquel Lagoon was placed on the 303(d) list of impaired waters in 1996. The Soquel Lagoon was placed on the list of impaired waters based on fecal indicator bacteria data

from the Santa Cruz County Environmental Health Department; the data had exceedances of water quality objectives in all years for which there was data (1986 to 1994). Additional data collected between 1994 and 2005 also had exceedances of water quality objectives.

1.3. Beneficial Uses

The Basin Plan describes beneficial uses for water bodies in the Central Coast Region. The Soquel Lagoon beneficial uses are:

- Contact and Non-contact Recreation,
- Wildlife Habitat,
- Cold Freshwater Habitat,
- Migration of Aquatic Organisms,
- Spawning, Reproduction and/or Early Development,
- Rare, Threatened or Endangered Species,
- Estuarine Habitat,
- Commercial and Sport Fishing, and
- Shellfish Harvesting.

Central Coast Water Board staff is proposing to remove the shellfish harvesting beneficial use in the Soquel Lagoon. This is primarily based on the fact that staff found no evidence of the shellfish harvesting beneficial use in the Soquel Lagoon (Lagoon), nor the potential to support such a use. Hydraulic modifications, seasonal Lagoon closure to tidal circulation, lack of suitable physical conditions and lack of evidence of any historic (since 1975) or current shellfish harvesting have led Central Coast Water Board staff to propose removal of the shellfish harvesting beneficial use in the Lagoon. Appendix-D, "Use Attainability Analysis for the Soquel Lagoon," provides the basis for staff's proposal.

1.4. Water Quality Objectives

The Basin Plan states, "*controllable* water quality shall conform to the water quality objectives contained herein. When other conditions cause degradation of water quality beyond the levels or limits established as water quality objectives, controllable conditions shall not cause further degradation of water quality" (emphasis added). This requirement applies to all waters of the State.

The Basin Plan contains specific water quality objectives for fecal coliform (Basin Plan, pg. III-10); the applicable objectives are listed in the following subsections and apply to all the waterbodies that are part of this project.

Escherichia coli (*E. coli*) are often used as fecal indicator bacteria. The Basin Plan does not include water quality objectives for *E. coli*. However, the United States Environmental Protection Agency (USEPA) recommends *E. coli* not exceed a log mean

of 126 CFU per 100 mL, based on not less than generally 5 samples equally spaced over a 30-day period (USEPA, *Ambient Water Quality Criteria for Bacteria-1986*, January 1986).

1.4.1. Water Contact Recreation

The following water quality objective protects the water contact beneficial use:

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL.[1] All the waterbodies assigned allocations in this project are designated this beneficial use.

1.4.2. Non-Contact Water Recreation

The following water quality objective protects the non-contact water beneficial use:

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 2000 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000 MPN per 100 mL.

1.4.3 Shellfish Harvesting

The following water quality objective protects the shellfish harvesting beneficial use. However, please note that staff is proposing to remove the shellfish harvesting beneficial use (from the Soquel Lagoon) as part of this project. If this beneficial use is removed, then the following water quality objective will not apply.

At all areas where shellfish may be harvested for human consumption, the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70 per 100 mL, nor shall more than 10 percent of the samples collected during any 30-day period exceed 230 per 100 mL for a five tube decimal dilution test or 330 per 100 mL when a three-tube decimal dilution test its used. The Central Coast Water Board is proposing to remove the shellfish harvesting beneficial use; therefore, these objectives will not apply if the proposal is approved.

[1] Throughout this report, fecal coliform units are expressed as colony forming unit (CFU), organisms, count (#/100ml or CFU/100 ml) and most probable number (MPN). All unit expressions are considered equivalent fecal coliform bacteria concentration measures (Reference: Protocol for Developing Pathogen TMDLs).

1.4.4 Other Applicable Beneficial Uses

The Basin Plan does not include explicit numeric objectives for fecal coliform for the protection of other surface water beneficial uses.

1.5. Waste Discharge Prohibition

In 2004, the State Water Resources Control Board (State Board) adopted the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program,* May 20, 2004 (Nonpoint Source Implementation Policy). The Nonpoint Source Implementation Policy requires the Central Coast Water Board to regulate all nonpoint sources (NPS) of pollution using the administrative permitting authorities provided by the Porter-Cologne Water Quality Control Act. Administrative permitting authorities include waste discharge requirements (WDRs), waivers of WDRs, and Basin Plan prohibitions. Responsible parties are to participate in the development and implementation of NPS Pollution Control Implementation Programs designed around their type of nonpoint source discharge.

Staff is proposing to address specific types of nonpoint sources of pollution in the Soquel Lagoon Watershed by adding the watershed as a named area subject to two proposed nonpoint source pollution prohibitions: (1) the Human Fecal Material Discharge Prohibition and (2) the Domestic Animal Waste Discharge Prohibition. These two prohibitions were adopted as amendments to the Basin Plan with the TMDLs for the Pajaro River Watershed at the March 20, 2009 Board Meeting (see Resolution No. R3-2009-0008).

2. WATERSHED DESCRIPTION

2.1. Location, Climate, and Hydrology

Soquel Creek flows from its headwaters in the Santa Cruz Mountains toward the city of Capitola and drains into the Pacific Ocean. The Soquel Lagoon (the Lagoon) is formed in Soquel Creek's southernmost reach within the City of Capitola. According to the U.S. Census Bureau, the City of Capitola population in the year 2004 was approximately 9,640.

The Soquel Lagoon Watershed (Watershed) is approximately 42 square miles and is made up of several subwatersheds, including: Soquel Lagoon, Soquel Creek, Bates Creek and Noble Gulch (see Figure 2-1). The largest of the three, the Soquel Creek subwatershed, drains approximately 38 square miles.

Two waterbodies, Noble Gulch (the Gulch) and Bates Creek, drain into the downstream most, and most urbanized, two miles of Soquel Creek. Noble Gulch is piped underground for the last 0.4 mile prior to draining into the Lagoon from the northeast. Bates Creek drains into Soquel Creek from the northeast approximately two miles north of the mouth of the Lagoon. Several other creeks flow into Soquel Creek in the upper Soquel Watershed (Figure 2-1).

Capitola Public Works Department constructs a sandbar across the mouth of the Lagoon each year in May and monitors breaching in the winter to avoid flooding. The Lagoon's northernmost boundary is loosely defined as "somewhere between the Railroad Trestle and Nob Hill," based on the observance of "the saltwater prism, which during high tide can extend as far upstream as Nob Hill" (personal communication, Steve Peters, Water Quality Specialist, Health Services Agency, County of Santa Cruz, March 9, 2006). Nob Hill is a market located adjacent to the Lagoon approximately 0.7 miles north of the mouth of the Lagoon. Figure 2-2 illustrates the approximate location of the Lagoon in relation to other land references.

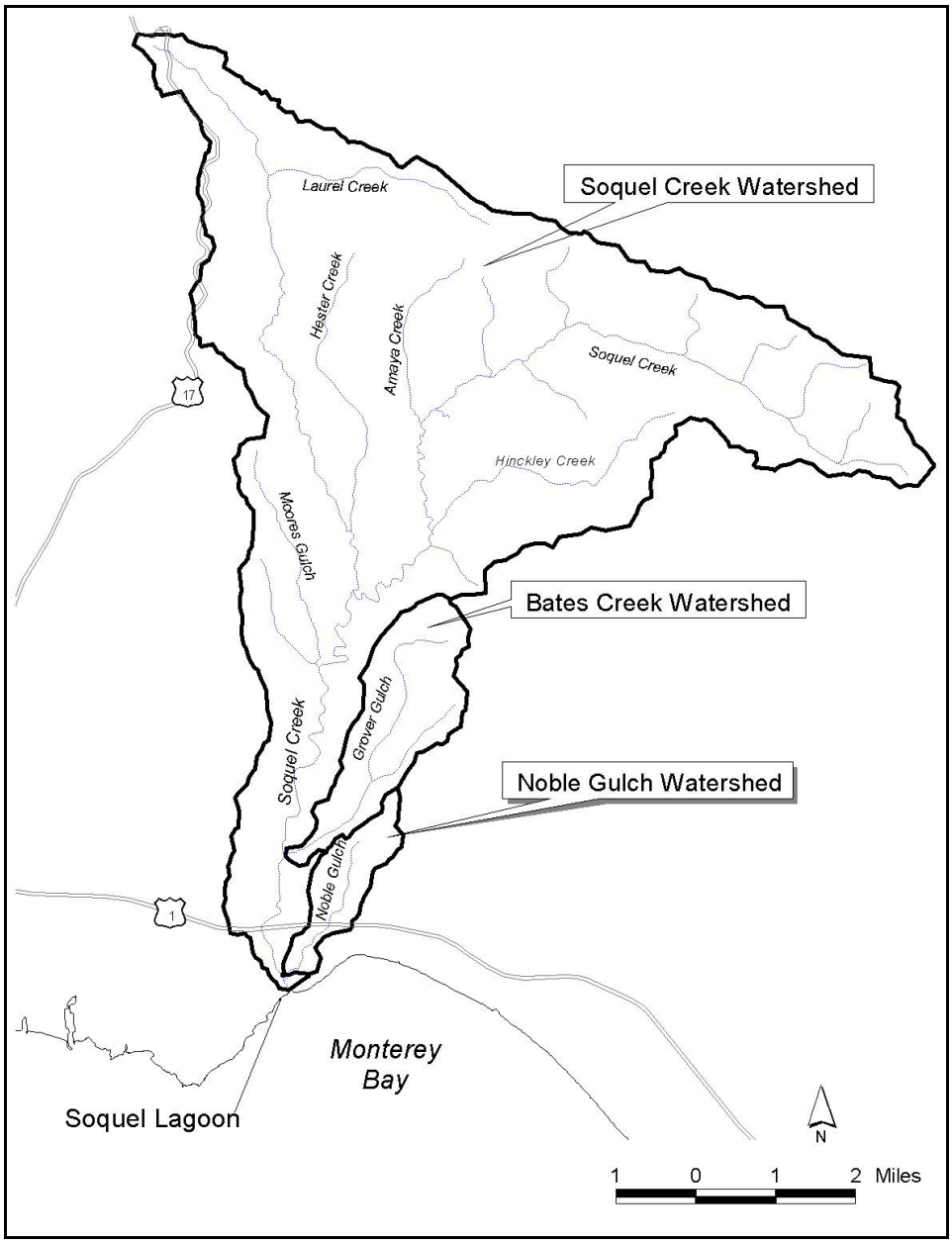

Figure 2-1. Waterbodies within the Soquel Watershed

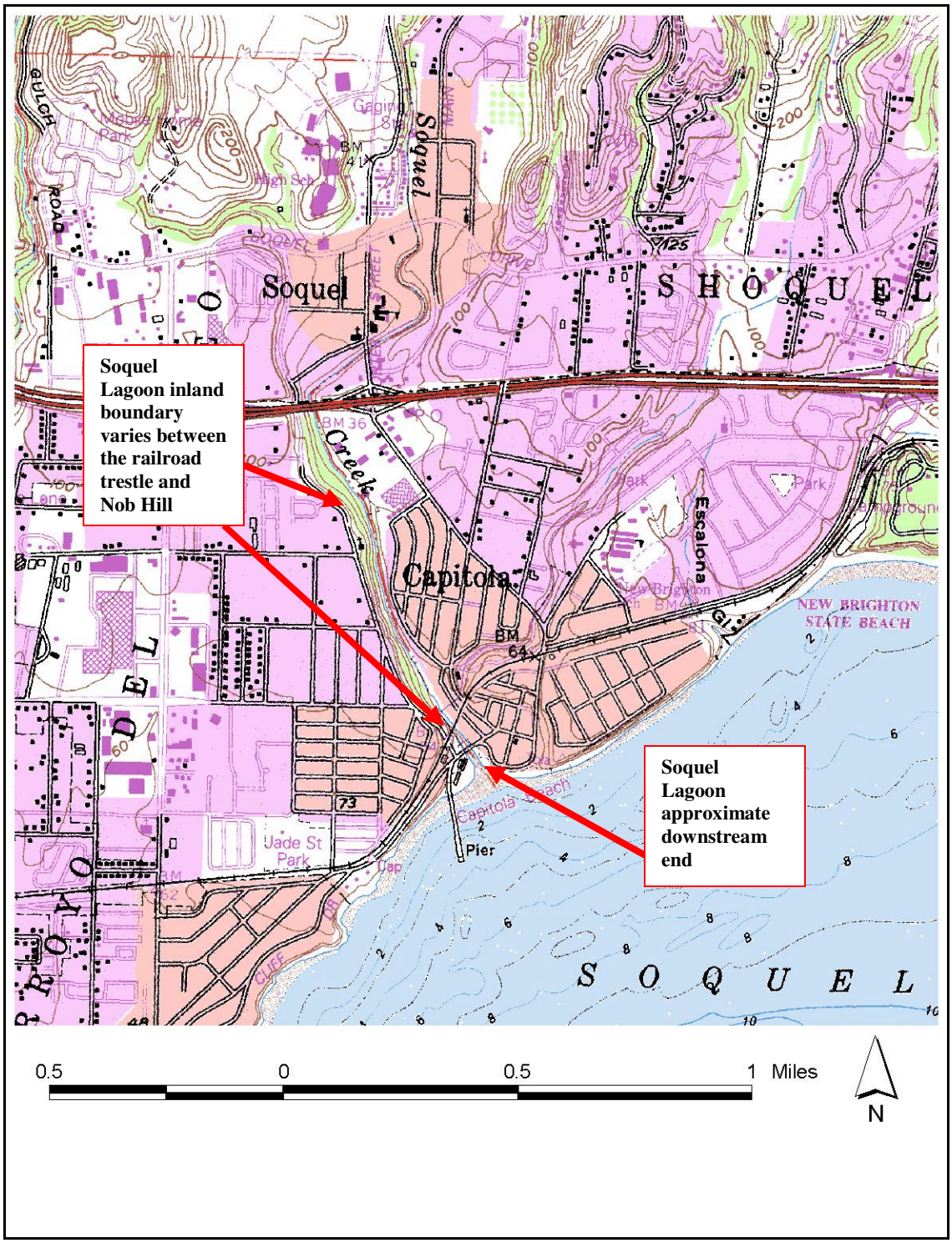

Figure 2-2. Soquel Lagoon Boundaries

The Watershed has a Mediterranean climate. Summers are warm and dry, cooled at times by fog at lower elevations due to the proximity of the Pacific Ocean. Winters are cool and wet. Average annual precipitation from October 1996 thorough April 2006 was approximately 21.80 inches at the City of Capitola (Figure 2-3). The wettest time of the year was generally from December to April.

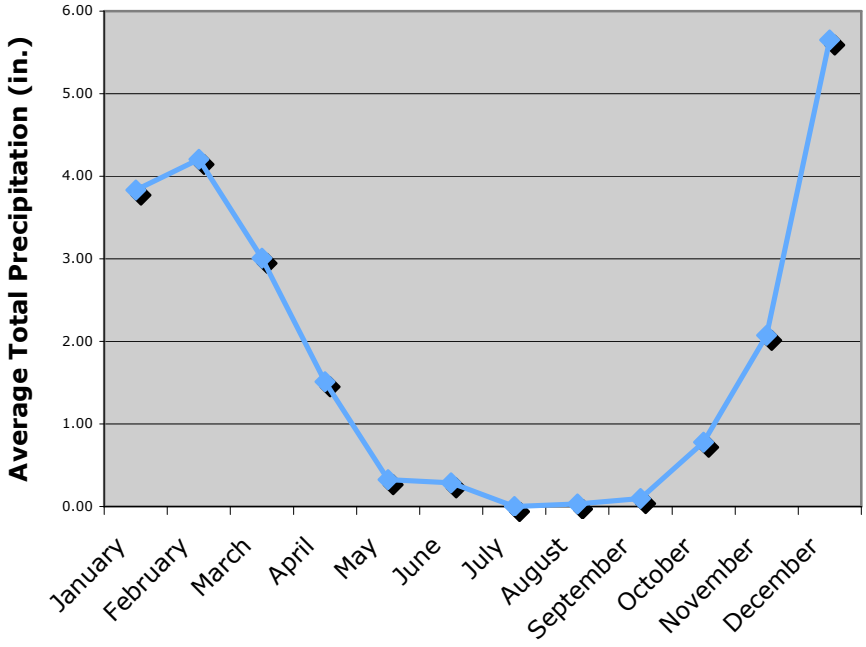

Figure 2-3. City of Capitola Average Monthly Precipitation from October 1996 through April 2006

Information provided in the *Assessment of Sources of Bacterial Contamination At Santa Cruz County Beaches* (Ricker and Peters, 2006) indicated that flow based on measurements at the mouth of Soquel Creek was 4.3 cubic feet per second (cfs) during mid-summer. The document also indicated that flow in Soquel Creek, approximately 0.7 mile upstream from the mouth, was 4.0 cfs and in Noble Gulch was 0.2 cfs. Both flow rates were estimates during mid-summer months. The flow rate estimate at approximately 0.7 mile upstream from the mouth was based on flow at the United States Geologic Survey gauge approximately 0.9 mile upstream of this location and was adjusted for input from the outfalls at this location. Outfall flow was based on the document, *Soquel Watershed Assessment and Enhancement Project Plan* (D.W. Alley, et al., 2003). The flow rate estimate in Noble Gulch was based on visual observation, and is an estimate of typical conditions. Although both of the later flow rates were estimates, they provide an idea of relative flow of the two waterbodies.

2.2. Land Use

The Watershed includes lands under the jurisdiction of the City of Capitola, the County of Santa Cruz, and California State Parks system. Figure 2-4 illustrates the California State Parks and City of Capitola lands in the Soquel Lagoon watershed.

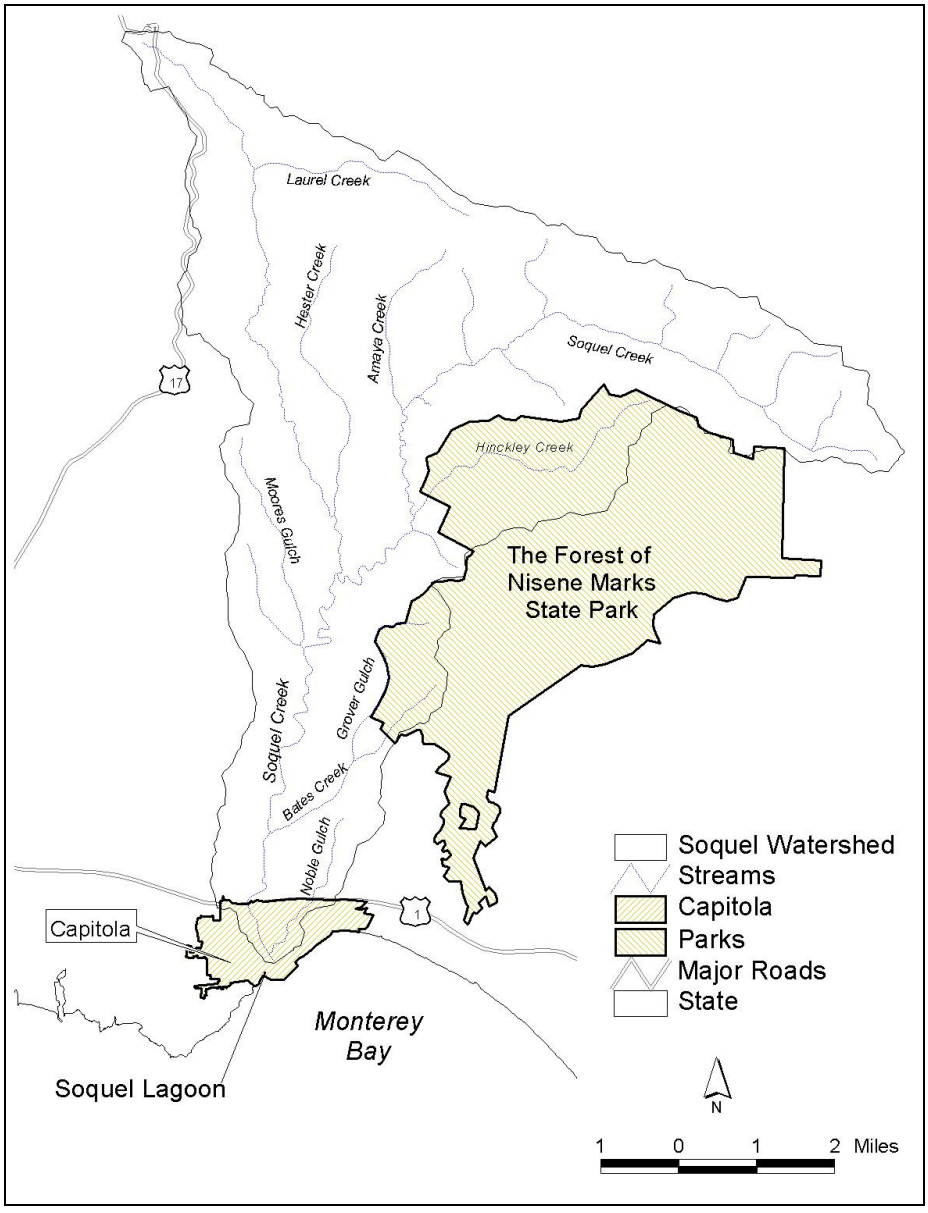

Figure 2-4. City of Capitola and the Forest of Nisene Marks State Park Boundaries

Land uses in the Watershed include bare lands, pasture, urbanized areas, and naturally vegetated lands that include areas covered with forest, shrubs, and grasses.

Ninety three percent of the land in the Soquel Creek Subwatershed is covered by naturally occurring vegetation. The second largest land use is urban at seven percent. The majority of urban land use is concentrated in the southern tip of Soquel Creek Subwatershed while forest and other naturally vegetated land uses cover the remainder. Pasture/hay, bare ground, and open water account for a combined area of less than one percent of the land area in the Soquel Creek Subwatershed.

Sixty eight percent of Noble Gulch Subwatershed is urban development, while 32 percent is naturally occurring vegetation.

The Bates Creek Subwatershed is farther upstream away from the more urbanized section of the Watershed than Noble Gulch. Therefore the majority of land (84 percent) is covered by naturally occurring vegetation. However, 10 percent of the land use is urban, and six percent is pasture/hay.

Table 2-1 summarizes the land uses occurring in the project Watershed.

Table 2-1 Land uses in major subwatersheds of the Soquel Lagoon Watershed[1].

	Land Use / percent of area covered by type		
Subwatershed	Urban	Naturally Vegetated	Pasture/hay
Soquel Creek	7%	93%	
Noble Gulch	68%	32%	
Bates Creek	10%	84%	6%

[1] Staff used data which represents land uses from 1988 to 1994. (Land uses have not changed significantly since 1994.)

3. DATA ANALYSIS

3.1. Water Quality Data

This section discusses the water quality data staff used to develop these TMDLs, the results of water quality analyses, and the impacted areas. Staff analyzed data from water quality sampling conducted by two sources: 1) The County of Santa Cruz Environmental Health Services, and 2) The Coastal Watershed Council (CWC). Data provided by the County was collected from 1986 to 2006; however, water board staff used only data collected from 2003 to 2006 between the Lagoon mouth and the West Branch of Soquel Creek at San Jose and Olive Springs Roads. Staff also analyzed Santa Cruz County data from 2003 to 2006 from Noble Gulch and Bates Creek. Data provided by the CWC was collected in 2004 and 2005 from storm drains in the Capitola area. Staff analyzed CWC data from those storm drains that emptied into the Lagoon.

There were several stations sampled along Noble Gulch with very small data sets. Santa Cruz County staff tried to isolate areas of highest contamination and sampled some of the locations only a few times or less since 2003. The data was not included here due to the small sample sizes and because staff concluded the data would not change the conclusions in this report. The data is included in Appendix A.

Additional data provided by the County of Santa Cruz was submitted late in the writing of this Final Project Report. Staff reviewed the data and concluded it would not change the implementation strategies of this report. However, staff included one of the data sets in this analysis because it replaced a former data set that had questionable data quality. The remainder of the data that was submitted late is included in Appendix A.

3.1.1. Soquel Creek

Fecal coliform sampling activities for Soquel Creek are shown in the table below.

Table 3-1. Santa Cruz County Environmental Health Services Fecal Coliform Sampling Locations and Period of Data Record in Soquel Creek

Station #	Station Location	Number of Samples from 2003 to 2006	Frequency of Samples from 2003 to 2006	Total Period of Record[1]
S0	Soquel Creek at Flume Outlet	211	2003 - Irregular 2004 to 2006 - Weekly	1987 to 2006
S04	Soquel Creek Above Stockton Bridge East	6	Irregular	1987 to 2005
S07	Soquel Creek at Railroad Trestle	58	Irregular	1986 to 2006
S23	Soquel Creek at Nob Hill	82	Irregular	1986 to 2006
S2315	Soquel Creek at Porter Street Bridge	35	Irregular	2003 to 2006
S6	West Branch Soquel Creek at San Jose at Olive Springs Road	42	Irregular	2003 to 2006

The County collected fecal coliform samples at the most downstream station in Soquel Creek (Soquel Creek at Flume Outlet; SO) at least weekly from 2003 to 2006 with the exception of three months in 2003 (Figure 3-1). Approximately eight to 10 samples were collected each month in 2005 and January of 2006 from the same station. Four additional stations in the lowest 1.75 miles of Soquel Creek and Lagoon (SO4-S2315) were sampled irregularly (Table 3-1). A fifth station (S6; approximately 4.5 miles upstream of Soquel Lagoon) was sampled irregularly.

Santa Cruz County staff sampled additional stations along Soquel Creek a few times since 2003. There were 12 total samples collected from six different sites in an approximately 0.5 mile reach upstream of the Soquel Creek at Porter Street Bridge station. Water Board staff included the stations (S232, S2321, S24, S234, S253, and S275) and data in Appendix A. Staff did not include the data in Table 3.1 because of the number of stations with such small data sets.

The sampling stations of Soquel Lagoon and Creek from the mouth to the upper watershed provided information as follows. Staff determined stations downstream of and

1 Data collection periods of record may contain gaps. Only data from 2003 to 2006 were used in the analysis.

including the Soquel Creek at Railroad Trestle sampling station (S07) provided information on fecal coliform levels in the Noble Gulch Subwatershed. Stations from the Soquel Creek at Nob Hill sampling station (S23) to the Soquel Creek at Porter Street Bridge sampling station (S2315) provided information regarding fecal coliform for a reach above the Lagoon but still within the urban section of the Soquel watershed and including some of Bates Creek watershed. The West Branch Soquel Creek at San Jose at Olive Springs Road sampling station (S6; Figure 3-2) provides information regarding water quality from approximately half way upstream in the watershed, which is a receiving water for mostly rural residential and naturally vegetated land.

Figure 3-1 and Figure 3-3 illustrate monitoring site locations and proportion of data exceeding water quality objectives.

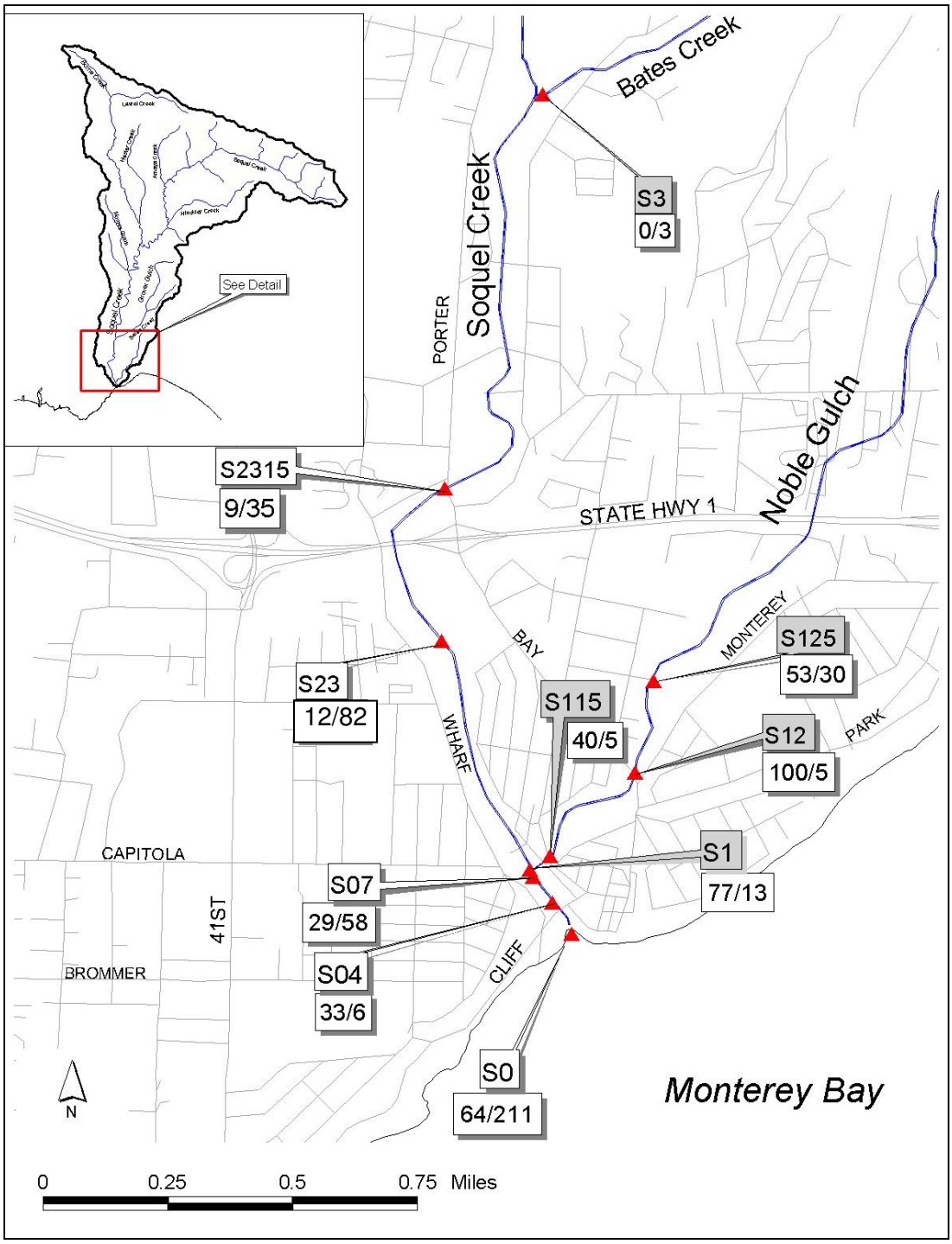

Figure 3-1. Soquel Creek, Noble Gulch, and Bates Creek Sampling Stations showing station numbers. Below each station number is the percent of data exceeding 400 MPN over the number of samples since January 1, 2003 (for example, Station S07 exceeded the 400 MPN objective 29 percent of the time based on 58 samples). Noble Gulch and Bates Creek Sampling Stations were shaded to separate them from the Soquel Creek stations.

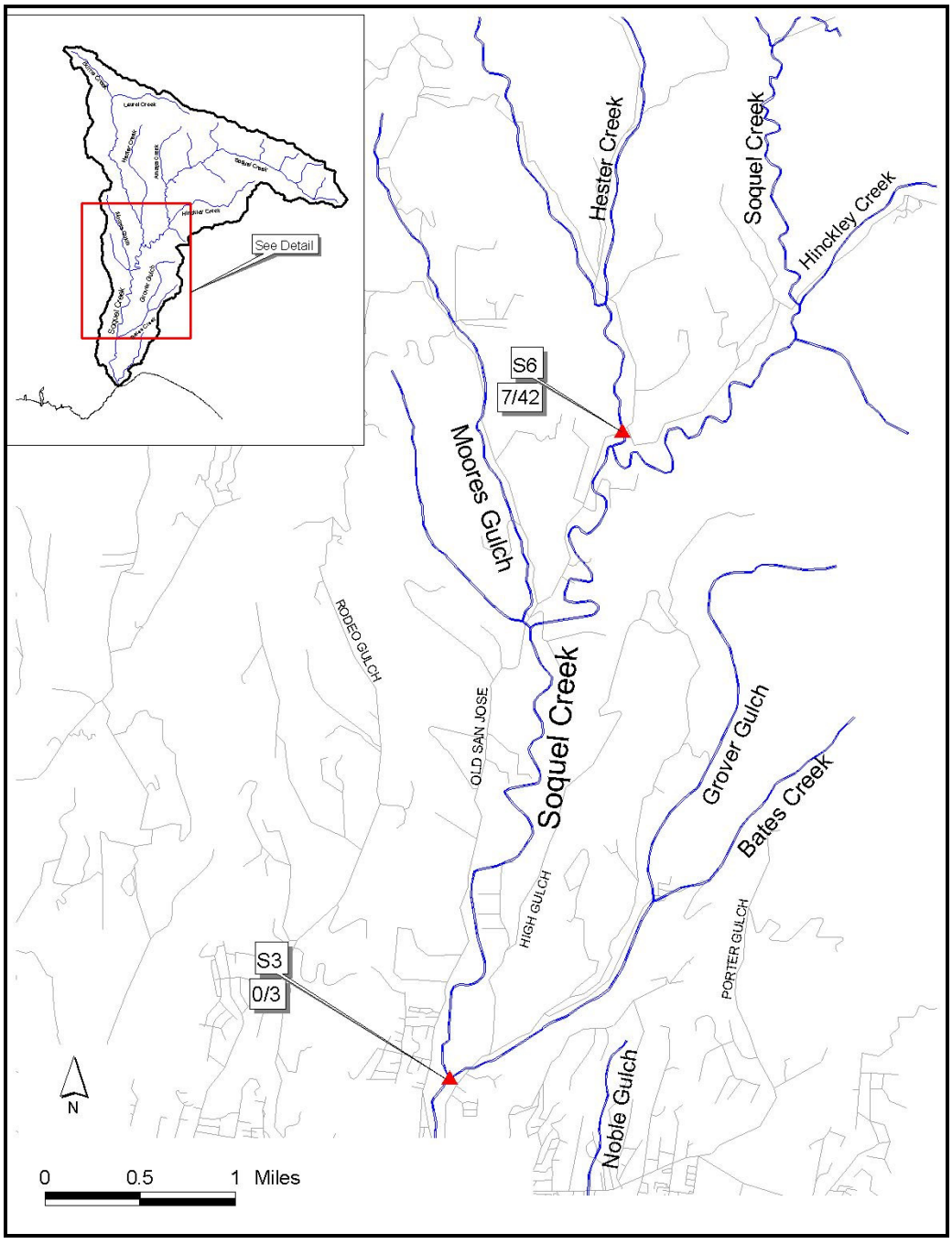

Figure 3-2. West Branch Soquel Creek at San Jose at Olive Springs Road Sampling Station (S6). (This Sampling Station was too far upstream in the Watershed to include on Figure 3-1). The Bates Creek Sampling Station (S3) from Figure 3-1 was included for reference. Both stations show percent exceedance over number of samples since January 1, 2003.)

3.1.2. Noble Gulch

Recent fecal coliform sampling activities for Noble Gulch are shown in the Table below.

Table 3-2. Santa Cruz County Environmental Health Services Fecal Coliform Sampling Locations and Period of Data Record in Noble Gulch

Station #	Station Location	Number of Samples from 2003 to 2006	Frequency of Samples from 2003 to 2006	Total Period of Record[1]
S1	Noble Gulch at Soquel Creek	13	Irregular	1986 to 2005
S115	Noble Gulch at Pacific Cove Entrance	5	Irregular	2005
S12	Noble Gulch at Tunnel at Bay	5	Irregular	2003 to 2005
S125	Noble Gulch at St. Joe's Church	30	Irregular	2003 to 2006

Santa Cruz County Environmental Health Services sampled four stations on Noble Gulch irregularly (Figure 3-1). All data is included in Appendix 1 of this report.

Although Noble Gulch flowed at approximately 0.05 the rate of the flow of Soquel Creek (see Section 2.1 *Location, Climate, and Hydrology*), it discharged directly into the Lagoon. Therefore, analyzing data from Noble Gulch was important to the water quality analysis of this report.

1 Data collection periods of record may contain gaps.

3.1.3. Bates Creek

Recent fecal coliform sampling activities for Bates Creek are shown in the Table below.

Table 3-3. Santa Cruz County Environmental Health Services Fecal Coliform Sampling Locations and Period of Data Record in Bates Creek

Station #	Station Location	Number of Samples from 2003 to 2006	Frequency of Samples from 2003 to 2006	Total Period of Record[1]
S3	Bates Creek at Soquel Creek	3	Irregular	2004 to 2005

The County collected fecal coliform samples at one Bates Creek station (Bates Creek at Soquel Creek; S3) on three occasions in 2004 and 2005 (Figure 3-1). This sampling site was just upstream of the confluence of Soquel Creek and Bates Creek. Although this is a small data set, it is included here to show that this is the only data from 2003 to 2006 and to support the conclusion in the monitoring section that more data is needed from this Creek.

3.1.4. Storm Drains

Santa Cruz County staff collected very few water samples from 2003 to 2006 in storm drains that drain to Soquel Creek because the sampling stations were either under the water level of Soquel Creek and could not be sampled, or they were dry. Therefore, staff did not use data from these samples in their analysis.

The data provided by CWC used in this report was *E. coli* data collected at two storm drain sampling stations. Two samples were collected in 2004 and eight samples were collected in 2005 from two storm drains that emptied into Soquel Creek and Lagoon (the data is included in Appendix A). Staff analyzed the 2005 data only, because the 2004 data set was small. Staff reviewed the 2004 data and determined it would not change the conclusions of this report. One station, the Creekside sampling station, was located approximately 0.8 mile upstream of the mouth of the Lagoon and a second station, the Monterey Ave. station, was located along Monterey Ave. approximately 0.3 mile northeast of the Lagoon.

3.1.5. Data Analysis Method

Staff analyzed Santa Cruz County Environmental Health water quality sampling results using a program titled "Fecal Coliform Investigation and Analysis Spreadsheet" (FECIA). FECIA is a fully automated spreadsheet designed to assist in characterization and quantification of pathogenic indicator organism water quality objectives exceedances. Observed data are compared against specified values equal to water quality objectives to determine the magnitude and frequency of exceedances.

Staff used the FECIA program to generate the data analysis figures and tables located in Appendix B of this report. Figures were generated for each sampling station. Each figure displays analyzed data collected from 2003 to 2006 as shown in the tables in Section 3.1 *Water Quality Data*. The figures display either the water contact recreation beneficial use geometric mean water quality objective or the water contact recreation beneficial use maximum water quality objective. The maximum water quality objective (400 MPN) was used when the County of Santa Cruz took less than five samples in a 30-day period. Concentration ranges, the range of concentrations within the 25^{th} -75^{th} percentile range, the mean concentration, and the median concentration are shown in the resulting FECIA analysis.

Some sampling stations lacked enough data for staff to conclude impairment based on water quality objectives. Therefore, staff based their conclusions regarding impairment on the *Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List (*State Water Resources Control Board, adopted on September 2004).

Staff also generated tables that summarized data on a monthly basis. Tables were generated for each sampling station. Each table shows the mean, median, minimum, maximum, the 25^{th} percent deviation, the 75^{th} percent deviation, the number of water quality objective exceedances, the sample count, and the percent sample exceedance.

There were only two 2004 CWC data samples, therefore formal analysis was unnecessary. CWC data from 2005 was analyzed by creating an Excel table of data and statistics. The data from both years and the Excel table of the 2005 statistics are located in Appendix 1 of this report.

3.2. Data Analysis Summary

This section summarizes data analysis results contained in Appendices A and B. For each station sampled by Santa Cruz County, the percent violation of the geometric mean and maximum water quality objective are provided as well as the number of sample sets used to calculate the percent violation. FECIA calculated violations of the geometric mean water quality objective when five or more samples were available in a 30-day period. Sampling stations are listed from the most downstream station (top row of the table) to the most upstream station (bottom row of the table) on all three waterbody tables.

3.2.1. Soquel Creek

Table 3-4 shows the percent violation of the geometric mean objective, maximum water quality objective, and the number of samples used to determine the percent violation of these objectives in Soquel Creek.

Table 3-4. Soquel Creek Percent Violations of Water Quality Objectives since January 1, 2003

Station #	Station Location	Geometric Mean Water Quality Objective (200 MPN fecal coliform)		Maximum Water Quality Objective (400 MPN fecal coliform)	
		% Violations	Number of Samples Sets	% Violations	Number of Samples
S0	Soquel Creek at Flume Outlet	87	193	64	211
S04	Soquel Creek Above Stockton Bridge East	100	2	33	6
S07	Soquel Creek at Railroad Trestle	80	25	29	58
S23	Soquel Creek at Nob Hill	19	53	15	82
S2315	Soquel Creek at Porter Street Bridge	(1)	(1)	9	35
S6	West Branch Soquel Creek at San Jose at Olive Springs Road	(1)	(1)	7	42

(1) Insufficient data to calculate geometric mean

Note that samples from each of the monitoring stations in Soquel Creek exceeded one or both of the fecal coliform water quality objectives.

Staff did not analyze the 12 samples from the 0.5 mile reach upstream of the Soquel Creek at Porter Street Bridge sampling station using FECIA analysis. However, staff considered this data in determining the impaired reaches. Staff noted that only one of the 12 samples exceeded the maximum water quality objective (at 810 MPN/100mL; the maximum water quality objective is 400 MPN/100mL). All except one of the remaining 11 samples were less than 200 MPN/100mL.

3.2.2. Noble Gulch

Table 3-5 shows the percent violation of the geometric mean objective, maximum water quality objective, and the number of samples used to determine the percent violation of these objectives in Noble Gulch.

Table 3-5. Noble Gulch Percent Violations of Water Quality Objectives

Station #	Station Location	Geometric Mean Water Quality Objective (200 MPN fecal coliform)		Maximum Water Quality Objective (400 MPN fecal coliform)	
		% Violations	Number of Samples Sets	% Violations	Number of Samples
S1	Noble Gulch at Soquel Creek	100	2	77	13
S115	Noble Gulch at Pacific Cove Entrance	(1)	(1)	40	5
S12	Noble Gulch at Tunnel at Bay	(1)	(1)	100	5
S125	Noble Gulch at St. Joe's Church	100	5	53	30

Note that samples from each of the monitoring stations in Noble Gulch exceeded one or both of the fecal coliform water quality objectives.

Bates Creek

Table 3-6 shows the percent violation of the geometric mean objective, maximum water quality objective, and the number of samples used to determine the percent violation of these objectives in Bates Creek.

Table 3-6. Bates Creek Percent Violations of Water Quality Objectives

Station #	Station Location	Geometric Mean Water Quality Objective (200 MPN fecal coliform)		Maximum Water Quality Objective (400 MPN fecal coliform)	
		% Violations	Number of Samples Sets	% Violations	Number of Samples
S3	Bates Creek at Soquel Creek	(1)	(1)	0	3

Note that there was insufficient data to determine whether Bates Creek was meeting or exceeding the geometric mean of 200 MPN/100mL objective. However, the three samples indicated that the maximum water quality objective for fecal coliform was being achieved.

3.2.3. Storm Drains

Table 3-7 shows the percent violation of the *E. coli* water quality criterion and the number of samples used to determine the percent violation of these objectives in storm drains.

Table 3-7. Coastal Watershed Council 2005 *E. coli* Data and Statistics

Location	Date	*E. coli* (MPN/100mL)	% of samples >*E. coli* Target (235MPN)	Number of Samples
Creekside	**7/27/2005**	5		
	8/29/2005	379		
	9/29/2005	20		
	10/26/2005	173		
			25%	4
Monterey Ave.	**7/27/2005**	323		
	8/29/2005	3873		
	9/29/2005	598		
	10/26/2005	4884		
			100%	4

3.3. Identification of Impaired Reaches

This section characterizes the impaired reaches of Soquel Creek, Noble Gulch, Bates Creek, and the status of storm drains sampled by CWC in terms of *E. coli* levels. The subwatersheds and the waterbodies are identified using Figures 2-5 and 3-1.

3.3.1. Soquel Creek

Soquel Creek was impaired from the mouth of the Lagoon upstream to the Soquel Creek at Porter Street Bridge sampling station (the first sampling station that did not have impaired water quality). The percentage of exceedances at each sampling station decreased moving upstream from 64 percent at the mouth of the Lagoon to nine percent at the Soquel Creek at Porter Street Bridge station.

The trend of decreasing fecal coliform levels extended into the next approximately 0.5 mile unimpaired reach upstream of the Soquel Creek at Porter Street Bridge sampling station. Staff concluded this reach was unimpaired based on 12 samples from six stations within this 0.5 mile reach. Although a robust data set was lacking at any one station within the reach, considered together, there was only one data point out of 12 that exceeded the maximum water quality objective in this reach.

The farthest upstream station (West Branch Soquel Creek at San Jose at Olive Springs Road, approximately 4.5 miles upstream of the Lagoon) at which data was collected exceeded the water quality objective in seven percent of the samples. Staff determined this station was also unimpaired.

3.3.2. Noble Gulch

Fecal coliform objectives were exceeded in Noble Gulch at three of the four sampling stations downstream of and including the Noble Gulch at St. Joe's Church sampling station, approximately 0.6 mile upstream of the confluence of Noble Gulch and Soquel Creek.

Although the unanalyzed data sets (described above in Section 3.1 *Water Quality Data*) for this waterbody were small, the data, when considered together, supported the conclusion that Noble Gulch was impaired. All of the data (nine samples collected in February and March of 2005 within an approximately 0.75 mile reach upstream from Highway One) at four stations exceeded the water quality objective.

Staff concluded all reaches of Noble Gulch were impaired because there were no monitoring stations meeting water quality objectives.

3.3.3. Bates Creek

Only one station was sampled in Bates Creek located just prior to the confluence of Bates and Soquel Creeks. No fecal coliform maximum objective (400 MPN per 100 mL) exceedances were recorded at this station for the 3 samples collected from 2004 to 2005. Staff was unable to make a conclusion regarding the potential impairment of this waterbody due to the small data set. However, sampling of Soquel Creek immediately downstream of Bates Creek is required in the monitoring plan in Section 11. Samples from this location will help to determine water quality from Bates Creek.

3.3.4. Storm Drains

E. coli water quality criterion was exceeded at the Creekside and Monterey Ave (CWC) sampling stations in 2005. Exceedances at the Creekside station occurred one time out of four. Exceedances at the Monterey Ave. station occurred four times out of four. Both storm drains empty into Soquel Creek. Although the sample sizes were small, Central Coast Water Board staff concluded this data suggests that stormwater discharges carry pathogens to Soquel Creek. Additionally, staff concluded that more samples should be collected from storm drains in this area. The Monitoring Plan in Section 11 of this report establishes requirements for the County of Santa Cruz to sample storm drains.

3.3.5. Impaired Reaches

Staff developed the TMDLs in this report for the impaired reaches of the waterbodies described above and the corresponding subwatersheds. Staff summarized the impaired reaches as:

1) Soquel Lagoon and Soquel Creek from the mouth of the Lagoon upstream to the Soquel Creek at Porter Street Bridge sampling station, and
2) The entire reach of Noble Gulch.

3.4. Microbial Source Analysis Results

Genetic ribotyping is one method of microbiological source analysis and was utilized to identify microbiological sources in Soquel Lagoon and Noble Gulch. The genetic ribotyping method differentiated sources of *E. coli*. Monsour Samadpour of the University of Washington Public Health Department has worked with over 100,000 *E. coli* samples and developed genetic fingerprints that are specific to certain *E. coli* sources of animal origin. This method compares Ribonucleic Acid band patterns extracted from contaminated stream sites and known sources of *E. coli*. Numerous entities in California have successfully used this method, including California Polytechnic State University's (San Luis Obispo) study of Morro Bay, California.

Although this report presents various sources in "percent contribution" values, staff considered the ribotyping results only as an estimate of possible sources and of relative source contributions among all of the various sources. Ribotyping represents one of the lines of evidence in determining source contribution.

Santa Cruz County personnel collected *E. coli* samples for ribotyping analysis from three of the sampling stations on Soquel Creek (S0, S04, and S23), one of the sampling stations on Noble Gulch (S1), and an additional station on Noble Gulch (S11D) that was originally thought to be a storm drain (Noble Gulch is piped underground for its last approximately 0.4 mile prior to entering Soquel Creek). The sampling stations are shown in Figure 3-3.

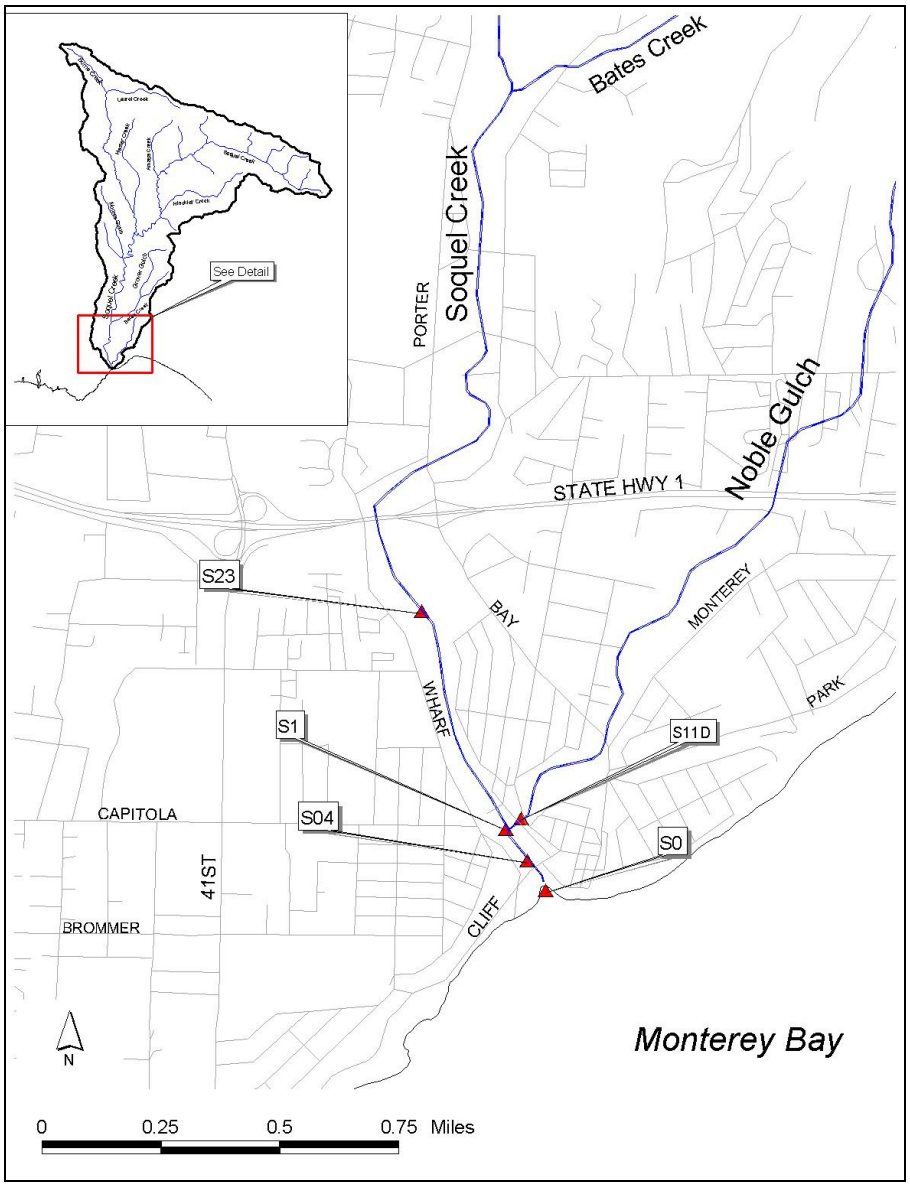

Figure 3-3. Soquel Creek and Noble Gulch Ribotyping Data Collection Stations

Ribotyping samples were collected between January 13, 2004 and March 17, 2005. Percent source contributions from samples collected during both wet and dry seasons combined are presented in Table 3-8. Table 3-9 contains the percent source contributions separated into wet and dry seasons.

Table 3-8. Percent Source Contributions from Ribotyping Data

Sites	Soquel Creek at Flume Outlet (SO)	Soquel Creek Above Stockton Bridge East (S04)	Soquel Creek at Nob Hill (S23)	Noble Gulch at Soquel Creek (S1)	Noble Gulch at Blue Gum and Riverview (S11D)
Dates	**1/13/04 to 9/21/04**	**6/6/05 to 2/17/05**	**1/21/04 to 2/17/05**	**1/13/03 to 2/17/05**	**7/11/05 to 9/28/05**
Source	**Percent Source Contribution**				
Bird	54	46	48	64	36
Wildlife	7	31	10	16	21
Rodent	13	7	14	10	14
Dog	13	10	9	2	21
Human	6	0	6	4	4
Unknown	5	1	9	4	0
Cat	1	4	3	0	0
Horse	0	0	1	0	1
Cow	0	0	0	0	0
Marine Mammal	0	0	0	0	0
Total Water Samples	36	21	51	16	9
Total Isolate Samples	112	68	151	50	28

Based on this combined wet and dry season study, birds were the largest contributing source of *E. coli* at 36 percent or more from all five sampling stations. Other sources, wildlife (raccoon, deer, and opossum), dog, and rodent were present at all five stations and contributed a significant percentage of the fecal coliform. We also observed a four to six percent human contribution to fecal coliform at all but one of the sampling stations, Soquel Creek above Stockton Bridge East. However, this station was downstream of another station that did have a human source. Horse was identified as contributing one percent of the fecal coliform isolates in both Soquel Creek and Noble Gulch.

Dog, human, horse, and cat sources were considered controllable sources because they are present as a result of human activities and land management. Bird, wildlife, and rodent sources are generally considered natural and uncontrollable because their presence is generally not a result of human activities. However, bird, wildlife, and rodent sources are controllable to some degree. For example, these animals are attracted to trash dumpsters and areas where human activities involving food occur. Therefore, they are present partially as a result of human activities. Some of their waste can be controlled by managing those human activities.

Table 3-9. Variation of Fecal Coliform Sources During Wet and Dry Seasons (January 2003 - September 2005)

Sites	Soquel Creek at Flume Outlet (SO)		Soquel Creek Above Stockton Bridge East (S04)		Soquel Creek at Nob Hill (S23)		Noble Gulch at Soquel Creek (S1)		Noble Gulch at Blue Gum and Riverview (S11D)	
Dates	**1/13/04 to 9/21/04**		**6/6/05 to 2/17/05**		**1/21/04 to 2/17/05**		**1/13/03 to 2/17/05**		**7/11/05 to 9/28/05**	
	Wet[1]	**Dry[2]**	**Wet[1]**	**Dry[2]**	**Wet[1]**	**Dry[2]**	**Wet[1]**	**Dry[2]**	**Wet[1]**	**Dry[2]**
Total Water Samples	36		21		51		16		9	
Total Isolate Samples	10	102	10	58	22	129	19	31	0	28
Total Days of Wet Season Sampling	1		1		2		2		0	
Source	**Percent Source Contribution**									
Bird	40	55	40	47	32	51	63	65	(1)	36
Wildlife	10	7	10	34	23	8	32	6	(1)	21
Marine Mammal	0	0	0	0	0	0	0	0	(1)	0
Dog	30	12	10	10	5	9	5	0	(1)	21
Human	10	6	0	0	5	6	0	6	(1)	4
Horse	0	0	0	0	5	0	0	0	(1)	4
Cow	0	0	0	0	0	0	0	0	(1)	0
Cat	0	1	20	2	0	4	0	0	(1)	0
Unknown	10	5	0	2	14	9	0	6	(1)	4
Rodent	0	15	20	5	18	13	0	16	(1)	14

[1] Wet = Samples collected during a time when rain occurred within the previous 72 hours
[2] Dry = Samples collected during a time when more than 72 hours occurred without rain
(1) No samples collected during the wet season at this station.

There was not enough wet season data to draw conclusions about wet versus dry season sources (Table 3-9). In order to accurately characterize the relative contribution from different sources of fecal contamination at a particular location, it is important to analyze 50-100 bacterial isolates (individual colonies) collected from that location over time (*Assessment of Sources of Bacterial Contamination At Santa Cruz County Beaches*, Ricker and Peters, 2006). None of the above data sets collected on wet days were based on sufficient isolate numbers. However, data derived from wet season sampling can still be used in terms of identifying at least some of the contributing sources. This is why wet and dry season data was analyzed in Table 4.1 after being combined.

No contribution from cows was recorded in this study. However, had there been greater numbers of samples collected in the wet season, particularly after the first rain event, cow or other livestock animal sources, in addition to a higher contribution from horses, may have been detected. Farm animal contribution is discussed further in Section 4.1.4. *Domestic Animal Discharges*.

A second reason for performing wet season sampling is to determine if the human component increases during wet weather. This would suggest that onsite-wastewater disposal systems are dysfunctional and/or that the sewer collection system is leaking and waste is transported to storm drain systems during storm events. Additional information included in Sections 4.1.3. *Onsite Wastewater Disposal System Discharges* and 4.1.1. *Sanitary Sewer Collection System Spills and Leaks* was used to determine whether or not septic or sewer systems were a significant source of pathogens to the Soquel Lagoon.

4. SOURCE ANALYSIS

This source analysis was based on existing water quality data, wastewater spill data, microbial source data, land use, flow estimates, discussions with staff at County of Santa Cruz Health Services Agency, City of Capitola Public Works, Santa Cruz County Sanitation District (SCCSD), Coastal Watershed Council, and observations made in the field. This analysis also considered information provided in a report prepared by the County of Santa Cruz, Environmental Health Services, Water Resources Program titled *Assessment of Sources of Bacterial Contamination at Santa Cruz County Beaches* prepared in March, 2006.

4.1. Sources of Pathogen Indicator Organisms Investigated

This section discusses pathogen sources of concern in the Soquel Watershed that are subject to regulation by the Central Coast Water Board. The modes by which various sources provided in Tables 3-8 and 3-9 reach the Soquel Lagoon are discussed.

4.1.1. Sanitary Sewer Collection System Spills and Leaks

Sewage can reach the Lagoon from sewer line overflows (spills) or leaks. Sewage spills can occur when roots, grease buildup, or other debris block sewer lines. Some spills from the Santa Cruz County Sanitation District's (SCCSD's) collection system reached the Soquel Lagoon in 2002, 2003, and 2004. Leaks can occur from cracked lines or lines with faulty connections. When sewer lines are blocked or leaking, sewage may run onto the street, into gutters, and into storm drains. Sewer leaks can also occur in small volumes and below the ground. These types of leaks often continue unnoticed. SCCSD provided evidence that several sewer main lines were leaking prior to and including last year. Sewage spills and leaks contain human waste. Ribotyping analysis indicated that at two Lagoon sampling stations humans generated six percent of the sampled fecal coliform. Humans were also identified as generating four percent of the fecal coliform in two stations on Noble Gulch. Staff concluded that sewage was a likely source of pathogens in the Lagoon; however, staff also concluded that current management practices and permit requirements are adequate to control these sources.

The Watershed does not have a Waste Water Treatment Plant (WWTP) within its boundaries. However, the Watershed has a collection system that collects wastewater from the City of Capitola and a portion of Santa Cruz County within the Watershed's boundaries and takes this wastewater to the City of Santa Cruz's WWTP. The SCCSD's Waste Discharge Requirements (WDR No. R3-2005-0043) addresses the County's collection system. Areas of the Soquel Watershed not connected to the SCCSD collection system are on onsite-wastewater disposal systems.

The State Water Resources Control Board adopted Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Water Quality Order No. 2006-0003 (Sanitary Sewer Order) on May 2, 2006. The Sanitary Sewer Order requires public agencies that own or operate sanitary sewer systems to develop and implement sewer system management plans. The goal of the sewer system management plan is to provide a plan and schedule to properly manage, operate, and maintain all parts of the sanitary sewer system. This will help reduce and prevent sanitary sewer overflows and releases, as well as mitigate any sanitary sewer overflows and releases that do occur.

The State Board General Waste Discharge Requirements for Sanitary Sewer Systems do not impose additional requirements beyond those requirements already adopted by the Central Coast Water Board.

The SCCSD main line (main) crosses underneath Soquel Creek and the Lagoon. The main crosses Soquel Creek at Porter Street between Soquel Wharf Road and Main Street, and the Soquel Lagoon near the Nob Hill at Soquel Creek sampling station where the main crosses toward Soquel Wharf Road. It crosses in a third location at the Stockton Avenue Bridge. Locations are labeled A, B, and C, respectively, on Figure 4-1. The main also parallels Noble Gulch throughout most of its reach (within approximately 25 to 400 feet). The main is inspected once every year during routine cleaning (personal communication, Diane Romeo, Sanitation Engineering, SCCSD, May 5, 2006).

The SCCSD Engineering and Operations Staff supplied a report, *Capitola Video Results* (March, 2006), summarizing an inspection of sections of the sewer main in the City of Capitola. The report indicated that the sewers adjacent to Soquel Creek and in the upper village area were constructed primarily in the 1960s of rigid clay or asbestos concrete. It also summarized the results of the investigation of approximately 4,460 feet of sewer main that was televised in February 2006 after winter storm events produced 0.71 inches of rain. There were only a few spots where water was observed trickling into the pipe due to saturated soils. However, due to cracking, offset joints, chipping, and non-water tight lateral connections showing a slime build up (indicative of water leaking into the system), it was evident that the sewer main was most likely leaking inwardly and outwardly. The report also indicated that several lateral connections at the main were leaking (lateral connections are discussed in Section 4.1.1.a *Private Laterals/Private Pump Station Spills*). During the wet season, these conditions contribute to sewer system overflow (or spills) by rainfall and groundwater infiltration. Conversely, sewage exfiltration potential exists in dry seasons (exfiltration occurs when sewage leaks underground).

The report indicated that the sewer main in the worst condition was along Cherry and San Jose Avenues located in the Esplanade section of Capitola, which is east of and adjacent to the Lagoon. Several sections were cracked and lateral connections extended into the sewer main with slime build up below. Many as-built plans were missing and the mapping of the sewer lines was incomplete. Some of the manholes in the Capitola village area showed inlet piping that may or may not be abandoned. Occasionally, sewer mains that were considered abandoned were determined functional and connected to

residences. Furthermore, some of the manholes were constructed of brick. Water in the rainy season can leak around the bricks and into the sewer system causing overflows (or spills).

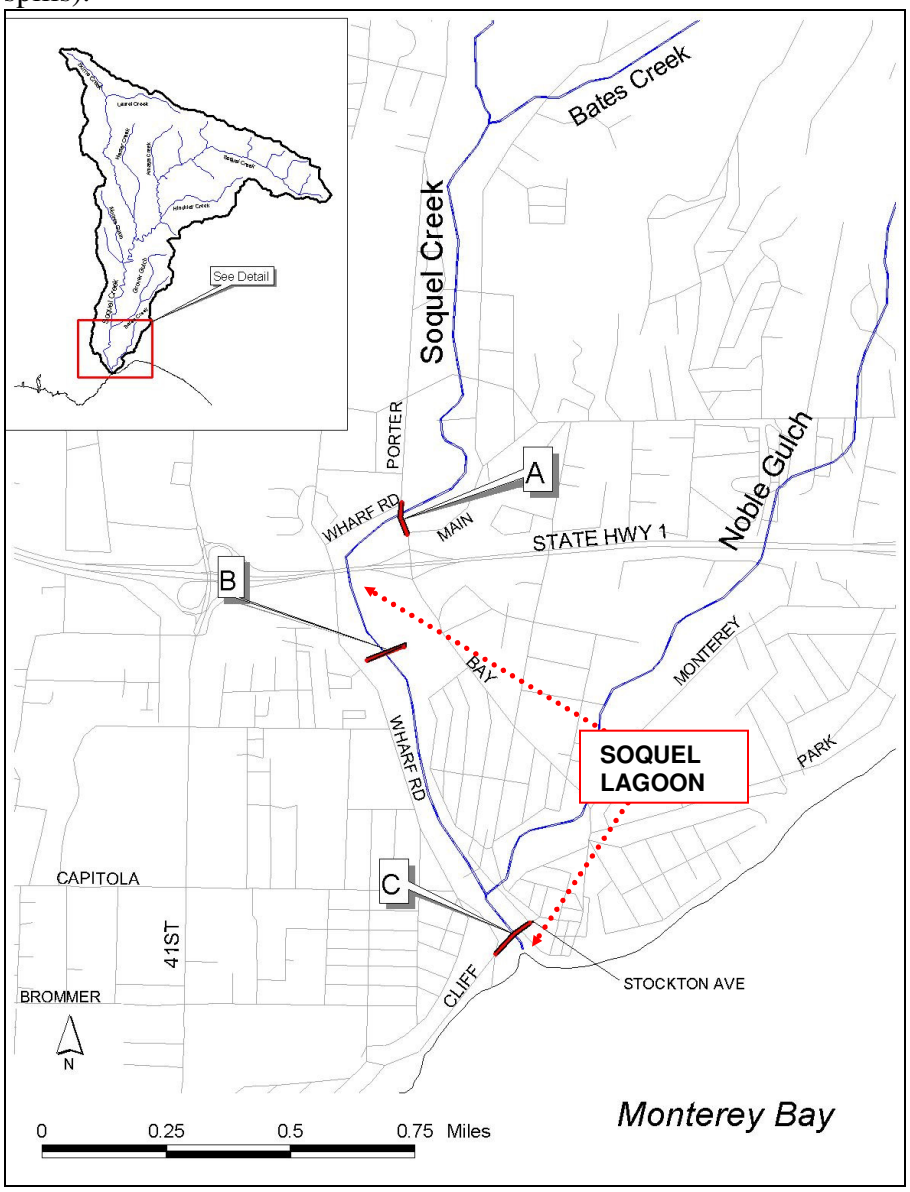

Figure 4-1. Locations where the sewer main crosses under Soquel Creek (A: Porter Street between Soquel Wharf Road and Main Street, B: Near Nob Hill at Soquel Creek sampling station toward Soquel Wharf Road, and C.: Stockton Avenue Bridge)

Additionally, sections of main along Riverview Avenue (located approximately 125 to 200 feet from the Lagoon) were found in poor condition in past inspections. Furthermore, a videotape prepared last year showed that the Soquel Wharf Road sewer main was in poor condition with areas where a portion of the pipe was missing. Of the

13 manholes on this sewer, at least nine were constructed of brick (*Capitola Video Results*, SCCSD Operations and Engineering, 2006).

Several hundred feet of sewer main located east of Soquel Creek were replaced with PVC pipe since the 1980s. Communication with Rachel Lather of the SCCSD in July of 2006 indicated that a section of the sewer main was replaced recently along Riverview Avenue in the Esplanade area between Oak Drive and Gilroy Drive. Other sections along Riverview Avenue were replaced previous to that section. Lather also described sections of the main scheduled for replacement in 2006 and 2007 that include an additional section along Riverview Avenue, and several sections within the Esplanade. Repairs will also include taking the sewer main off the cliff face along Grand Avenue where it was exposed. The section of main on Soquel Wharf Road will not be replaced in the coming year due to the topography and geology of the area in which it is located. Other sections of main were thought to be in worse condition and to have a greater impact on water quality. Lather also told Central Coast Water Board staff that there was close communication with John Ricker, Water Resources Program Coordinator, Health Services Agency, County of Santa Cruz, when prioritizing the Capital Improvement Projects of the SCCSD for the following year. Furthermore, the SCCSD submitted a Collection System Management Plan per the requirements of the WDR in February of 2006. The plan summarized how sections of the main are inspected and by whom, assumptions about the system used to project long term Capital Improvement Projects, and the basis for priority of replacement. Collection system replacement is based on investigations of the general condition of the system.

The sewers' problems were not just leaks, but also blocks and spills. Sewer main blocks that did not require clean up action, in addition to blocks that resulted in spills were partially due to the faultiness of the collection system as described above. Staff concluded that blocks and spills were also due to obstructions such as grease, wood, rags, and hair. Spill data was compiled into the following graph in Figure 4-2.

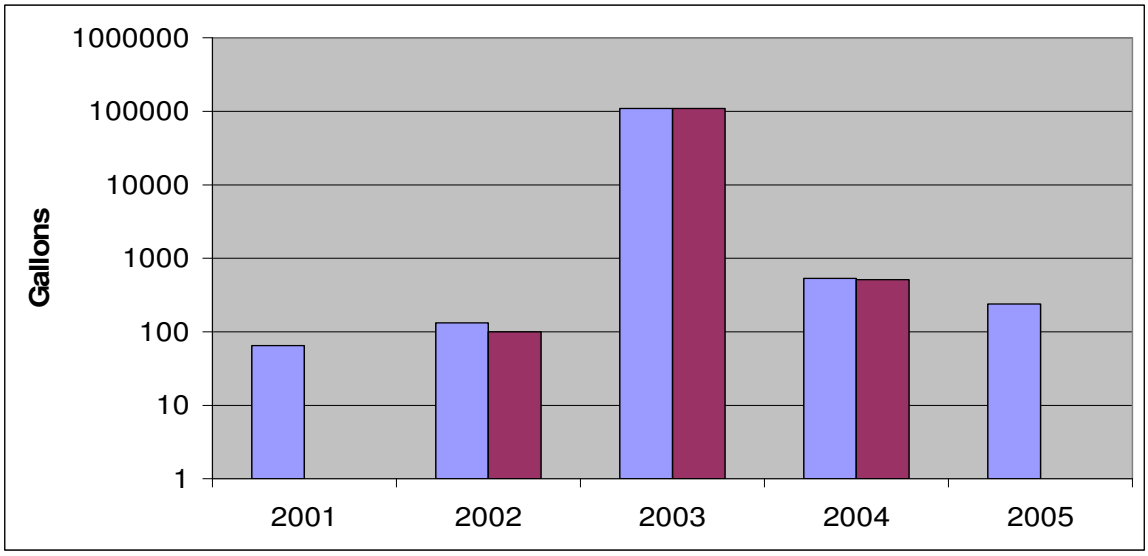

Figure 4-2. Total Domestic Sewage Spilled into Soquel Creek/Lagoon and Storm Drain System from 2001 to 2005. Blue bars represent total spills to Soquel Creek/Lagoon and Storm Drains. Red bars represent total spills only to Soquel Creek/Lagoon.

Table 4-1 shows the total annual spill volumes and the number of spills that occurred from January 1, 2001 through September 11, 2005 within the SCCSD boundaries.

		Total Spills to Storm Drains and Surface Waters	Total Spills to Soquel Creek/Lagoon
2001	Gallons	65	0
	Number of Spills	3	0
2002	Gallons	132	100
	Number of Spills	3	1
2003	Gallons	109,250	109,000
	Number of Spills	4	2
2004	Gallons	535	510
	Number of Spills	4	2
2005	Gallons	240	0
	Number of Spills	8	0

Table 4-1. Annual Spill Volume and Number of Spills within the Santa Cruz County Sanitation District

From 2001 through 2005, 22 spills were reported that were a result of SCCSD collection system failure within the Soquel Watershed. The largest spill volume occurred in 2003 amounting to 109,205 gallons, of which 109,000 gallons reached Soquel Creek. Two spills that occurred that year were relatively large with one measuring 100,000 gallons and the other measuring 9,000 gallons. The 9,000-gallon spill also entered Noble Gulch. The total volume of spills in each of the other four years was 535 gallons or less. Spills did not reach the Soquel Lagoon in 2001 and 2005.

The SCCSD implemented an overflow emergency response plan to minimize the effects of spills upon surface waters. When spills occurred, the SCCSD determined if the spills entered storm drains. If the spill entered the storm drain, they determined where the spill migrated and "trapped" the spill. The SCCSD extracted the spills from the storm drains and hauled the sewage to the wastewater treatment plant. Spills that did not reach water bodies were vacuumed, absorbed, raked-up, or diluted with fresh water.

Based upon the information above, Central Coast Water Board staff concluded collection system leaks were a chronic problem. This source contributes to exceedance of water quality objectives. However, staff concluded that collection system problems are being

sufficiently addressed through the current practices of the SCCSD and the annual reports they must submit in compliance with their WDR.

4.1.1.a Private Laterals/Private Pump Station Spills

The SCCSD provided a report regarding videotaped sewer lines in the City of Capitola (*Capitola Video Results*, SCCSD Operations and Engineering, 2006) summarized above in Section 4.1.1. *Sanitary Sewer Collection System Spills and Leaks*. The report indicated that lateral connections to the sewer main were missing saddles (which help to make them water tight), and that the mortar (also to keep them water tight) was cracked or non-existent. Many laterals showed slime build up at the connection to the main indicating that water was leaking into the main. The report also indicated that lateral connections were leaking inwardly and outwardly and that some lateral connections were "break-in" style with lateral pipe extending into the sewer main that could have contributed to blockages. Furthermore, most of the laterals were found "low lying" with the lateral flow line below the flow line of the main with solids and standing water in the lateral. However, because the inspection only televised the sewer main it was difficult to determine the condition of the lateral pipes themselves. Rachel Lather of the SCCSD acknowledges that laterals are a problem in the Capitola Village but is uncertain as to the extent of the problem. She also said that some laterals in the Village could have been built as long ago as the 1930s (personal communication, June 26, 2006).

The SCCSD provided spill reports from 2001 to 2006. One spill in 2002 estimated at 37 gallons was the only reported spill from a private lateral. There were no spills reported from private pump stations. However, Russ Bateson, Operations Manager of the SCCSD, indicated that there were approximately 10 spills per year throughout the district (including other watersheds in addition to Soquel) from private laterals that went unreported (personal communication, June 28, 2006).

When the main is replaced or repaired, lateral connections along that section of the main are repaired by the SCCSD as well (personal communication, Diane Romeo, Sanitation Engineering, SCCSD, May 11, 2006). Repair of the sewer main was discussed in Section 4.1.1. *Sanitary Sewer Collection System Spills and Leaks* above and is discussed in Section 10.1.1. *Sanitary Sewer Collection System Spills and Leaks*. The report described sections of the main that were recently replaced and in good condition, but that had leaking lateral connections. These sections of main will not be replaced again until they need repair. Therefore the leaking lateral connections will not be replaced either, unless homeowners replace them.

Staff concluded it was highly probable that the lateral pipes were leaking and that the sewage was transported to the Lagoon. Furthermore, as stated in Section 3.4 *Microbial Source Analysis Results*, ribotyping analysis indicated that at two Lagoon sampling stations humans generated six percent of the sampled fecal coliform. Humans were also identified as generating four percent of the fecal coliform in two stations on Noble Gulch.

The SCCSD recently adopted a Code (Santa Cruz County District Code Sections 7.04.325 and 7.04.375; March 2006) regarding sanitary sewer collection system maintenance of systems serving four or more units. Staff concludes that the ordinance may only reduce this source by a small amount as the ordinance does not address private laterals. Summarized, the Code requires that owners of such properties:

1) Maintain their sanitary sewer system to prevent overflows, including flushing once during an eighteen month period;
2) Immediately stop an overflow if one occurs and have the problem repaired by a licensed plumber within five working days;
3) Report spills to the SCCSD within 24 hours and submit a written report; and
4) Certify that the sanitary sewer system was inspected prior to the sale of the house or building if the house or building was constructed, or the sewer system was inspected, more than 20 years prior to the date of sale.

The district may impose penalties of up to $2,500.00 against a property owner who fails to perform any act required in the ordinance if the spill reaches public or private property other than the property owner's property.

Based upon above information, staff determined leaks from private laterals are a source of fecal indicator bacteria in the City of Capitola and County of Santa Cruz stormwater.

4.1.2. Storm Drain Discharges to Municipally Owned and Operated Separate Storm Sewer Systems (MS4s) Required to be Covered by an NPDES Permit

Storm drain discharges have the potential to contain human waste from municipal system sewage spills and leaks (discussed in Section *4.1.1. Sanitary Sewer Collection System Spills and Leaks*). Storm drain discharges also have the potential to contain urban runoff, including pet waste and dumpster leachate, which are controllable sources, and bird and rodent waste, which are sources that are controllable to some degree (as explained in this section). Based on the ribotyping analysis (Section 3.4 *Microbial Source Analysis Results*) and land use that is mainly urban surrounding the Lagoon, staff concluded that these sources were likely present in the storm drain discharge within the Soquel Watershed and that these sources lead to exceedances of water quality objectives and criterion in Soquel Lagoon and Creek. These sources and their transport mechanisms are discussed below.

Water samples collected via the CWC within storm drains were few. Although the sample sizes were small, Central Coast Water Board staff concluded this data may suggest stormwater discharges carry pathogens to Soquel Creek but this should be considered in conjunction with other evidence (such as urban runoff pathogen contributions in other watersheds, ribotyping data, and land uses). Additionally, staff concluded that more samples should be collected from storm drains in this area. Noble Gulch was impaired throughout the range of sampling stations. Whatever is contributing to the Monterey Ave (storm drain) station could also contribute to impairment of Noble Gulch as it is very close in proximity. One reason for small sample sizes in this watershed by CWC was that storm drains chosen for sampling were dry during the

sampling periods. The Monitoring Plan in Section 11 of this report establishes requirements for the County of Santa Cruz to sample storm drains.

The City of Capitola received funds from the Clean Beaches Initiative Grant Program to reduce pathogenic indicator organism inputs at Capitola Beach and Soquel Creek. The *Village Drainage Improvement Plan* (City of Capitola, 2004) described the top priority projects to be implemented with the funds. The number one priority of the Plan was a dry weather diversion system that was recently completed. The diversion system is expected to improve water quality and reduce pathogen loading from the sources described above in the Lagoon during the time of operation, May through October. Runoff from the Esplanade and restaurants between the Esplanade and Soquel Creek was identified as a key source of pathogenic indicator organism pollution. A portion of this runoff directly entered the Lagoon through the Fog Bank outfall. The diversion, which included the construction of a small subsurface pump station, will redirect this runoff to the sanitary sewer system and eventually to the wastewater treatment facility in the City of Santa Cruz.

4.1.2.a. Controllable Bird Waste

Fecal coliform ribotyping results indicate birds were a source of fecal coliform in the Lagoon (46 percent or greater at all three Soquel Creek sampling stations) and in Noble Gulch. Birds frequent locations such as dumpsters and trash cans as feeding sites. Birds were known to congregate in the Lagoon area on sandbars. They were also attracted to this area due to the presence of outdoor seating at restaurants and people that feed birds. Bird waste may reach storm drains and surface waters when storms occur or in other forms of urban runoff. Bird waste associated with dumpsters, trashcans, and trash that is littered can be controlled.

Employees from restaurants adjacent to the Lagoon have not been observed rinsing bird waste off roofs. However, restaurateurs periodically pressure wash their sidewalks with water that drains to storm drains (personal communication, Steve Peters, Water Quality Specialist, Health Services Agency, County of Santa Cruz, March 30, 2006). Staff observed one esplanade restaurant employee pressure washing their patio during field reconnaissance; the Implementation Plan in Section *10.1.2. Storm Drain Discharges)* recommends methods to minimize wash water that may contain bird pathogens as a source.

4.1.2.b. Pet Waste

From the ribotyping analysis, 21-percent of the identified isolates originated from dogs in Noble Gulch (at Blue Gum and Riverview). Fecal coliform from cats was also identified in Soquel Creek, to a lesser degree. Noble Gulch was narrow and fairly steep in stretches, and lacked a wide floodplain. Therefore, residences surrounding Noble Gulch were located proximal to this waterbody. Residences along Soquel Creek were also very close to the Creek in some stretches. There was the potential for residences adjacent to waterbodies in the Soquel Watershed to dispose of their pet waste by depositing it directly into the waterbody. Pet wastes can also reach these waterbodies via storm drain discharges during wet seasons through surface runoff. During dry seasons, pet wastes

can reach storm drains if wash water or excess water from other sources comes into contact with pet waste.

Staff observed several leashed dogs in Perry Park adjacent to the Lagoon during field reconnaissance (March 16, 2006). Staff observed numerous signs in this park and two additional Soquel Creek adjacent parks that advise dog walkers to pick up after their dog. Bags were also provided for picking up dog waste.

The Capitola Municipal Code includes an ordinance that requires dog owners/walkers to immediately remove and dispose of dog feces after defecation on public property (6.12.100 Public defecation). The County of Santa Cruz has a similar ordinance (6.12.080 Animal defecation prohibited where). The presence of signs and disposal bags likely helped to reduce dog waste from entering storm drain systems and ultimately the Lagoon, however, dogs continued to contribute pathogens to the Lagoon. The Implementation Plan in Section 10.1 recommends methods to minimize these sources.

4.1.2.c. Controllable Rodent and Wildlife Waste

Microbial source tracking results indicated rodents and wildlife contributed pathogen indicator organisms to the Lagoon. Controllable rodent and wildlife waste can reach the Lagoon through storm water discharges. The Implementation Plan in Section 10.1 recommends methods to minimize this source.

4.1.2.d. Dumpster Leachate

When it rains, rainwater can enter dumpsters and discharge leachate. Leachate is formed when dumpsters are uncovered and containers leak. During dry seasons, bird waste may reach surface waters when trash-holding areas are hosed off or washed. Wash water may reach storm water drains and surface waters.

During field reconnaissance staff observed two recycling dumpsters upside down next to a restaurant on a sidewalk over-hanging the Lagoon. The dumpsters appeared to have been hosed out with water and were drying.

The maintenance of trash receptacles in sanitary condition is in progress (*Assessment of Sources of Bacterial Contamination At Santa Cruz County Beaches,* Ricker and Peters, 2006). However, an evaluation of this program is needed. The Implementation Plan in Section 10.1.2. Storm *Drain Discharges*) recommends methods to evaluate the progress of sanitary trash receptacle maintenance.

4.1.2.e. Human Waste Discharges

Illegal human waste discharges can reach surface waters via storm drains. Staff concluded homeless persons in non-riparian areas were a source of human pathogens in the Lagoon. Supporting this conclusion was the finding that humans were identified as contributing four to six percent of the fecal coliform in water samples from all but one sampling station. Tamara Doan of the Coastal Watershed Council, who collects water samples in the Watershed, stopped monitoring the storm drain pipe draining Highway One to Soquel Creek in 2004 because homeless persons were living in the pipe. Personal

effects believed to belong to homeless persons were observed in 2005, however, no persons were observed.

Central Coast Water Board staff received information from the Capitola Police Department that evidence of homeless encampments included ground covers under shrubs in commercial areas or camping in vehicles (personal communication, Todd Mayer, Captain, Capitola Police Department, May 4, 2006; forwarded through email from Steve Jesberg, Public Works Director, City of Capitola, May 4, 2006).

Law enforcement cited overnight sleepers and campers. The City of Capitola Public Work department broke down large encampments (personal communication, Todd Mayer, Captain, Capitola Police Department, May 4, 2006; forwarded through email from Steve Jesberg, Public Works Director, City of Capitola, May 4, 2006).

There was no specific confirmation that homeless encampments were affecting surface waters. However, because evidence of homeless encampments has been observed in non-riparian areas and because sanitary disposal facilities are not always available for these sites, Central Coast Water Board staff determined it was highly likely that human waste reached surface waters. Additionally, as discussed in Section 3.4 *Microbial Source Analysis Results*, humans were a source of the fecal coliform in the water samples collected in Soquel Creek.

Staff proposes actions regarding homeless persons and encampments in the Implementation Plan in Section 10.

4.1.3. Onsite Wastewater Disposal System Discharges

Onsite wastewater disposal systems (OWDSs) are potential sources of fecal coliform in surface waters. However, Water Board staff concluded OWDSs were not contributing to water quality impairment in Soquel Watershed.

Staff suspected that rare onsite-wastewater disposal system failures occurred at rural residences in the upper Subwatersheds of Soquel Creek, Noble Gulch, and in the Subwatershed of Bates Creek. During dry periods, sewage from failing onsite-wastewater disposal systems probably did not reach a waterway unless a failure occurred close to a creek. However, on rare occasions during wet periods pathogen indicator organisms from failed onsite-wastewater disposal systems may have flowed to ditches, roadways, creeks, and ultimately Soquel Creek.

Soquel Creek was impaired up to the Soquel Creek at Porter St. Bridge sampling location. This sampling location indicated no impairment. Upstream of this station for approximately 0.5 mile, residences and business were on the Santa Cruz Sanitary Sewer Collection System. Any OWDSs would have been located upstream of this unimpaired reach. Therefore, staff concluded OWDSs were not a contributor to the impairment in Soquel Creek.

Furthermore, development within in the Soquel Watershed is recent and of low density relative to development within the San Lorenzo watershed in which there is encroachment of homes and OWDSs to the San Lorenzo River. Soquel Creek generally has a wider floodplain and most of the relatively new development meets current septic standards (personal communication, John Ricker, Water Resources Program Coordinator, Health Services Agency, County of Santa Cruz, April 20, 2006).

The entire reach of Noble Gulch was impaired. Dwellings not connected to the Santa Cruz Sanitary Sewer Collection System begin at approximately the north end of Ashwood Way, north of Soquel Drive, and adjacent to Noble Gulch OWDSs extended north into less developed areas. Staff found approximately nine dwellings within 125 feet of the Gulch and of those, three were within about 50 feet of the Gulch. Staff assumed that each dwelling had an associated OWDS. The soil mapping units in which the dwellings were located (identified in the USDA Soil Survey for Santa Cruz County, California, 1980) had slow permeability with the potential for OWDS absorption fields to not function properly. However, John Ricker, Santa Cruz County Environmental Health Services, Water Resources Division Director, was contacted and said that there were no problem areas that he knew of in the entire Soquel Watershed.

Staff determined that because: (1) Nobel Gulch was impaired downstream of these OWDSs (but not upstream of the OWDSs) (*Comment inserted after TMDLs approved by Water Board: Staff determined that the preceding statement was confusing, but did not delete it because the TMDLs were approved as written. OWDTSs were found not to be a source contributing to impairment in Noble Gulch*); (2) there were a small number of suspect systems upstream of this impaired reach; and (3) there was no other evidence of failing systems, staff would not name OWDSs as a source and will not require implementation for OWDSs. However, if staff finds evidence during the implementation phase of the TMDL that septic systems are a source causing exceedance of water quality objectives, staff will address this source accordingly.

Although staff concluded OWDSs were not a source leading to the impairment of surface waters in this Watershed as this time, municipalities and the Water Board either already have or are drafting regulatory maintenance plans. Santa Cruz County currently has an ordinance (7.38.035 Requirement of Adequate Sewage Disposal) that requires adequate individual sewage disposal and maintenance of the individual sewage disposal system. There is currently no regular inspection of these systems. The County of Santa Cruz and the City of Capitola proposed implementing an OWDSs maintenance and management program to reduce OWDS failures in their draft Storm Water Management Plan (SWMP), but an explanation of the OWDSs maintenance and management program was not included in the SWMP. Furthermore, the Central Coast Water Board has not yet approved the SMWP.

Additionally, Water Board staff is in the process of developing revisions to existing Basin Plan criteria for onsite wastewater systems. The proposed criteria include recommendations and requirements for proper siting, design, maintenance and management of onsite wastewater systems. The proposed Basin Plan revisions also will

require municipalities to develop onsite wastewater management plans (which the current criteria only recommend). In addition Water Board staff is in the process of developing a waiver of waste discharge requirements for owners of onsite wastewater systems that will ensure proper siting, design, maintenance and management. All owners of new onsite wastewater systems will have to enroll in the waiver if they plan to operate in areas without onsite wastewater management plans approved by the Executive Officer. Local permitting agencies will be required to characterize and address water quality impacts from existing onsite wastewater systems in management plans.

4.1.4. Domestic Animal Discharges

4.1.4.a Farm Animals and Livestock Discharges

Staff determined that farm animal and livestock discharges were not a source of pathogens in the Soquel Lagoon or Creek, however, they were a likely source in Noble Gulch. Land use analysis indicated that 121 acres of the Soquel Watershed was covered by pastureland or hay (areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops). Approximately 92 percent of this total was within the Subwatershed of Bates Creek. Staff did not have evidence that Bates Creek was impaired.

Staff observed horses in proximity to the Soquel Creek flood plain during field reconnaissance, however, the horses were located upstream of the unimpaired reaches of Soquel Creek. During the same field visit staff also noted that chickens, roosters, and cattle were present along Soquel San Jose Road which is adjacent to the Soquel flood plain in some stretches, but again this was upstream of the reaches of Soquel Creek considered impaired.

According to Steve Peters, Water Quality Specialist, Health Services Agency, County of Santa Cruz, there were horses in pasture on the north side of Highway One, east of Noble Gulch between Silver Birch and Monterey Ave. within the Noble Gulch watershed (personal communication, April 13 and July 5, 2006). Peters also observed horses above Soquel Drive around Victory Lane and Cunnison Lane.

Central Coast Water Board staff observed cattle on Cunnison Lane West of Noble Gulch (personal observation, June 26, 2006). Staff found several corrals adjacent to and in proximity of the Gulch on aerial imagery from Google Earth (Google Earth, 2008). The corrals were between approximately Highway One and the north end of Victory Lane/Coyote Canyon. The same imagery also showed pastures along the Gulch or in close range of it.

The ribotyping analysis used in this report suggested that approximately one percent of the contribution of fecal coliform originated from horses at one sampling location in both Soquel Creek and Noble Gulch. There was no fecal coliform from cows identified in the sampling. However, there was no wet season sampling conducted at the Noble Gulch sampling station. Also, the wet season information for Soquel Creek at Nob Hill was based on only 22 isolates from only two days of wet season sampling. As stated above,

reliable pathogen indicator organism analysis should include 50 – 100 isolates collected from one location over time. Therefore more contribution from horses as well as cattle may have been identified if sampling was more robust and conducted during the wet season. Additionally, there is substantial evidence from other watersheds that when cattle are present in the watershed fecal coliform from cows travels to the respective waterbody.

Staff concluded that horses and/or other farm animals likely contributed pathogens to Noble Gulch. Waste from farm animals and/or livestock is controllable and therefore staff is proposing actions in Section 10 *Implementation Plan*.

4.1.4.b. Pet Waste in Areas Not Draining to an MS4

Staff concluded that pet waste in areas that do not drain to MS4s likely contributed pathogens to surface waters in the Soquel Creek watershed.

As discussed above, results from ribotyping analysis suggested that 21 percent of the identified isolates from fecal coliform present in Noble Gulch (at Blue Gum and Riverview) were from dogs. Fecal coliform from cats was also identified in Soquel Creek, to a lesser degree. Ribotyping analysis from other watersheds in the Central Coast Region typically indicated that dog and pet waste was a source of fecal indicator bacteria in surface waters. Additionally, County staff has observed pet waste in riparian areas, some of which likely reached surface waters.

Staff concluded that pet waste in areas that do not drain to MS4s, was a source of pathogens that can be controlled.

4.1.5. Homeless Person/Encampment Discharges Not Draining to an MS4

Staff discussed discharge from homeless persons that is flowing to creeks from storm drains in Section 4.1.2.e. *Human Waste Discharges*. Homeless person/encampment discharges also drain directly into surface waters. However, homeless persons that discharged directly to surface waters from riparian areas were not regulated by a SWMP program. Homeless encampments were present in the Soquel Lagoon Watershed riparian areas and may have been a significant human pathogen source. In addition to human waste, homeless person/encampments may also generate wastes from other sources such as rodent, pet, and bird.

Staff concluded homeless person/encampment discharges must be addressed. Staff based this conclusion upon discussions at technical advisory committee meetings established while the County developed the Proposition 13 Report. The homeless encampment issue often came up in discussions among members.

The following information also supports staff's conclusion. Tamara Doan of the Coastal Watershed Council began sampling the Soquel Watershed in 2000. She indicated there was evidence of encampments in the area directly under the North abutment of the Highway One overpass. Additionally, those working for the Coastal Watershed Council

observed "signs" of encampments from May 2000 through August 2005 in the area (including riparian habitat) directly behind the Mid-County Senior Center (near sampling station Soquel Creek at Nob Hill at the upstream end of the Lagoon). The "signs" included barbeques, lawn chairs, sleeping bags, and food stashes (personal communication, April 19, 2006).

According to Doan the upper watershed had more signs of temporary human use than actual homeless encampments. She observed human waste at the confluence of Soquel and Moore Creek 4.6 miles upstream of the Lagoon.

Staff concluded that homeless persons were not as likely in Noble Gulch as it was visible to homeowners due to the proximity of houses and backyards to the Gulch. However, one stretch of the Gulch just south of Highway One provided better cover as it was not as visible to homeowners (personal communication, Steve Peters, Water Quality Specialist, Health Services Agency, County of Santa Cruz, April 21, 2006)).

Homeless encampment locations are dynamic due to the general mobility of this population. Locations change depending upon dispersal performed by law enforcement officials. For these reasons, staff did not prepare maps showing homeless encampment locations.

Because homeless encampments were observed in riparian areas and because there were no sanitary disposal facilities available for these sites, Central Coast Water Board staff determined it was highly likely that human waste reached surface waters. Additionally, as discussed in Section 3.4 *Microbial Source Analysis Results*, humans were a source of the fecal coliform in the water samples collected in Soquel Creek.

Central Coast Water Board staff concluded homeless encampments are a pathogenic indicator organism source and is proposing additional actions in the Implementation Plan in Section 10.

4.1.6. Natural Sources

Ribotyping data indicate that birds and other wildlife contribute to fecal coliform loading in the Soquel Lagoon. Birds made up between 36 percent and 64 percent, wildlife contributed between seven percent and 31 percent, and rodents contributed between seven percent and 14 percent of the isolates identified by ribotyping. A direct one-to-one transfer from the percent of identified isolates to the percent of total contribution cannot be made with the ribotyping data. However, the ribotyping results do suggest that wildlife contributions could be significant.

Staff distinguished natural sources from "controllable" wildlife sources. Controllable sources were those caused or influenced by human activity, such as littering or leaving trash receptacles accessible to wildlife. Another controllable source was the entrance of wildlife fecal matter into storm drains through wash water. Staff discussed controllable

wildlife sources in the preceding sections and included measures to minimize their contribution to pathogen loading in the Implementation Plan of this report.

4.2. Source Analysis Conclusions

Staff determined the relative order of controllable sources that contributed pathogen indicator organisms to the Soquel Lagoon. They are listed here in relative order beginning with the largest source first:

1) Storm Drain Discharges to MS4s, including but not limited to discharges from domestic animals, humans, and controllable wildlife.
2) Sanitary Sewer Collection System Spills and Leaks (including discharges from private laterals connected to municipal sanitary sewer collection systems).
3) Domestic animal discharges not draining to MS4s, including farm animals, livestock and pets.
4) Human Waste Discharges from homeless persons/encampments not draining to MS4s.

Evidence regarding natural sources lead staff to conclude that the contribution may have been significant. Staff estimated most of the natural sources were not controllable.

The order was based on the information in Sections 3 *Data Analysis* and 4 *Source Analysis* of this report. As stated previously, staff used water quality data, discharger data and reports, flow estimates, land use data, ribotyping results, field reconnaissance work, and conversations with County staff to complete the source analysis conclusions.

Storm drain discharges likely contributed the most pathogen indicator organisms to the Soquel Lagoon. Land from which storm water runoff was generated was larger than the total land containing any of the other sources named below. Many contributors to stormwater pathogen indicator organisms, including the four likely greatest contributors based on ribotyping analysis (birds, wildlife, rodents, and dogs), lived within urban land which was the second largest land use in the watershed and the largest land use surrounding the Lagoon. Storm drains from this urban land emptied into the reaches of Soquel Creek in which impairment occurred.

Sanitary Sewer Collection System spills and leaks were likely the second greatest contributor of pathogen indicator organisms in the Lagoon. Based on video analysis performed by the SCCSD, the sewer collection system was determined to leak in proximity of the Lagoon. Furthermore, old pipes exist throughout the City of Capitola. Stormwater and subsurface flow was suspected of carrying this sewage to the Lagoon. Staff concluded that because it was known that the system was leaking and the majority of the known leaking sections were in the proximity of the Lagoon, this was a greater source of pathogen indicator organisms to the Lagoon than the remaining two sources of livestock and homeless. Furthermore, system spills reached the Lagoon in 2002, 2003,

and 2004 and human DNA was identified in the Lagoon downstream of areas of the watershed containing the sewer collection system.

Staff concluded that domestic animals, including farm animals /livestock and pets, and homeless persons/encampments were not as great a source of pathogen indicator organisms to the Lagoon as the above sources. The lower ranking of this source category was partly based on ribotyping analysis through which livestock contribution of pathogen indicator organisms was identified as one percent in both Soquel Creek and Noble Gulch. Additionally, the proportion of the area known to contain livestock in the watershed is not great. This source category was ranked slightly higher than homeless because staff identified more specific areas known to contain livestock than areas containing homeless persons. Furthermore, domestic animals are typically more permanent in their locations relative to homeless persons who are of a transient nature.

Staff considered that human DNA found in the Lagoon may have come from homeless persons and not from the other sources described above in this conclusion section. However, staff concluded that although pathogenic indicator organism contribution of homeless living in riparian areas was more direct to the waterbody when it occurred, because the number of homeless was uncertain, and their encampments may have been temporary, homeless persons contributed less to the lagoon than the above sources.

4.3. Comparison with Sources in Other Pathogen Impaired Waters

The purpose of this section is to describe how sources from the Soquel Watershed compared with sources identified in other TMDL Project Reports. Staff compared sources with similar sources identified in the San Lorenzo River Watershed TMDL project reports.

Sanitary Sewer Collection System Spills and Leaks: The San Lorenzo River Watershed TMDL identified the municipal collection systems as a source in the San Lorenzo River Watershed. This TMDL includes similar results.

Storm Drain Discharges: The San Lorenzo River Watershed Pathogen TMDL Project Report also indicated stormwater contributed pathogens to surface waters.

Homeless Persons/Encampments Discharges: The San Lorenzo River Watershed Pathogen TMDL Project Report also indicated homeless encampment discharges contributed pathogens to surface waters.

Farm Animals and Livestock: The San Lorenzo River Watershed Pathogen TMDL Project Report also indicated farm animals and livestock discharges contributed pathogens to surface waters.

5. CRITICAL CONDITIONS AND SEASONAL VARIATION

This section discusses factors affecting impairment, critical conditions, and seasonal fecal coliform variations.

5.1. Critical Conditions and Uncertainties

1. The critical conditions of impairment occur when fecal coliform levels approach, but do not exceed water quality objectives. These levels are considered critical because of the uncertainty surrounding actual fecal coliform levels, and effectiveness of implementation measures.

Staff concluded that there are no critical conditions.

Many factors contributed to the Soquel Lagoon impairment. These factors included the following: 1) discharge of pathogens to waterbodies in the Soquel Watershed; 2) stream flow transmission; and 3) survival and possible instream fecal coliform population growth.

Some uncertainties are inherent with pathogen indicator organisms. Stream flows may serve to either increase or dilute fecal coliform concentrations. Stagnant pools may be areas where fecal coliform increases due to evaporation or increasing numbers of cells, i.e., through naturalized bacteria. Conversely, increased stream flows may dilute fecal coliform concentrations.
There is uncertainty regarding the relative contributions of identified sources. Staff concluded that both "controllable" and "non-controllable" sources are contributing fecal input into the waterbodies. However, there is uncertainty surrounding the relative load that each of these sources is contributing.

Staff has addressed the uncertainties through the use of conservative approaches in the TMDL development and implementation program. For example, setting the TMDL equal to the water quality objective assures that critical conditions, if any, and uncertainties are addressed.

5.2. Seasonal Variations

Staff analyzed Soquel Creek and Noble Gulch fecal coliform data on a seasonal basis (Table 5-1). Data from sampling stations without enough data to detect a seasonal trend were not included. Staff considered monthly water quality objective exceedances. The table provides seasonal trend conclusions for three sampling stations in the Soquel Watershed. The three stations were the only stations from which enough data was collected in order to consider seasonal trends.

Table 5-1. Soquel Creek and Noble Gulch Seasonal Analysis

Station	Fecal Coliform Water Quality Objective	Months Exceeding Fecal Coliform Water Quality Objective	Comments
Soquel Creek at Flume Outlet	Fecal Coliform Geomean=200 MPN/100 mL	Mean: All months	No seasonal trend.
		Median: All months	
	Fecal Coliform not to Exceed=400 MPN/100 mL	Mean: All months except April	
		Median: May to Dec.	
Soquel Creek at Railroad Trestle	Fecal Coliform Geomean=200 MPN/100 mL	Mean: June, Oct., Nov., Dec.	No seasonal trend.
		Median: Jan., June, Oct., Nov., Dec.	
Noble Gulch at St. Joe's Church	Fecal Coliform not to Exceed=400 MPN/100 mL	Mean: Feb., March, April, May, Sep., Nov., and Dec.	No seasonal trend.
		Median: Feb., March, April, May, Sep., Nov., and Dec.	

Staff concluded there were no significant seasonal variations based on the data available. Therefore, staff did not adjust load allocations and numeric targets to account for critical conditions.

5.3. Conclusion

Though several conditions potentially account for the documented impairment, staff concluded there were no critical conditions or significant seasonal variations. Therefore, staff did not adjust load allocations and numeric targets to account for critical conditions or seasonal variations.

6. NUMERIC TARGETS

The Basin Plan contains fecal coliform water quality objectives. These water quality objectives are in place to protect the water contact recreational beneficial use.

The numeric target used to develop the TMDL is:

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL.[2]

Staff proposes removal of the shellfish beneficial use for the Soquel Lagoon from the Basin Plan. (See the Use Attainability Analysis in Appendix D.) Therefore, staff is not proposing numerical targets related to shellfish harvesting.

Natural non-controllable sources are a contributor of fecal indicator bacteria (FIB) in Soquel Watershed. Some doubt exists whether the non-controllable fraction of FIB alone are causing receiving water concentration of FIB to exceed the numeric target. However, there is evidence that non-controllable sources alone may not cause receiving water concentration to exceed the numeric target, i.e., that the numeric target can be achieved by managing controllable sources of FIB. For example, Waddell and Scott's Creeks are coastal streams with lagoons similar to Soquel. Both Waddell and Scott's Creeks, as well as their lagoons, carry FIB concentrations that achieve the geometric mean value of the numeric target. Single samples from these water bodies have exceeded the numeric target, but again, the monthly geometric mean achieves the numeric target. Staff, therefore, concludes that the potential exists to achieve the numeric targets by managing the controllable fraction of FIB in Soquel Watershed. Staff acknowledges that Aptos Creek is a waterbody heavily influenced by urban sources of FIB, whereas Waddell and Scott's Creek are much less developed with less human presence in their watersheds. Therefore, staff offers the above example as more of an indirect comparison, showing concentrations of FIB that more "natural" waterbodies may exhibit in this area, and not to show a direct comparison to other urban waterbodies that are achieving numeric targets.

In the event that the numeric target cannot be achieved through management of controllable sources, staff will consider other regulatory options; please see the discussion in the TMDL and Allocations section.

[2] Throughout this report, fecal coliform units are expressed as colony forming unit (CFU), organisms, count (#/100ml or CFU/100 ml) and most probable number (MPN). All unit expressions are considered equivalent fecal coliform bacteria concentration measures (Reference: Protocol for Developing Pathogen TMDLs).

7. LINKAGE ANALYSIS

The goal of the linkage analysis is to establish a link between pollutant loads and water quality. This, in turn, supports that the loading capacity specified in the TMDLs will result in attaining the numeric target. For these TMDLs, this link is established because the numeric target concentrations are the same as the TMDLs and water quality objectives, expressed as a concentration. Sources of pathogen indicator organisms have been identified that cause the elevated concentrations of pathogen indicator organisms in the receiving water body. Therefore, reductions in pathogenic indicator organism loading from these sources should cause a reduction in the pathogenic indicator organism concentrations measured. The numeric targets are protective of the recreational beneficial uses; hence the TMDLs define appropriate water quality.

8. TMDL CALCULATIONS AND ALLOCATIONS

A TMDL is the pollutant loading capacity that a water body can accept while protecting beneficial uses. TMDLs can be expressed as loads (mass of pollutant calculated from concentration multiplied by the volumetric flow rate), but in the case of pathogens, it is more logical for these TMDLs to be expressed as a concentration. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure [40 CFR §130.2(I)]. Concentration TMDLs make more sense in this situation because the public health risks associated with recreating in contaminated waters scales with pathogen indicator concentration, and indicator organisms (e.g. fecal coliform) are not readily controlled or measured on a mass basis. Therefore, we are establishing the TMDLs as a concentration of indicator organisms in the Soquel Lagoon, Soquel Creek, and Noble Gulch.

<u>TMDLs are established for the following reaches in the following water bodies:</u>

Soquel Lagoon: all waters of Soquel Lagoon.
Soquel Creek: beginning from the mouth of Soquel Creek, upstream and along Soquel Creek to the bridge at Porter Street.
All reaches of Noble Gulch.

<u>The TMDLs for Soquel Lagoon, Soquel Creek, and Noble Gulch are:</u>

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL.

8.1. Wasteload and Load Allocations

The wasteload and load allocations are receiving water concentrations. Responsible parties can not cause pathogen indicator organism (e.g. fecal coliform) concentration to exceed the allocations in the receiving water body.

The wasteload and load allocations are applicable to all responsible parties. For all sources not containing human fecal material the wasteload and load allocation is:

Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL.

For all sources containing human fecal material the wasteload and load allocation is

Fecal coliform concentration shall not exceed zero MPN per 100mL.

The parties responsible for the allocations to controllable sources are not responsible for the allocation to natural sources.

Table 8-1 shows the allocations and parties responsible for the allocations.

Table 8-1. Allocations and Responsible Parties

Waste Load Allocations		
Waterbody Subject to Allocation	**Responsible Party (Source) NPDES/ORDER Number**	**Receiving Water Fecal Coliform (MPN/100mL)**
Soquel Lagoon[1]	City of Capitola (Storm drain discharges to MS4s required to be covered by and NPDES permit) Storm Water General Permit NPDES No. CAS000004	Allocation-1[a]
Soquel Creek [2] Noble Gulch[3]	County of Santa Cruz and City of Capitola (Storm drain discharges to MS4s required to be covered by and NPDES permit) Storm Water General Permit NPDES No. CAS000004	Allocation-1[a]
Soquel Lagoon[1] Soquel Creek [2] Noble Gulch[3]	Santa Cruz County Sanitation District (Sanitary sewer collection system spills and leaks) Order No. R3-2005-0043	Allocation-2[b]
Load Allocations		
Waterbody Subject to Allocation	**Responsible Party (Source)**	**Receiving Water Fecal Coliform (MPN/100mL)**
Soquel Lagoon[1] Soquel Creek [2] Noble Gulch[3]	Owners and operators of land used for/containing pets (Pet waste not draining to MS4s)	Allocation-1[a]
Noble Gulch[3]	Owners and operators of land used for/containing farm animals and livestock (Farm Animals and Livestock discharges)	Allocation-1[a]
Soquel Lagoon[1] Soquel Creek [2] Noble Gulch[3]	Owners/operators of land that include homeless persons/encampments (Homeless person/encampment discharges not draining to MS4s)	Allocation-2[b]
Soquel Lagoon[1]	No responsible party	Allocation-1[a]

Soquel Creek [2] Noble Gulch[3]	(Natural sources)	

[1] All waters of the Soquel Lagoon
[2] Beginning and including the downstream most reach of Soquel Creek, up to and including Soquel Creek at the bridge crossing at Porter Street.
[3] All reaches of Noble Gulch.

[a] Allocation-1: Fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 400 MPN per 100 mL.

[b] Allocation 2: Allocation of zero; no loading allowed from this source.

Should all control measures be in place and pathogen indicator organism levels remain high, investigations (e.g., genetic studies to isolate sources or other appropriate monitoring) can be used to determine if the high levels of indicator organisms are due to uncontrollable sources. Responsible parties may demonstrate that controllable sources of pathogen indicator organisms are not contributing to exceedance of water quality objectives in receiving waters. If this is the case, staff may consider re-evaluating the numeric targets and allocations. For example, staff may propose a site-specific objective to be approved by the Central Coast Water Board. The site-specific objective would be based on evidence that uncontrollable natural sources alone were the cause of exceedances of the numeric targets.

In some situations, a responsible party may demonstrate that their allocation is met by demonstrating that all necessary control measures to achieve the allocation are in place. Staff will review these situations on a case-by-case basis.

The parties responsible for the allocations to controllable sources are not responsible for the allocation to natural sources.

The TMDL is achieved when the numeric target is consistently met in the impaired waters of Soquel Lagoon, Soquel Creek, and Noble Gulch.

8.2. Margin of Safety

Each TMDL requires a margin of safety component that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving water (CWA 303(d)(1)(C)). A margin of safety is incorporated implicitly in the TMDLs through conservative assumptions; a margin of safety has been established implicitly through the use of protective numeric targets equal to existing water quality objectives for the Soquel Lagoon, Soquel Creek, and Noble Gulch.

The pathogen TMDLs for the Soquel Lagoon, Soquel Creek and Noble Gulch are the water quality objective for protection of the water contact recreation beneficial use. The Central Coast Region Water Quality Control Plan states that, "controllable water quality shall conform to the water quality objectives. When other conditions cause degradation of water quality beyond the levels or limits established as water quality objectives, controllable conditions shall not cause further degradation of water quality" (Basin Plan, p. III-2).

Because the allocation for controllable sources is set at the existing water quality objective, if achieved, these allocations will by definition contribute as much as possible to achieving the water quality objectives in the receiving water. Thus, in these TMDLs there is no uncertainty relative to the load effect from controlled sources on water quality.

9. PUBLIC PARTICIPATION

Public participation began when the County developed a report required by Proposition 13 Grant Funds. The grant required a Technical Advisory Committee (TAC) to meet periodically.

Staff communicated with key personnel from the County of Santa Cruz, County of Santa Cruz Sanitation District, Coastal Watershed Council, and City of Capitola.

Central Coast Water Board staff presented project reports for these TMDLs at two meetings. Central Coast Water Board staff solicited comments at both these meetings. One meeting was held during the early phase of the Central Coast Water Board project plan development on November 16, 2005. At the second meeting, on June 26, 2006, Central Coast Water Board staff presented preliminary project report findings. Central Coast Water Board staff incorporated public comments into this document where appropriate. Staff also scoped issues pursuant to the California Environmental Quality Act at this meeting. Staff will prepare environmental documents indicating any potential environmental impacts and considering alternative allocations schemes or implementation strategies prior to soliciting formal public comments on these TMDLs and implementation plan.

Central Coast Water Board staff solicited public comments before the Water Board public hearing to consider adoption of the Soquel Lagoon, Soquel Creek, and Noble Gulch TMDLs. Staff received comments from:

1. Teri Caddell, A-1 Septic Service, Inc. in a letter dated December 6, 2007,
2. John Ricker, Water Resources Division Director, Santa Cruz County Environmental Health Services, in an email dated January 23, 2008. Comments from the abovementioned individual/agency are included as Attachment 7 to the staff report. Some comments resulted in changes to the Project Report and are noted in Attachment 7.

On March 21, 2008 in Salinas, California, the Central Coast Water Board held a public hearing and heard and considered all public comments and evidence in the record regarding the TMDLs, Implementation plan and removal of the shellfish harvesting beneficial use. The TMDLs and implementation plan were amendments included in resolution no. R3-2008-0002. The Central Coast Water Board also adopted resolution no. R3-2008-0002 on March 21, 2008.

On November 6, 2008, the Central Coast Water Board's Executive Officer withdrew resolution no. R3-2008-0002 from consideration for adoption by the State Water Resources Control Board. The Executive Officer withdrew the resolution for consideration due to State Board staff's request to clarify language regarding the amendments before submittal to the State Water Resources Control Board for approval. The clarifications included changing the allocations to human sources to zero, clarifying and simplifying the prohibition language and changing some of the nonpoint sources to point sources.

On May 8, 2009 in San Luis Obispo, California, the Central Coast Water Board held a public hearing and heard and considered all public comments and evidence in the record.

10. IMPLEMENTATION PLAN

The purpose of the Implementation Plan is to describe the steps necessary to reduce pathogen loads and to achieve these TMDLs. The Implementation Plan identifies the following: 1) actions expected to reduce pathogen loading; 2) parties responsible for taking these actions; 3) regulatory mechanisms by which the Central Coast Water Board will assure these actions are taken; 4) reporting and evaluation requirements that will indicate progress toward completing the actions; 5) and a timeline for completion of implementation actions. The Implementation Plan also addresses economic considerations to achieve compliance. A monitoring plan designed to measure progress toward water quality goals is included in the following section.

Recall from Section 1.5 *Waste Discharge Prohibition* that staff is proposing to address specific types of nonpoint sources of pollution in the Soquel Lagoon Watershed by adding the Watershed as a named area subject to two proposed nonpoint source pollution prohibitions: (1) the Human Fecal Material Discharge Prohibition and (2) the Domestic Animal Waste Discharge Prohibition. Also, recall that these two prohibitions will be proposed as amendments to the Basin Plan with the TMDLs for the Pajaro River Watershed at the March 20, 2009 Board Meeting (see Resolution No. RB3-2009-0008). Some of the required implementation actions described in the following subsections are actions required to demonstrate compliance with the Human Fecal Material Discharge Prohibition and the Domestic Animal Waste Discharge Prohibition.

Staff differentiated existing versus proposed requirements as presented below.

10.1. Implementation Actions

Staff discusses the proposed actions necessary for the water bodies to attain pathogen indicator organism water quality objectives in this section. The actions are presented with the sources of pathogen indicator organisms to the Soquel Creek Watershed.

10.1.1. Sanitary Sewer Collection System Spills and Leaks

Entities with jurisdiction over sewer collection systems in the Soquel Lagoon Watershed can demonstrate compliance with these TMDL load allocations through Waste Discharge Requirements and/or NPDES permits.
The Santa Cruz County Sanitation District (SCCSD) must continue to implement its Collection System Management Plan, as required by Waste Discharge Requirements (WDR Order No. R3-2005-0043).

In addition, the SCCSD is required to improve maintenance of their sewage collection system, including identification, correction, and prevention of sewage leaks in portions of the collection systems that run through, or adjacent to, impaired surface waters within the Soquel Creek Watershed.

To this end, within six months following adoption of these TMDLs by the Office of Administrative Law, the Executive Officer will issue a letter pursuant to Section 13267 of the California Water Code requiring: 1) submittal within one year of, a technical report that describes how and when the SCCSD will conduct improved collection system maintenance in portions of the collection system most likely to affect impaired surface water bodies, with the end result being compliance with its TMDL allocation, 2) stream monitoring for fecal coliform or another fecal indicator bacteria and reporting of these monitoring activities, and 3) annual reporting of self-assessment as to whether the SCCSD is in compliance with the TMDL allocation.

10.1.2. Storm Drain Discharges

The Central Coast Water Board will address fecal indicator bacteria (FIB), e.g. fecal coliform and/or other indicators of pathogens, discharged from the County of Santa Cruz and the City of Capitola by regulating the MS4 entities under the provisions of the State Water Resource Control Board's General Permit for the Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems (General Permit) (NPDES No. CAS000004). As enrollees under the General Permit, the MS4 entities must develop and implement Storm Water Management Plans (SWMPs) that control urban runoff discharges into and from their MS4s. To address the MS4 entities' TMDL wasteload allocations, the Central Coast Water Board will require the MS4 entities to specifically target FIB in urban runoff through incorporation of Wasteload Allocation Attainment Program in their SWMPs.

The Central Coast Water Board will require the Wasteload Allocation Attainment Program to include descriptions of the actions that will be taken by the MS4 entities to attain the TMDL wasteload allocations, and specifically address:

1. Development of an implementation and assessment strategy;
2. Source identification and prioritization (including leaks to storm sewers from private laterals);
3. Best management practice identification, prioritization, implementation schedule, analysis, and effectiveness assessment;
4. Monitoring program development and implementation;
5. Reporting; including evaluation whether current best management practices are progressing towards achieving the wasteload allocations within thirteen years of the date that the TMDLs are approved by the Office of Administrative Law;
6. Coordination with stakeholders; and
7. Other pertinent factors.

The Wasteload Allocation Attainment Program will be required by the Central Coast Water Board to address each of these TMDLs that occur within the MS4 entities' jurisdictions.

The Central Coast Water Board will require the Wasteload Allocation Attainment Program to be submitted at one of the following milestones, whichever occurs first:

1. Within one year of approval of the TMDLs by the Office of Administrative Law;
2. When required by any other Water Board-issued storm water requirements (e.g., when the Phase II Municipal Storm Water Permit is renewed).

For those MS4 entities that are enrolled under the General Permit at the time of Wasteload Allocation Attainment Program submittal, the Wasteload Allocation Attainment Program must be incorporated into the SWMPs when they are submitted. For those MS4 entities that are not enrolled under the General Permit at the time of Wasteload Allocation Attainment Program submittal, the Wasteload Allocation Attainment Program must be incorporated into the SWMPs when the SWMPs are approved by the Central Coast Water Board.

The Executive Officer or the Central Coast Water Board will require information that demonstrates implementation of the actions described above, pursuant to applicable sections of the California Water Code and/or pursuant to authorities provided in the General Permit for storm water discharges.

10.1.3 Private Sewer Laterals to the Sanitary Collection System

Individual owners and operators of private laterals to sanitary sewer collection systems are ultimately responsible for maintenance of their private laterals and are, therefore, responsible for complying with the Human Fecal Material Discharge Prohibition; compliance with the Human Fecal Material Discharge Prohibition implies compliance with their load allocation for these TMDLs.

The Central Coast Water Board requires immediate cessation of leaks from private laterals.

The Central Coast Water Board has identified leaks from private laterals located in the City of Capitola and County of Santa Cruz as a source of fecal indicator bacteria in municipal separate storm sewer systems (MS4s). Therefore, enrollees for the City of Capitola and County of Santa Cruz' General Permit for the Discharges of Storm Water from Small Municipal Separate Storm Sewer Systems will address fecal indicator bacteria from private lateral leaks in the Wasteload Allocation Attainment Program (as described in the following section).

10.1.4. Domestic Animal Discharges Not Regulated by WQ Order No. 2003-0005-DWQ [Storm Water General Permit]

Owners and/or operators of lands containing domestic animals (including pets, farm animals, and livestock) in the Soquel Creek Watershed and Noble Gulch Watershed must comply with the Domestic Animal Waste Discharge Prohibition; compliance with the Domestic Animal Waste Discharge Prohibition implies compliance with the load allocation for these TMDLs.

Within three years of approval of these TMDLs by the Office of Administrative Law, the Executive Officer will notify owners and/or operators of lands used for/containing domestic animals of the requirement to comply with the Domestic Animal Waste Discharge Prohibition. In his notification, the Executive Officer will also describe the owner's/operator's of lands containing domestic animals options for demonstrating compliance with the Domestic Animal Waste Discharge Prohibition; pursuant to California Water Code section 13267 and within six months of the notification by the Executive Officer, owners/operators of lands containing domestic animals will be required to submit the following for approval by the Executive Officer or the Water Board:

1) Clear evidence that the owner/operator of lands containing domestic animals is and will continue to be in compliance with the Domestic Animal Waste Discharge Prohibition; clear evidence could be documentation submitted by the owner/operator to the Executive Officer validating current and continued compliance with the Prohibition, or
2) A plan for compliance with the Domestic Animal Waste Discharge Prohibition. Such a plan must include a list of specific management practices that will be implemented to control discharges containing fecal material from domestic animals. The plan must also describe how implementing the identified management practices are likely to progressively achieve the load allocations to domestic animals, with the ultimate goal achieving the load allocations no later than thirteen years after Office of Administrative Law approval of these TMDLs. The plan must include monitoring and reporting to the Central Coast Water Board, demonstrating the progressive progress towards achieving load allocations for discharges from domestic animals, and a self-assessment of this progress. The plan may be developed by an individual discharger or by or for a coalition of dischargers in cooperation with a third-party representative, organization, or government agency acting as the agents of owners/operators of lands containing domestic animals, or
3) Submittal of a Report of Waste Discharge pursuant to California Water Code Section 13260 (as an application for waste discharge requirements; WDRs or National Pollutant Discharge Elimination System (NPDES permit)).

10.1.5. Homeless Person/Encampment Discharges Not Regulated by WQ Order No. 2003-0005-DWQ [Storm Water General Permit]

Owners of land that contain homeless persons and/or homeless encampments in the Soquel Lagoon Watershed must comply with the Human Fecal Material Discharge Prohibition.

Owners of land with homeless persons must demonstrate to the satisfaction of the Executive Officer or the Water Board that they are in compliance with the Human Fecal Material Discharge Prohibition; compliance with the Human Fecal Material Discharge Prohibition implies compliance with the load allocation for these TMDLs.

Within three years of approval of these TMDLs by the Office of Administrative Law, the Executive Officer will notify owners of land containing homeless persons of the requirement to comply with the Human Fecal Material Discharge Prohibition. In his notification, the Executive Officer will also describe owner's options for demonstrating compliance with the Human Fecal Material Discharge Prohibition; pursuant to California Water Code 13267 and within six months of the notification by the Executive Officer, owners will be required to submit the following for approval by the Executive Officer or the Water Board:

1) Clear evidence that the owner is and will continue to be in compliance with the Human Fecal Material Discharge Prohibition; clear evidence could be documentation submitted by the owner to the Executive Officer validating current and continued compliance with the Prohibition, or
2) A plan for compliance with the Human Fecal Material Discharge Prohibition. Such a plan must include a list of specific management practices that will be implemented to control discharges containing fecal material from homeless persons. The Plan must also describe how implementing the identified management practices are likely to progressively achieve the load allocation for homeless persons, with the ultimate goal achieving the load allocation no later than three years from the date of the Executive Officer's notification to the owner requiring compliance. The plan must include monitoring and reporting to the Central Coast Water Board, demonstrating the progressive progress towards achieving load allocations for discharges from homeless persons, and self-assessment of this progress, or
3) Submittal of a Report of Waste Discharge pursuant to California Water Code Section 13260 (as an application for waste discharge requirements).

10.2. Evaluation of Implementation Progress

Every three years, beginning three years after TMDLs are approved by the Office of Administrative Law, the Central Coast Water Board will perform a review of implementation actions, monitoring results, and evaluations submitted by responsible parties of their progress towards achieving their allocations. The Central Coast Water Board will use annual reports, nonpoint source pollution control implementation programs, evaluations submitted by responsible parties, and other available information to determine progress toward implementing required actions and achieving the allocations and the numeric target.

Responsible parties will continue monitoring and reporting according to this plan for at least three years, at which time the Central Coast Water Board will determine the need for continuing or otherwise modifying the monitoring requirements. Responsible parties may also demonstrate that although water quality objectives are not being achieved in receiving waters, controllable sources of pathogens are not contributing to the exceedance. If this is the case, the Central Coast Water Board may re-evaluate the numeric target and allocations. For example, the Central Coast Water Board may pursue and approve a site-specific objective. The site-specific objective would be based on

evidence that natural, or background sources alone were the cause of exceedances of the Basin Plan water quality objective for fecal indicator bacteria.

Three-year reviews will continue until the water quality objectives are achieved. The compliance schedule for achieving the allocations and numeric target required under these TMDLs is 13 years after the date of approval by the Office of Administrative Law.

10.3. Timeline and Milestones

Staff anticipates that the allocations, and therefore the TMDL, will be achieved thirteen years from the date the TMDL becomes effective (which is upon approval by the California Office Administrative Law). This estimation is in part based on the difficulty of identifying responsible parties of nonpoint sources and their inexperience with complying with the Aptos-Soquel prohibition. The estimation is also based on the uncertainty of the time required for in-stream water quality improvements resulting from management practices to be realized. Staff anticipates that the full in-stream positive effect of all the management measures will be realized gradually.

Stormwater permits or nonpoint source implementation programs may include additional provisions that the Central Coast Water Board determines are necessary to control pollutants (CWA section 402(p)(3)(B)(iii)). The Central Coast Water Board will consider additional requirements if implementation of management practices do not result in achievement of water quality objectives.

10.4. Economic Considerations

Overview

Porter-Cologne requires that the Central Coast Water Board take "economic considerations", into account when requiring pollution control requirements (Public Resources Code, Section 21159 (a)(3)(c)). The Central Coast Water Board must analyze what methods are available to achieve compliance and the costs of those methods."

Staff identified a variety of costs associated with implementation of these TMDLs. Costs fall into four broad categories: 1) planning or program development actions (e.g., establishing nonpoint source implementation programs, conducting assessments, etc.); 2) implementation of management practices for permanent to semi-permanent features; and 3) TMDL inspections/monitoring; and 4) reporting costs.

Anticipating costs with any accuracy is challenging for several reasons. Many of the actions, such as review and revision of policies and ordinances by a governmental agency, could incur no significant costs beyond the program budgets of those agencies. However, other actions, such as establishing nonpoint source implementation programs and establishing assessment workplans carry discrete costs. Cost estimates are further complicated by the fact that some implementation actions are necessitated by other regulatory requirements (e.g., Phase II Storm water) or are actions anticipated regardless of TMDL adoption. Therefore assigning all of these costs to TMDL implementation would be inaccurate.

Cost Estimates

Storm Drain Discharges

The State Water Resources Control Board adopted an NPDES General Permit for storm water discharge. The General Permit requires smaller State municipal dischargers, such as the County of Santa Cruz and the City of Capitola, to develop and implement a Storm Water Management Program (SWMP). As of the date of writing this report, the City and County have submitted a SWMP for the Central Coast Water Board's approval. The Central Coast Water Board has not approved Storm Water Management Programs for the above agencies.

Staff notes that the County and Cities have a difficult time collecting costs for the SWMP from individual property owner, and could require a proposition 218 vote. This may impose a financial hardship upon the County and Cities. The federal Clean Water Act requires compliance with NPDES permits. The costs associated with compliance with the TMDL are, therefore, no different than the costs required to comply with the NPDES permit.

Planning or Program Development Actions: Central Coast Water Board staff estimate no significant costs beyond the local agency program budget.

Stormwater Plan Implementation:

To implement the requirements of the TMDL, the Central Coast Water Board may ask local agencies to develop additional management measures for pathogen reduction; identify measurable goals and time schedules for implementation; develop a monitoring program; and assign responsibility for each task. The specifics of the storm water program efforts will not be known until Central Coast Water Board adoption of the SWMP occurs. An estimate of the storm water program efforts and their associated costs are provided below.

The University of South California conducted a survey of NPDES Phase I Stormwater Costs in 2005 (Center for Sustainable Cities, University of Southern California, 2005). They determined the annual cost per California household ranged from $18.00 to $46.00. However, these costs were just to keep the existing plan running and did not include start-up costs which may increase the total cost per household. According to Central Coast Water Board Stormwater Unit staff, recently approved Phase II SWMPs in Region 3 ranged from $21.00 to $130.00 per household. Stormwater Unit staff reported that the wide range of costs in both cases was based on many factors including the amount of revenue generated by the municipality, the size of the area covered by the SWMP, and because some municipalities did not include the cost of programs such as street sweeping that are already accounted for in other program budgets, while other municipalities did include this cost.

It was difficult for staff to estimate the cost of a SWMP for the above reasons. To get a rough idea of how much a SWMP program would cost in the Soquel Watershed, staff calculated an average annual cost from the range of costs for recently approved Phase II SWMPs in Region 3 ($21.00 in Seaside to $130.00 in the City of Monterey). Staff calculated an average annual cost of $77.00 per household. Staff used this cost per household to estimate the cost per year of SWMP implementation in the County of Santa Cruz and the City of Capitola.

Soquel Lagoon Unincorporated Area: 10,429 (population) (http://www.homegain.com/local_real_estate/CA/soquel.html, June 5, 2007) (÷ 2.71 persons per household[3] (http://quickfacts.census.gov/qfd/states/06/06087.html) (x $77.00 cost per household per year)) = $296,322 per year.

City of Capitola: 10,033 (population) http://www.ci.capitola.ca.us/capcity.nsf/vlookup/FINAL%20ELEMENT%20-%20COUNCIL%20ADOPTED%203-25-04_2/$file/FINAL%20ELEMENT%20-%20COUNCIL%20ADOPTED%203-25-04_2.pdf, March 2004) (÷2.11 persons per household (http://www.ci.capitola.ca.us/capcity.nsf/vlookup/FINAL%20ELEMENT%20-%20COUNCIL%20ADOPTED%203-25-04_2/$file/FINAL%20ELEMENT%20-

[3] Average Santa Cruz County occupancy

%20COUNCIL%20ADOPTED%203-25-04_2.pdf) (x $77.00 cost per household per year) = $366,133 per year.

The agencies mentioned above are required to develop and implement a storm water program for this Watershed independently of the Basin Plan amendment. Since this is an existing requirement under Phase II of the storm water program, no additional cost is estimated for implementing the existing storm water management program. Some additional implementation measures or management programs may be needed for pathogen reductions. The specific measures are not known at this time. However, the California Regional Water Quality Control Board, San Francisco Bay Region's *Pathogens in the Napa River Watershed Total Maximum Daily Load* , June 14, 2006, Marin County estimated additional pathogen-specific measures would result in a 2 to 15 percent increase to their annual program budget. Therefore staff estimates the total cost between the following minimum and maximum ranges:

Soquel Lagoon Unincorporated Area: $296,322 per year x 1.02 % minimum increase=302,248 minimum increase
$296,322 per year x 1.15 % maximum increase=340,770 maximum increase

City of Capitola: $366,133 per year x 1.02 % minimum increase=373,456 minimum increase
$366,133 per year x 1.15 % maximum increase=$421,053 maximum increase

Inspections/Monitoring: Central Coast Water Board staff is proposing the above Agencies monitor storm drains. The purpose of the monitoring is to determine the effectiveness of management measures. (The Central Coast Water Board will not impose targets/allocations as effluent limits on an Agency.)

Central Coast Water Board staff estimated monitoring will the County and City approximately $5,000 per year. According to John Ricker County of Santa Cruz Environmental Health Services, the cost of sampling is $40 for sample collection and field analysis plus $20 for each bacterial sample (personal communication, September 18, 2007), for a total of $60 per sample. Staff proposed the County sample each storm drain 10 times per year. Staff also estimated approximately 5 sample sites will be analyzed per year. Therefore, staff estimated the total water sampling cost per year at approximately $3,000 ($60/sample x 10 samples x 5 sites). Water Board staff also assumed County or City staff resources will cost $200 per sampling day. Therefore total sampling costs per year including staff resources would cost approximately $5,000 ($3,000 + ($200/sampling day x 10 sampling days/year)).

Reporting: The City of Santa Cruz and Scotts Valley/County of Santa Cruz are required to report independent of the TMDL under Phase II of the municipal storm water program. Therefore, no costs have been estimated for reporting.

Private Lateral Upgrades

Implementation: According to the Proposition 13 Report, the cost to repair a leaking private lateral is estimated to be $5,000.

Inspections/Monitoring: According to the Proposition 13 Report, the cost to test for leaking private laterals is approximately $1,000.

Reporting: Responsible parties shall submit a report documenting that their private sewer lateral was inspected and/or repaired or replaced and is effectively minimizing pathogen discharges. Water Board staff estimated this report will require approximately six hours or less of land owner time.

Farm Animals and Livestock

Planning or Program Development Actions: The cost to develop pathogen control measures at these facilities will vary from site to site depending upon constraints present at each site. Central Coast Water Board staff estimates that approximately eight hours is necessary for planning control actions.

Farm Animals and Livestock Plan Implementation:

There are a variety of methods owners of farm animals and livestock can use to help control wastes. Some methods include installing livestock exclusion barriers, stables for horses, corrals, and manure bunkers at locations that prevent runoff from entering surface waters.

1. Livestock Exclusion Barriers: According to the U.S. EPA, the cost of permanently excluding livestock from areas where animal waste can impact surface waters ranges from $2,474/mi to $4,015/mi (*Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. 840-B-92-002,* United States Environmental Protection Agency, January 1993).

2. Horse Stables: Horses can be boarded at stables. According to the American Miniature Horse Association, miniature horses can be board in a professional stable for $50 to $150 per month per horse and full size horses can be boarded for $200 to $550 per month per horse. The cost depends on the facilities, pasture, and riding opportunities (http://www.amha.com/MarketTools/Profitibility.html).

3. Corral Cost: According to a Progressive Farmer website, a corral (excluding the head gate) can cost less than $7,000. Gates cost the most-between $3,000 and $4,000 (http://www.progressivefarmer.com/farmer/animals/article/0,24672,1113452,00.html).

4. Manure Bunker Costs: Ecology Action has worked with landowners to install manure bunkers. Manure bunkers help prevent storm waters from infiltrating the manure thereby causing runoff of pollutants from the manure. According to Ecology Action, the average cost for constructing a manure bunker on properties in the San Lorenzo watershed was

approximately $4000.00. (Each bunker was constructed on an existing cement slab, or a new one was poured and employed some type of cover - either a permanent roof or a tarp.) The cost of bunker construction varies greatly depending on the size and materials choice. When looking at bunkers for the entire program, costs ranged from $3000 to $15,000 (Reference: E-mail dated 5-1-2007 from Jennifer Harrison of Ecology Action).

Inspections/Monitoring: The landowner cost for inspections/monitoring will vary depending upon the elements of the Nonpoint Source Implementation Program. The cost could be low if daily property walks occur to assess and repair discharges. Costs are higher if a landowner performs water quality monitoring.

Reporting: Central Coast Water Board staff estimated it would take approximately eight hours of land owner time to prepare a report to the Water Board. This report is required every three years.

Homeless Person/Encampment Discharges:

Planning or Program Development Actions: The approaches used to control homeless encampment waste can range from a land owner: 1) installing barriers to 2) participating with local agencies to develop a comprehensive Watershed-wide solution. Central Coast Water Board staff estimates that the planning cost for an approach such as installing barriers may require approximately eight hours of land owner time. Landowners may devote more time to comprehensive Watershed-wide approaches.

Homeless Encampment Waste Plan Implementation:

The Central Coast Water Board will identify possible properties with homeless encampments. The methods used to control these wastes will be developed by landowners. However, some possibilities for controlling wastes include hiring security to patrol areas used by homeless, utilizing portable toilets, and fencing. The web site http://www.security-ess.com/DesignDetail.html indicates the cost of security guards range from $25 - $40 per hour. This service provides guards for a six hour minimum per guard per day.

Staff contacted a service that provides portable toilets. This service provides a portable toilet for $95 per month (personal communication with Ace Portable Services, Santa Cruz, CA, January 23, 2007). Staff also contacted a service that provides security fences. The cost of a six foot chain link fence with 3 strands of barbed wire on the top is $1,800 per 100 feet or $15,000 per 1000 feet (personal communication with Affordable Fence Company, Santa Cruz, CA, January 23, 2007.)

Inspections/Monitoring: Land owners could utilize various approaches to inspect lands for homeless encampments. Again, the approach is dependant upon whether the land owner uses an approach in which the land owner is responsible for inspecting the property or local agencies are able to provide inspection services. The cost for security guards, mentioned above, is one means to estimate this cost.

Reporting: The Central Coast Water Board will identify possible properties with homeless encampments. Identified responsible parties are required to submit reports to the Water Board. All land responsible parties shall submit a report documenting that measures are in place and effectively minimizing discharges or demonstrating that no discharge is occurring from homeless encampments. Central Coast Water Board staff estimate this report will require approximately eight hours of the responsible parties time.

Cost Summary

These costs are reasonable relative to the water quality benefits to be derived.

11. MONITORING PLAN

11.1. Introduction

The Monitoring Plan outlines the monitoring sites, frequency of monitoring, and parties responsible for monitoring. The monitoring for compliance and evaluation of these TMDLs are the minimum staff concludes is necessary. However, if a change in these requirements is warranted after the TMDLs are approved, the Executive Officer and/or the Central Coast Water Board will require such changes.

11.2. Monitoring Sites, Frequency, and Responsible Parties

The following monitoring plan proposes specific monitoring sites, frequency, and indicators to be monitored. Staff will work with parties responsible for monitoring when the implementation and monitoring phase of the project commences, and will make revisions, where appropriate, to the monitoring plan outlined below.

Central Coast Water Board staff proposes fecal coliform monitoring in receiving waters at the following stations:

- Soquel Lagoon at Flume Outlet/Inlet
- Soquel Creek above Noble Gulch
- Soquel Creek at 2525 Main Street
- Soquel Creek at Bates Creek
- Noble Gulch at Soquel Creek
- Noble Gulch at Highway One
- Noble Gulch at Victory Lane/Coyote Canyon

In addition to the receiving water locations, staff also proposes fecal coliform monitoring in stormwater at the Monterey Ave. station. This is the same station sampled by the Coastal Watershed Council (CWC) located along Monterey Avenue approximately 0.6 mile east of Soquel Lagoon and approximately 100 feet southwest of Noble Gulch. The City of Capitola and the County of Santa Cruz will identify additional stormwater outfall locations at which stormwater will be sampled and submit for approval by the Executive Office of the Central Coast Water Board.

Storm drain samples will not be used to determine if the TMDL is attained. The Central Coast Water Board will use receiving water samples to determine compliance.

Monitoring activities will commence as directed by the Executive Officer of the Central Coast Water Board. Each party responsible for monitoring will be required to provide the data to the Central Coast Water Board.

Table 11-1 identifies the responsible party, monitoring site, sampling period, number of samples, and constituent. Most stations have more than one responsible party indicated for monitoring. This reflects the fact that multiple parties are known, or, potential sources of pathogens and thus share responsibility for monitoring. The responsible party must provide the data to the Central Coast Water Board.

Table 11-1. Monitoring Required

RECEIVING WATER MONITORING				
Responsible Party	**Monitoring Site**	**Sampling Period**	**Number of Samples**	**Constituent (#/100 mL)**
City of Capitola, Santa Cruz County	Soquel Lagoon at Flume Outlet	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
City of Capitola, Santa Cruz County	Soquel Creek above Noble Gulch	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
City of Capitola, Santa Cruz County	Soquel Creek at 2525 Main Street	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
City of Capitola, Santa Cruz County	Soquel Creek at Bates Creek	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
City of Capitola, Santa Cruz County	Noble Gulch at Soquel Creek	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
City of Capitola, Santa Cruz County	Noble Gulch at Victory Lane/Coyote Canyon	Weekly	1	Fecal Coliform
		One month in each of the last three years of sampling [1]	5	
STORM WATER MONITORING				
Responsible Party	**Monitoring Site**	**Sampling Period**	**Number of Samples[1]**	**Constituent (#/100 mL)**
City of Capitola and Santa Cruz County	Monterey Ave. (previously sampled CWC station)	Dry Season	5	Fecal Coliform
		Wet Season	5	
City of Capitola and Santa Cruz County	To be determined	Dry Season	5	Fecal Coliform
		Wet Season	5	
City of Capitola and Santa Cruz County	To be determined	Dry Season	5	Fecal Coliform
		Wet Season	5	
City of Capitola and Santa Cruz County	To be determined	Dry Season	5	Fecal Coliform
		Wet Season	5	
City of Capitola and Santa Cruz County	To be determined	Dry Season	5	Fecal Coliform
		Wet Season	5	

[1] Responsible Party must determine which month will produce samples with the best representation of water quality conditions, i.e., not at the end of major storm events, not when Creek is dry.

Landowner monitoring for pathogen indicator organisms may provide evidence of complying with load allocations. Landowners have the option of performing individual monitoring or participating in a cooperative monitoring program. Individual landowner monitoring can comprise either water quality monitoring or other forms of monitoring (such as a report documenting visual site inspections supported by site photos). The Central Coast Water Board staff will review data every three years to determine compliance with these TMDLs. If the executive officer determines additional monitoring is needed, he shall request it pursuant to Section 13267 or other appropriate sections of the California Water Code.

11.3. Reporting

The Central Coast Water Board will issue a Water Code Section 13267 letter to the parties responsible for receiving water monitoring and implementation reporting described in Table 10-1. Section 13267 states the Water Board may investigate water quality and the Water Board may require suspected dischargers to furnish monitoring program reports.

The parties responsible for implementation and monitoring will incorporate the results of monitoring efforts in reports filed pursuant to the NPDES, WDR, Small MS4 Stormwater Permit, Nonpoint Source Implementation Program, or other correspondence as requested by the Central Coast Water Board pursuant to California Water Code Section 13267 or 13383.

If reporting changes become necessary based on staff's assessment of these TMDLs implementation progress, the Executive Officer or the Central Coast Water Board will require such changes. At a minimum, the Central Coast Water Board will evaluate monitoring reporting data and implementation reporting information every three years.

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12. APPENDIX-A DATA

Please see accompanying appendix to this report.

13. APPENDIX-B DATA ANALYSIS

Please see accompanying appendix to this report.

14. APPENDIX-C MICROBIAL SOURCE TRACKING DATA

Please see accompanying appendix to this report.

15. APPENDIX-D USE ATTAINABILITY ANALYSIS

Please see accompanying appendix to this report.

APPENDIX A. FECAL COLIFORM SAMPLING DATA

Soquel Creek Water Quality Data for Sampling Stations S0, S04, S07, S23, S2315, and S6 Used in FECIA Analysis (see sampling station codes at end of tables)

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
01/06/03	190	02/17/05	520	01/28/03	637	1/21/04	50	06/16/03	160	01/13/03	100		
01/06/03	10000	02/23/05	190	03/12/03	98	3/9/04	20	06/19/03	92	02/10/03	240		
01/22/03	210	03/01/05	230	03/27/03	110	3/23/04	3010	03/30/04	480	03/12/03	60		
01/27/03	350	03/10/05	60	04/30/03	693	3/25/04	1220	05/13/04	100	04/08/03	290		
02/03/03	370	03/16/05	250	05/28/03	272	3/30/04	340	02/17/05	40	05/12/03	560		
02/10/03	1460	03/22/05	3100	06/25/03	216	4/26/04	160	02/23/05	40	06/09/03	180		
02/18/03	420			07/23/03	213	5/13/04	210	03/01/05	60	07/07/03	90		
02/24/03	2660			08/25/03	488	6/15/04	680	03/16/05	20	09/09/03	40		
03/03/03	760			09/23/03	269	6/16/04	420	03/22/05	7920	10/14/03	140		
03/17/03	710			10/21/03	146	6/24/04	200	04/06/05	50	11/10/03	610		
03/24/03	930			11/20/03	292	7/19/04	520	04/19/05	55	12/08/03	70		
04/01/03	880			12/18/03	109	8/2/04	330	05/10/05	50	01/12/04	90		
04/07/03	450			05/13/04	40	8/18/04	40	05/25/05	90	02/09/04	30		
04/21/03	600			02/17/05	640	9/21/04	120	06/06/05	300	03/08/04	60		
04/29/03	320			02/23/05	130	2/17/05	40	06/21/05	120	04/13/04	130		
05/05/03	90			03/01/05	170	2/23/05	10	07/11/05	124	04/23/04	150		
05/12/03	40			03/16/05	150	3/1/05	40	08/04/05	130	05/10/04	230		
05/19/03	490			03/22/05	4410	3/10/05	70	08/18/05	240	06/08/04	40		
05/27/03	410			04/01/05	60	3/16/05	40	08/30/05	160	06/17/04	40		
06/02/03	540			04/06/05	50	3/22/05	6700	09/12/05	100	07/12/04	36		

[1] Fecal Coliform Concentration (#/100ml)

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
06/09/03	640			04/19/05	30	4/6/05	20	09/28/05	160	08/11/04	70		
06/16/03	630			05/10/05	420	4/11/05	130	10/12/05	25	09/14/04	170		
06/23/03	530			05/17/05	230	4/19/05	25	10/24/05	80	10/12/04	200		
06/30/03	570			05/25/05	150	4/25/05	16	11/15/05	205	11/09/04	60		
07/07/03	2020			06/01/05	201	5/6/05	216	11/28/05	90	12/13/04	30		
07/14/03	500			06/06/05	180	5/10/05	140	12/13/05	50	01/10/05	40		
07/21/03	610			06/15/05	532	5/17/05	230	12/29/05	80	02/07/05	50		
07/28/03	260			06/21/05	600	5/17/05	230	01/11/06	60	03/08/05	80		
08/19/03	670			06/28/05	640	5/17/05	230	01/23/06	92	04/12/05	100		
08/26/03	570			07/11/05	140	5/25/05	115	02/08/06	32	05/10/05	30		
09/02/03	1300			07/19/05	270	6/6/05	220	02/23/06	8	06/13/05	80		
09/08/03	242			08/04/05	105	6/6/05	220	03/06/06	160	07/12/05	130		
09/15/03	690			08/10/05	310	6/15/05	168	03/22/06	20	09/13/05	104		
09/22/03	1170			08/18/05	500	6/21/05	110	04/12/06	425	09/22/05	200		
09/29/03	750			08/22/05	330	6/28/05	140	04/25/06	60	10/11/05	80		
10/06/03	830			08/30/05	20	7/11/05	112			11/14/05	65		
10/14/03	360			09/07/05	460	7/11/05	80			12/12/05	455		
10/20/03	780			09/12/05	220	7/19/05	130			01/10/06	30		
10/28/03	480			09/20/05	420	8/4/05	240			02/13/06	40		
11/03/03	3060			09/28/05	210	8/4/05	240			03/15/06	50		
11/10/03	990			10/03/05	490	8/10/05	4990			04/10/06	180		
11/17/03	1470			10/12/05	110	8/11/05	80			05/09/06	45		
11/24/03	870			10/19/05	220	8/18/05	230						
12/01/03	2000			10/24/05	190	8/22/05	210						
12/08/03	320			11/03/05	330	8/30/05	100						
12/15/03	1430			11/09/05	1170	9/7/05	250						
12/22/03	550			11/15/05	160	9/12/05	110						
12/29/03	11370			11/22/05	160	9/20/05	104						

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
01/05/04	200			11/28/05	680	9/28/05	130						
01/12/04	80			12/05/05	170	9/28/05	130						
01/20/04	510			12/13/05	240	10/3/05	328						
01/21/04	80			12/19/05	900	10/12/05	70						
01/26/04	50			12/29/05	130	10/19/05	415						
02/02/04	1500			01/03/06	80	10/24/05	370						
02/09/04	350			01/11/06	315	11/3/05	220						
02/17/04	510			01/17/06	580	11/9/05	370						
02/23/04	80			01/23/06	40	11/15/05	615						
03/01/04	770			01/31/06	50	11/22/05	20						
03/08/04	540					11/28/05	160						
03/09/04	160					12/5/05	60						
03/22/04	430					12/13/05	30						
03/23/04	310					12/19/05	640						
03/29/04	470					12/29/05	80						
04/05/04	580					1/3/06	80						
04/13/04	530					1/11/06	65						
04/19/04	360					1/17/06	188						
04/26/04	910					1/23/06	20						
05/03/04	1670					1/31/06	50						
05/10/04	950					2/8/06	8						
05/17/04	590					2/15/06	28						
05/24/04	490					2/23/06	4						
06/01/04	670					3/1/06	80						
06/14/04	1350					3/6/06	360						
06/15/04	1580					3/13/06	60						
06/16/04	1160					3/22/06	30						
06/22/04	1000					3/29/06	1270						

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
06/24/04	1100					4/3/06	60						
06/28/04	560					4/12/06	600						
07/06/04	760					4/17/06	52						
07/12/04	350					4/25/06	35						
07/19/04	1720					5/4/06	72						
07/20/04	1020					5/13/06	120						
07/26/04	940												
08/02/04	3080												
08/02/04	3480												
08/03/04	3480												
08/09/04	1070												
08/16/04	2480												
08/18/04	2700												
08/23/04	1440												
08/30/04	1350												
09/07/04	1280												
09/14/04	520												
09/20/04	1200												
09/21/04	860												
09/28/04	1100												
10/04/04	300												
10/12/04	680												
10/18/04	14850												
10/26/04	21200												
11/01/04	300												
11/09/04	1825												
11/15/04	3075												
11/23/04	850												

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
11/29/04	800												
12/09/04	2300												
12/13/04	260												
12/21/04	150												
12/27/04	2900												
01/04/05	150												
01/10/05	640												
01/18/05	40												
01/24/05	150												
02/01/05	50												
02/07/05	140												
02/15/05	9100												
02/17/05	240												
02/22/05	275												
02/23/05	150												
03/01/05	200												
03/08/05	230												
03/10/05	90												
03/15/05	140												
03/16/05	100												
03/21/05	320												
03/22/05	3840												
03/29/05	260												
04/01/05	80												
04/04/05	90												
04/06/05	100												
04/11/05	310												
04/12/05	160												

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
04/18/05	260												
04/19/05	30												
04/25/05	40												
04/26/05	140												
05/03/05	360												
05/06/05	260												
05/10/05	250												
05/16/05	580												
05/17/05	320												
05/24/05	470												
05/25/05	430												
05/31/05	1050												
06/01/05	545												
06/06/05	1640												
06/07/05	1600												
06/13/05	660												
06/15/05	1056												
06/21/05	980												
06/27/05	640												
06/28/05	440												
07/05/05	470												
07/11/05	670												
07/12/05	460												
07/19/05	400												
07/19/05	370												
07/25/05	540												
08/03/05	2960												
08/04/05	550												

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
08/10/05	1190												
08/16/05	625												
08/18/05	700												
08/22/05	1160												
08/22/05	600												
08/30/05	560												
08/30/05	300												
09/06/05	1020												
09/07/05	250												
09/12/05	156												
09/12/05	410												
09/19/05	424												
09/20/05	1350												
09/27/05	200												
09/28/05	410												
10/03/05	600												
10/04/05	280												
10/11/05	540												
10/12/05	350												
10/17/05	640												
10/19/05	220												
10/24/05	490												
10/25/05	680												
10/31/05	860												
11/03/05	740												
11/08/05	880												
11/09/05	1510												
11/14/05	720												

Date collected at SO	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S23	FeColi[1]	Date collected at S2315	FeColi[1]	Date Collected at S6	FeColi[1]		
11/15/05	1700												
11/21/05	700												
11/22/05	340												
11/28/05	1240												
11/28/05	1340												
12/05/05	440												
12/06/05	580												
12/12/05	740												
12/13/05	380												
12/19/05	800												
12/20/05	260												
12/27/05	100												
12/29/05	240												
01/03/06	120												
01/04/06	120												
01/10/06	100												
01/11/06	540												
01/17/06	130												
01/17/06	300												
01/23/06	300												
01/24/06	100												
01/30/06	390												
01/31/06	80												

Soquel Creek Water Quality Data for Sampling Stations S0, S00, S04, S07, S21, S232, and S2321 Not Used in FECIA Analysis (see sampling station codes at end of tables)

Date collected at S0	FeColi[1]	Date collected at S00	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S21	FeColi[1]	Date collected at S232	FeColi[1]	Date collected at S2321	FeColi[1]
02/7/06	320	06/12/06	3300	04/01/05	40	02/08/06	40	02/17/05	100	6/19/03	88	06/16/03	810
02/8/06	70			04/06/05	30	02/15/06	30	02/23/05	40	3/30/04	170	06/19/03	80
02/13/06	470			04/11/05	100	02/23/06	30	03/01/05	150			05/13/04	100
02/15/06	150			04/19/05	30	03/01/06	70	03/16/05	70				
02/22/06	120			04/25/05	60	03/06/06	420	03/22/05	5470				
02/23/06	160			05/10/05	150	03/13/06	60	04/06/05	5				
03/1/06	130			05/25/05	780	03/22/06	30	04/19/05	10				
03/1/06	140			06/01/05	1935	03/29/06	2070	05/10/05	200				
03/6/06	640			06/06/05	230	04/03/06	260	05/25/05	190				
03/7/06	100			06/06/05	230	04/12/06	2275	06/06/05	120				
03/13/06	155			06/21/05	1020	04/17/06	20	06/21/05	210				
03/15/06	230			07/11/05	420	04/25/06	50	07/11/05	180				
03/21/06	220			07/11/05	750			08/04/05	220				
03/22/06	90			08/04/05	1100			08/18/05	260				
03/27/06	120			08/04/05	1100			08/30/05	100				
03/29/06	1795			08/18/05	1580			09/12/05	160				
04/3/06	480			08/30/05	300			09/28/05	80				
04/4/06	3420			09/12/05	920			10/12/05	50				
04/10/06	160			09/28/05	420			10/24/05	410				
04/12/06	1200			09/28/05	420			11/15/05	290				
04/17/06	260			10/12/05	225			11/28/05	720				
04/18/06	90			10/24/05	280			12/13/05	130				
04/24/06	170			11/15/05	900			12/29/05	90				

[1] Fecal Coliform Concentration (#/100ml)

Date collected at S0	FeColi[1]	Date collected at S00	FeColi[1]	Date collected at S04	FeColi[1]	Date collected at SO7	FeColi[1]	Date collected at S21	FeColi[1]	Date collected at S232	FeColi[1]	Date collected at S2321	FeColi[1]
04/25/06	1530			11/28/05	1000			01/10/06	115				
05/2/06	110			12/13/05	300			01/23/06	20				
05/9/06	380			12/29/05	150			02/08/06	5				
05/15/06	490			01/11/06	480			02/23/06	4				
05/18/06	440			01/23/06	80			03/06/06	480				
05/23/06	360			02/08/06	60			03/22/06	30				
05/30/06	230			02/23/06	30			04/12/06	800				
06/6/06	1250			03/06/06	520			04/25/06	50				
06/12/06	700			03/22/06	80								
06/19/06	428			04/12/06	4375								
06/26/06	580			04/25/06	90								

Soquel Creek Water Quality Data for Sampling Stations S24, S234, S250, S251, S253, S2302, S2305, and S4 Not Used in FECIA Analysis (see sampling station codes at end of tables)

Date collected at S24	FeColi[1]	Date collected at S234	FeColi[1]	Date collected at S251	FeColi[1]	Date collected at S253	FeColi[1]	Date collected at S2302	FeColi[1]	Date collected at S2305	FeColi[1]	Date Collected at S4	FeColi[1]
06/16/03	180	06/16/03	190	04/23/04	850	06/16/03	240	03/25/04	780	03/25/04	930	04/14/04	20
06/19/03	68			06/17/04	60	06/19/03	52					06/17/04	110
						05/13/04	60					05/06/05	220
												09/22/05	30
												05/25/06	605

[1] Fecal Coliform Concentration (#/100ml)

Soquel Creek Water Quality Data for Sampling Station S275
Not Used in FECIA Analysis (see sampling station codes at end of tables)

Date collected at S275	FeColi[1]												
05/13/04	30												

[1] Fecal Coliform Concentration (#/100ml)

Noble Gulch Water Quality Data for Sampling Stations S1, S115, S12, and S125 Used in FECIA Analysis (see sampling station codes at end of tables)

Date collected at S1	FeColi[1]	Date collected at S115	FeColi[1]	Date collected at S12	FeColi[1]	Date collected at S125	FeColi[1]						
01/13/03	14200	3/14/05	290	11/19/03	1750	11/19/03	510						
02/10/03	19300	6/21/05	70	05/12/04	510	05/12/04	30						
11/19/03	1280	7/11/05	500	02/17/05	1980	02/17/05	2180						
03/30/04	720	8/18/05	350	02/23/05	2240	02/23/05	2020						
05/12/04	180	10/24/05	660	03/01/05	1920	03/01/05	1940						
12/27/04	15800					03/07/05	980						
12/28/04	15800					03/14/05	270						
02/17/05	2260					03/16/05	200						
02/23/05	1340					03/22/05	22040						
03/01/05	1720					04/06/05	5500						
03/14/05	340					04/19/05	625						
03/16/05	50					05/10/05	1050						
03/22/05	18340					05/25/05	550						
						06/06/05	90						
						06/21/05	260						
						07/11/05	20						
						08/04/05	300						
						08/18/05	500						
						08/30/05	190						
						09/12/05	190						
						09/28/05	880						
						10/12/05	370						

[1] Fecal Coliform Concentration (#/100ml)

Date collected at S1	FeColi[1]	Date collected at S115	FeColi[1]	Date collected at S12	FeColi[1]	Date collected at S125	FeColi[1]						
						10/24/05	185						
						11/15/05	350						
						11/28/05	16720						
						12/13/05	500						
						12/29/05	660						
						01/11/06	180						
						01/23/06	380						

Noble Gulch Water Quality Data for Sampling Stations S1, S116, S1505, S19, S191, S192, and S200 Not Used in Analysis (see sampling station codes at end of tables)

Date collected at S1	FeColi[1]	Date collected at S116	FeColi[1]	Date collected at S1505	FeColi[1]	Date collected at S19	FeColi[1]	Date collected at S191	FeColi[1]	Date collected at S192	FeColi[1]	Date collected at S200	FeColi[1]
04/06/05	1040	2/10/03	14673	3/7/05	1140	2/24/05	1500	2/24/05	660	3/7/05	740	2/24/05	4420
04/19/05	575	3/14/05	320	3/14/05	630	3/7/05	820	3/8/05	1310	3/8/05	1170		
05/10/05	310									3/14/05	1350		
05/25/05	150									3/16/05	610		
06/06/05	100												
06/06/05	100												
07/11/05	400												
08/30/05	1050												
09/12/05	300												
09/28/05	260												
10/03/05	150												
10/12/05	710												
11/15/05	560												
11/28/05	960												
12/13/05	1150												
01/11/06	110												
01/23/06	510												
02/08/06	240												
02/23/06	10												
03/06/06	540												
03/22/06	870												
04/12/06	64000												

[1] Fecal Coliform Concentration (#/100ml)

Date collected at S1	FeColi[1]	Date collected at S116	FeColi[1]	Date collected at S1505	FeColi[1]	Date collected at S19	FeColi[1]	Date collected at S191	FeColi[1]	Date collected at S192	FeColi[1]	Date collected at S200	FeColi[1]
04/25/06	280												

Bates Creek Water Quality Data for Sampling Station S3
Used in Analysis (see sampling station codes at end of tables)

Date collected at S3	FeColi[1]												
04/14/04	60												
06/17/04	390												
09/22/05	260												

[1] Fecal Coliform Concentration (#/100ml)

Coastal Watershed Council
2004 *E. coli* Data

LOCATION	Creekside
DATE	*E. coli (MPN/100mL)*
10/7/2004	20
11/8/2004	5

Coastal Watershed Council
2005 *E. coli* Data and Statistics

LOCATION	Creekside	Monterey Ave.
DATE	*E. coli (MPN/100mL)*	
7/27/2005	5	323
8/29/2005	379	3873
9/29/2005	20	598
10/26/2005	173	4884
LOGMean	**51**	**1383**
min	**5**	**323**
max	**379**	**4884**
count	**4**	**4**
#>*E. coli* Target (235MPN)	**1**	**4**
%>*E. coli* Target (235MPN)	**25%**	**100%**

Sampling Station Codes

S0	SOQUEL CREEK AT FLUME OUTLET
S00	SOQUEL CREEK AT FLUME INLET
S04	SOQUEL CREEK ABOVE STOCKTON BRIDGE EAST
S07	SOQUEL CREEK AT RAILROAD TRESTLE
S1	NOBLE GULCH AT SOQUEL CREEK
S115	NOBLE GULCH AT PAC COVE ENTRANCE
S116	NOBLE GULCH AT TRAILER #67
S12	NOBLE GULCH AT TUNNEL AT BAY
S125	NOBLE GULCH AT ST. JOE'S CHURCH
S1505	NOBLE GULCH BELOW # 60
S19	NOBLE GULCH AT HIGHWAY 1
S191	NOBLE GULCH ABOVE HIGHWAY 1
S192	NOBLE GULCH MID DEL RIO CIRCLE
S200	NOBLE GULCH TRIBUTARY AT VICTORY LANE
S21	SOQUEL CREEK ABOVE NOBLE G
S23	SOQUEL CREEK AT NOB HILL
S2302	SOQUEL CREEK BELOW STORM DRAIN #2
S2305	SOQUEL CREEK ABOVE STORM DRAIN#2
S2315	SOQUEL CREEK AT PORTER STREET BRIDGE
S232	SOQUEL CREEK AT 2525 MAIN STREET
S2321	SOQUEL CREEK AT SOQUEL ELEMENTARY SCHOOL
S234	SOQUEL CREEK 200' UP SCHOOL BRIDGE
S24	SOQUEL CREEK BELOW SOQUEL DRIVE
S250	SOQUEL CREEK AT 25/25 REST.
S251	EAST BRANCH SOQUEL CREEK AT 152 OLIVE S.
S253	SOQUEL CREEK ABOVE TRAILER PARK
S275	SOQUEL CREEK AT ELKHORN NURSERY
S3	BATES CREEK AT SOQUEL CREEK
S4	SOQUEL CREEK AT BATES CREEK
S6	WEST BRANCH SOQUEL CREEK AT SAN JOSE-OLIVE S.

APPENDIX B. DATA ANALYSIS

Staff analyzed water quality data using a program developed by Tetra Tech, the United States Environmental Protection Agencies' contractor. The program is titled "Fecal Coliform Investigation and Analysis Spreadsheet (FECIA)." FECIA is a fully automated spreadsheet designed to assist in characterization and quantification of fecal coliform instream water quality objective exceedances. Data were compared against water quality objectives to determine magnitude and frequency of exceedances. FECIA generated the data analysis figures and tables that were used in completing the data analysis for this report. They are included here for reference.

All tables in Appendix 2 provide summary statistics for the figures shown above the tables. The table displays statistical data on a monthly basis including the mean, median, minimum, maximum, number of exceedances of the water contact recreation water quality objective versus the sample count (XS:Count), and the percent sample exceedance (XS%) of the water quality objective. Note that when the table analyzed geometric means, the column entitled "mean" was actually the "mean of the geometric mean." The mean value for the maximum water quality objective or criterion is the actual mean value of the samples collected.

A. Soquel Creek at Flume Outlet (S0)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

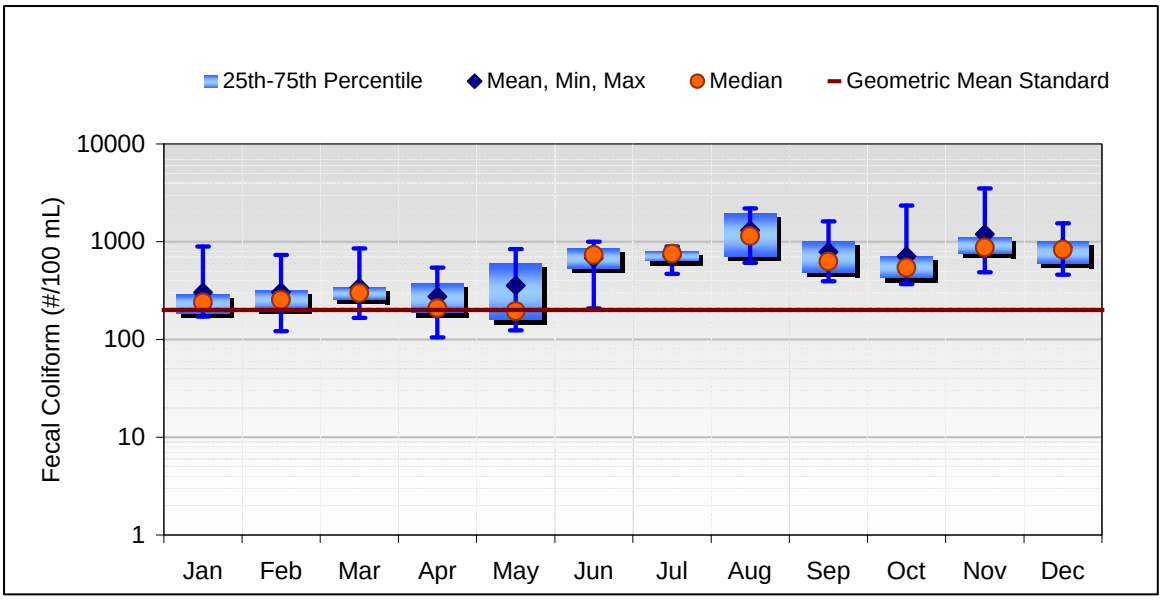

Figure 1. Soquel Creek at Flume Outlet Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (January 6, 2003 through January 31, 2006)

Table 1. Soquel Creek at Flume Outlet Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Geometric Mean Water Quality Objective

Summary Statistics (Data: 1/6/2003 to 1/31/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	303	239	171	894	186	293	14:22	64%
Feb	304	255	122	733	205	325	9:12	75%
Mar	339	299	166	856	256	345	12:13	92%
Apr	275	209	105	543	188	383	7:13	54%
May	356	195	124	840	159	606	7:14	50%
Jun	680	732	208	1003	537	866	18:18	100%
Jul	712	755	470	893	636	812	17:17	100%
Aug	1306	1142	609	2185	707	1975	16:16	100%
Sep	784	630	394	1616	486	1026	15:15	100%
Oct	710	543	369	2343	429	724	18:18	100%
Nov	1191	875	488	3506	758	1126	18:18	100%
Dec	877	830	460	1544	599	1032	17:17	100%
All Data	**670**	**599**	**105**	**3506**	**286**	**835**	**168:193**	**87%**

Maximum Water Quality Objective (400 MPN/100 ml)

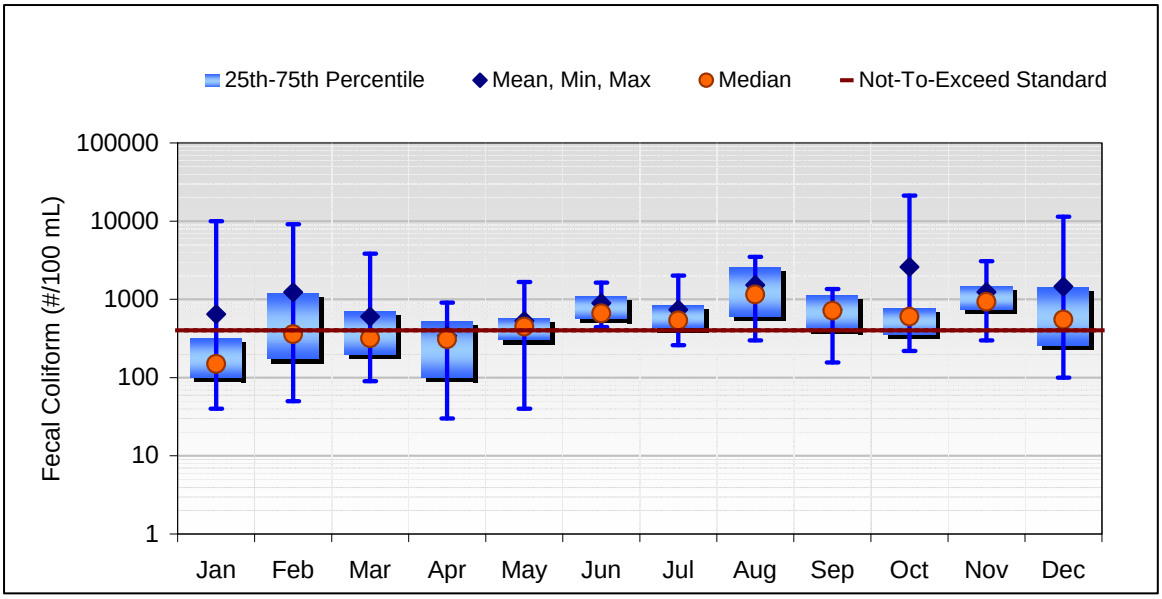

Figure 2. Soquel Creek at Flume Outlet Fecal Coliform (#/100 ml) and Water Contact Maximum Water Quality Objective (January 6, 2003 through January 31, 2006)

Table 2. Soquel Creek at Flume Outlet Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Maximum Water Quality Objective

Summary Statistics (Data: 1/6/2003 to 1/31/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	645	150	40	10000	100	325	4:23	17%
Feb	1236	360	50	9100	173	1223	6:14	43%
Mar	604	320	90	3840	200	710	8:17	47%
Apr	344	310	30	910	100	530	6:17	35%
May	528	450	40	1670	305	583	10:16	63%
Jun	895	665	440	1640	568	1115	20:20	100%
Jul	739	540	260	2020	430	850	11:15	73%
Aug	1524	1160	300	3480	613	2590	18:19	95%
Sep	741	720	156	1350	410	1153	14:18	78%
Oct	2596	600	220	21200	360	780	12:17	71%
Nov	1245	935	300	3075	755	1500	16:18	89%
Dec	1460	550	100	11370	260	1430	10:17	59%
All Data	**1039**	**545**	**30**	**21200**	**300**	**985**	**135:211**	**64%**

B. Soquel Creek Above Stockton Bridge East (S04)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

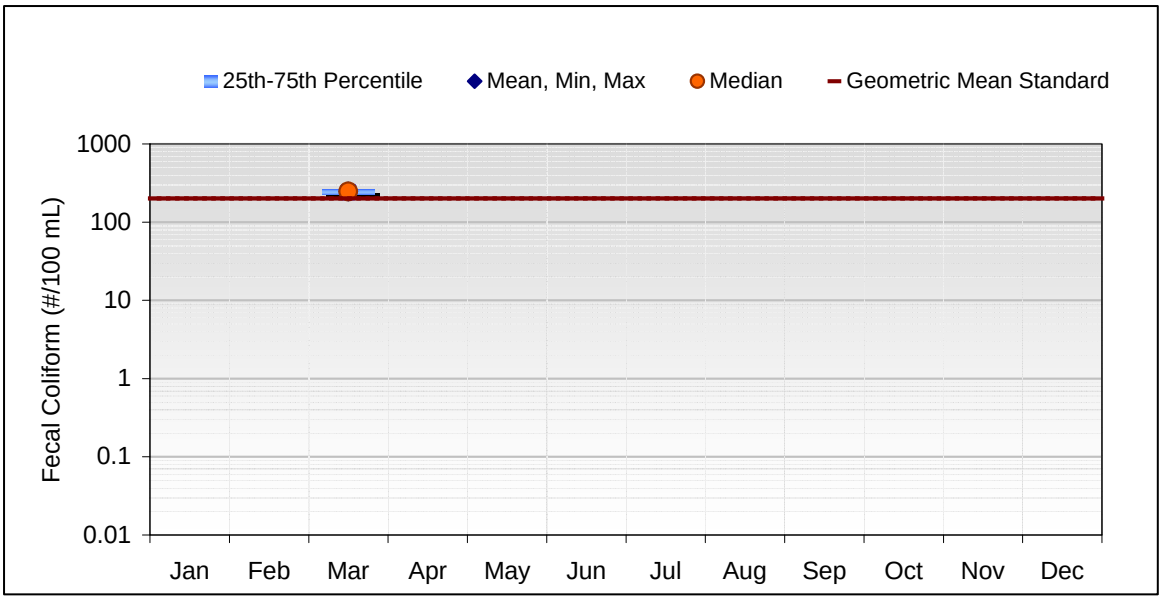

Figure 3. Soquel Creek Above Stockton Bridge East Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (February 17, 2005 through March 22, 2005)

Table 3. Soquel Creek Above Stockton Bridge East Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Geometric Mean Water Quality Objective

Summary Statistics (Data: 2/17/2005 to 3/22/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	0	0	0	0	0	0	0:0	n/a
Mar	246	246	203	289	224	268	2:2	100%
Apr	0	0	0	0	0	0	0:0	n/a
May	0	0	0	0	0	0	0:0	n/a
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**246**	**246**	**203**	**289**	**224**	**268**	**2:2**	**100%**

Maximum Water Quality Objective (400 MPN/100 ml)

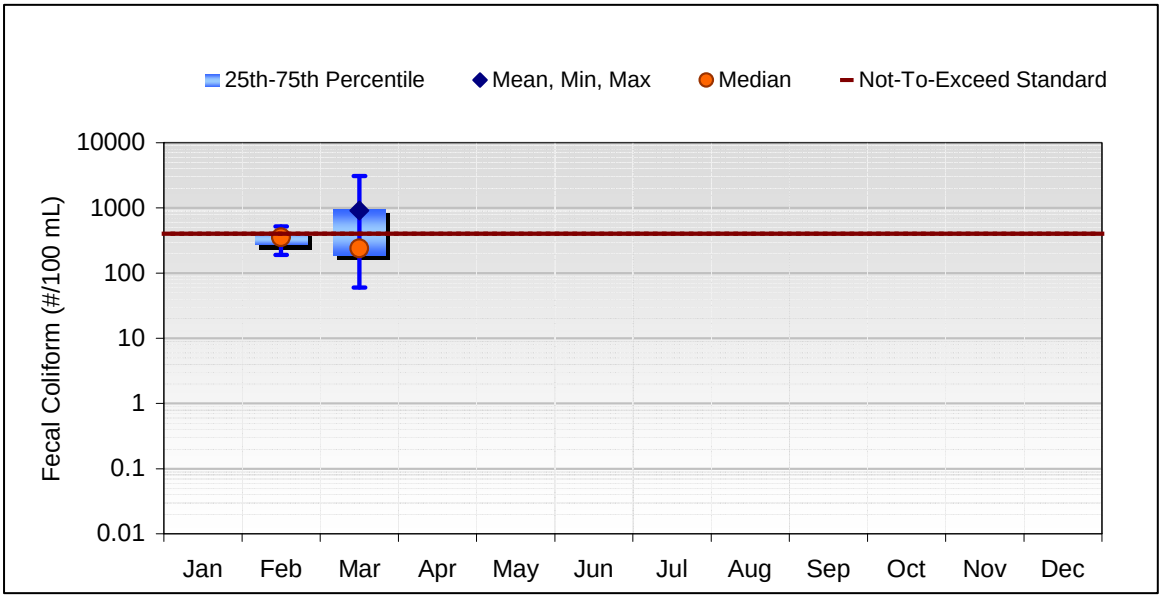

Figure 4. Soquel Creek Above Stockton Bridge East Fecal Coliform (#/100 ml) and Water Contact Maximum Water Quality Objective (March 17, 2005 through March 22, 2005)

Table 4. Soquel Creek Above Stockton Bridge East Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Maximum Water Quality Objective

Summary Statistics (Data: 2/17/2005 to 3/22/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	355	355	190	520	273	438	1:2	50%
Mar	910	240	60	3100	188	963	1:4	25%
Apr	0	0	0	0	0	0	0:0	n/a
May	0	0	0	0	0	0	0:0	n/a
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**725**	**240**	**60**	**3100**	**200**	**453**	**2:6**	**33%**

C. Soquel Creek at Railroad Trestle (S07)

Geometric Mean Objective (200 MPN/100 ml)

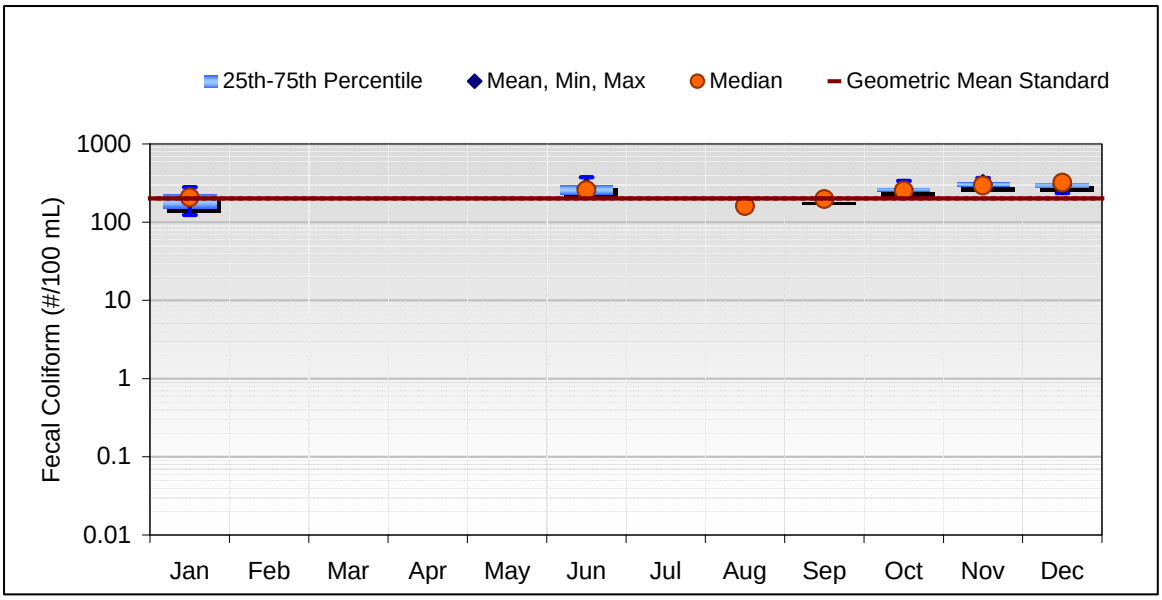

Figure 5. Soquel Creek at Railroad Trestle Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (January 28, 2003 through January 31, 2006)

Table 5. Soquel Creek at Railroad Trestle Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Geometric Mean Water Quality Objective

Summary Statistics (Data: 1/28/2003 to 1/31/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	199	207	124	280	150	234	3:5	60%
Feb	0	0	0	0	0	0	0:0	n/a
Mar	0	0	0	0	0	0	0:0	n/a
Apr	0	0	0	0	0	0	0:0	n/a
May	0	0	0	0	0	0	0:0	n/a
Jun	277	256	221	375	229	304	4:4	100%
Jul	0	0	0	0	0	0	0:0	n/a
Aug	161	161	161	161	161	161	0:1	0%
Sep	198	198	178	216	191	205	2:4	50%
Oct	265	253	216	337	244	274	4:4	100%
Nov	310	294	282	368	284	320	4:4	100%
Dec	296	322	235	331	278	327	3:3	100%
All Data	**250**	**235**	**124**	**375**	**207**	**285**	**20:25**	**80%**

Maximum Objective (400 MPN/100 ml)

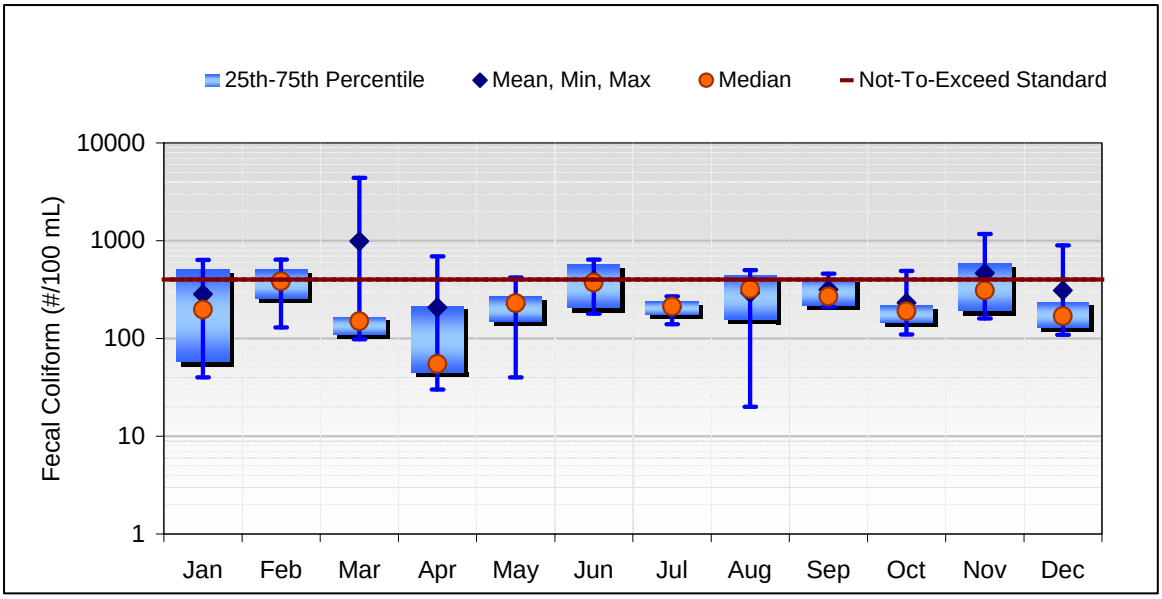

Figure 6. Soquel Creek at Railroad Trestle Fecal Coliform (#/100 ml) and Exceedance of Water Contract Recreation Maximum Water Quality Objective (January 28, 2003 through January 31, 2006)

Table 6. Soquel Creek at Railroad Trestle Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 1/28/2003 to 1/31/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	284	198	40	637	58	514	2:6	33%
Feb	385	385	130	640	258	513	1:2	50%
Mar	988	150	98	4410	110	170	1:5	20%
Apr	208	55	30	693	45	218	1:4	25%
May	222	230	40	420	150	272	1:5	20%
Jun	395	374	180	640	205	583	3:6	50%
Jul	208	213	140	270	177	242	0:3	0%
Aug	292	320	20	500	156	449	2:6	33%
Sep	316	269	210	460	220	420	2:5	40%
Oct	231	190	110	490	146	220	1:5	20%
Nov	465	311	160	1170	193	593	2:6	33%
Dec	310	170	109	900	130	240	1:5	20%
All Data	**365**	**218**	**20**	**4410**	**133**	**450**	**17:58**	**29%**

D. Soquel Creek at Nob Hill (S23)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

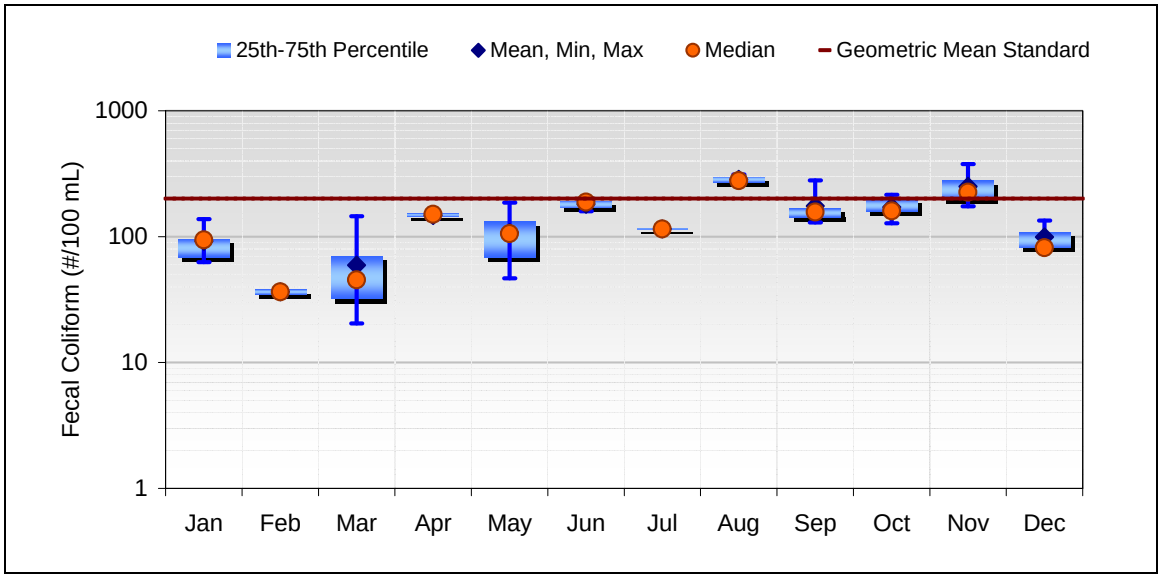

Figure 7. Soquel Creek at Nob Hill Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (January 21, 2004 through May 13, 2006).

Table 7. Soquel Creek at Nob Hill Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Geometric Mean Objective.

Summary Statistics (Data: 1/21/2004 to 5/13/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	92	94	63	138	69	96	0:5	0%
Feb	37	37	33	40	35	38	0:2	0%
Mar	59	45	20	146	32	70	0:7	0%
Apr	148	150	138	153	146	153	0:4	0%
May	108	106	47	187	69	131	0:5	0%
Jun	182	188	159	197	171	192	0:6	0%
Jul	115	115	112	118	114	117	0:2	0%
Aug	285	278	264	313	272	297	5:5	100%
Sep	176	157	130	280	143	168	1:5	20%
Oct	172	160	128	215	158	198	1:5	20%
Nov	251	225	174	378	198	278	3:4	75%
Dec	99	82	81	134	82	108	0:3	0%
All Data	**148**	**146**	**20**	**378**	**94**	**192**	**10:53**	**19%**

Maximum Water Quality Objective (400 MPN/100 ml)

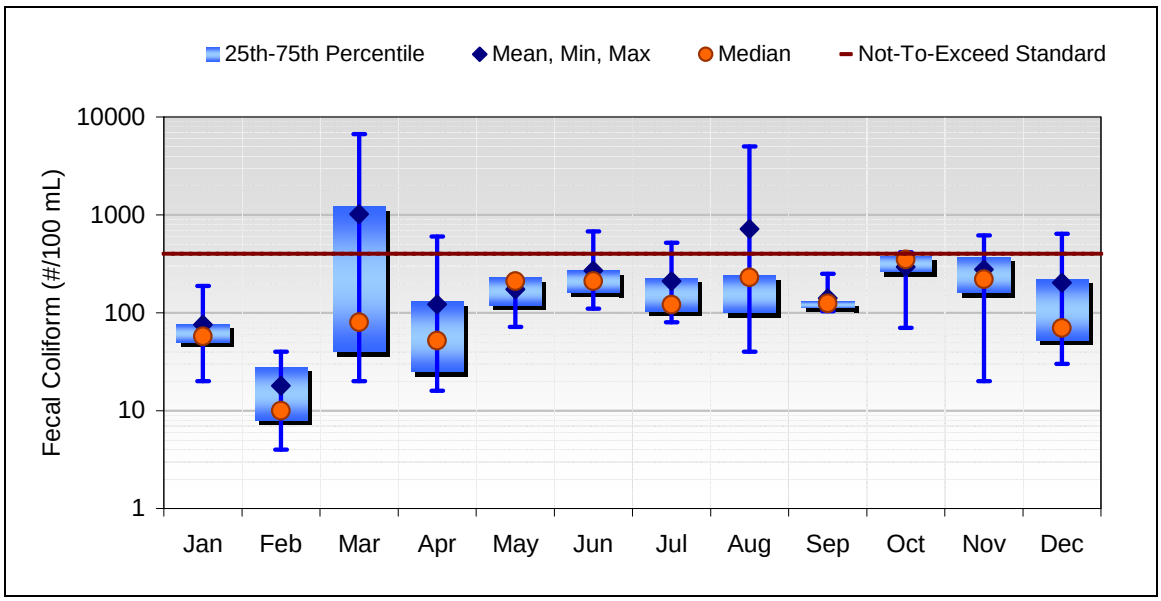

Figure 8. Soquel Creek at Nob Hill Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (January 21, 2004 through May 13, 2006).

Table 8. Soquel Creek at Nob Hill Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 1/21/2004 to 5/13/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	76	58	20	188	50	76	0:6	0%
Feb	18	10	4	40	8	28	0:5	0%
Mar	1018	80	20	6700	40	1220	4:13	31%
Apr	122	52	16	600	25	130	1:9	11%
May	174	210	72	230	120	230	0:9	0%
Jun	270	210	110	680	161	270	2:8	25%
Jul	211	121	80	520	104	228	1:4	25%
Aug	718	230	40	4990	100	240	1:9	11%
Sep	141	125	104	250	113	130	0:6	0%
Oct	296	349	70	415	264	381	1:4	25%
Nov	277	220	20	615	160	370	1:5	20%
Dec	203	70	30	640	53	220	1:4	25%
All Data	**367**	**130**	**4**	**6700**	**60**	**238**	**12:82**	**15%**

E. Soquel Creek at Porter Street Bridge (S2315)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

There was not enough water quality data collected at the Soquel Creek at Porter Street Bridge sampling station to calculate geometric means.

Maximum Water Quality Objective (400 MPN/100 ml)

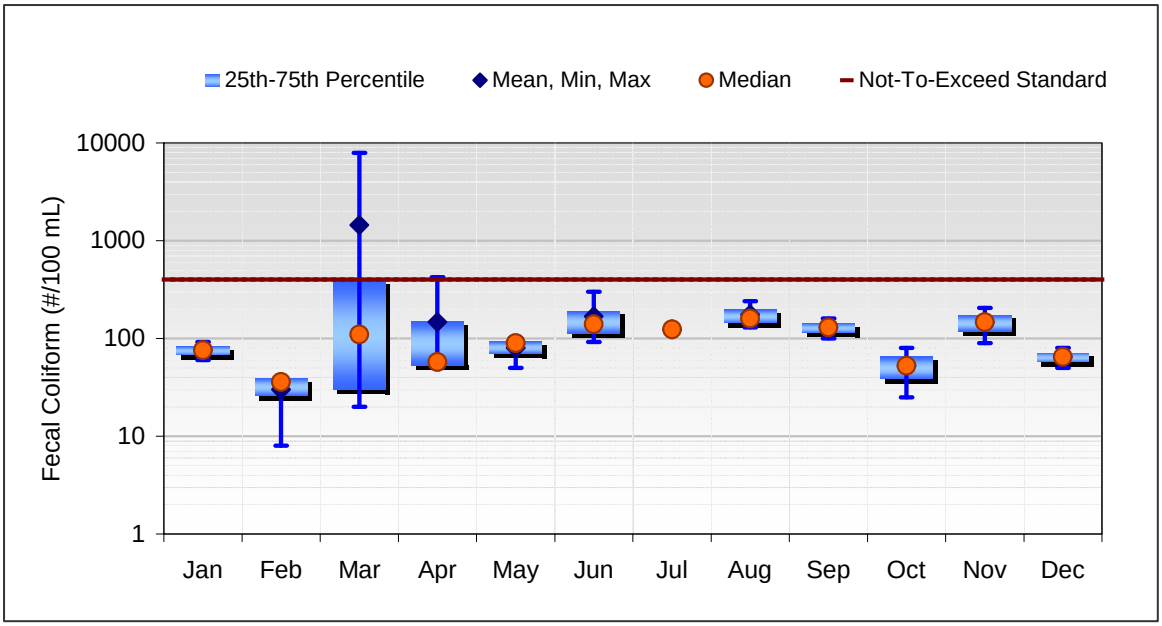

Figure 9. Soquel Creek at Porter Street Bridge Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (June 16, 2003 through April 25, 2006)

Table 9. Soquel Creek at Porter Street Bridge Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 6/16/2003 to 4/25/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	76	76	60	92	68	84	0:2	0%
Feb	30	36	8	40	26	40	0:4	0%
Mar	1443	110	20	7920	30	400	2:6	33%
Apr	148	58	50	425	54	151	1:4	25%
May	80	90	50	100	70	95	0:3	0%
Jun	168	140	92	300	113	195	0:4	0%
Jul	124	124	124	124	124	124	0:1	0%
Aug	177	160	130	240	145	200	0:3	0%
Sep	130	130	100	160	115	145	0:2	0%
Oct	53	53	25	80	39	66	0:2	0%
Nov	148	148	90	205	119	176	0:2	0%
Dec	65	65	50	80	58	73	0:2	0%
All Data	**339**	**90**	**8**	**7920**	**50**	**160**	**3:35**	**9%**

F. West Branch Soquel Creek at San Jose at Olive Springs Rd. (S6)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

There was not enough water quality data collected at the West Branch Soquel Creek at San Jose at Olive Springs Rd. sampling station to calculate geometric means.

Maximum Water Quality Objective (400 MPN/100 ml)

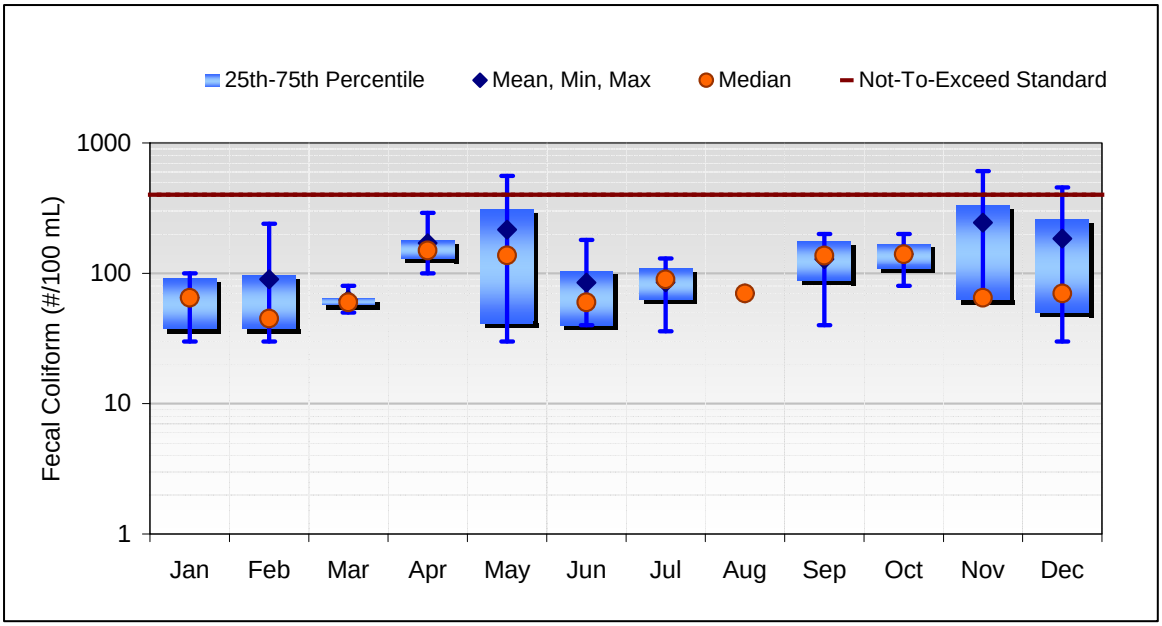

Figure 10. West Branch Soquel Creek at San Jose at Olive Springs Rd. Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (January 13, 2003 through May 9, 2006).

Table 10. West Branch Soquel Creek at San Jose at Olive Springs Rd. Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 1/13/2003 to 5/9/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	65	65	30	100	38	93	0:4	0%
Feb	90	45	30	240	38	98	0:4	0%
Mar	63	60	50	80	58	65	0:4	0%
Apr	170	150	100	290	130	180	0:5	0%
May	216	138	30	560	41	313	1:4	25%
Jun	85	60	40	180	40	105	0:4	0%
Jul	85	90	36	130	63	110	0:3	0%
Aug	70	70	70	70	70	70	0:1	0%
Sep	129	137	40	200	88	178	0:4	0%
Oct	140	140	80	200	110	170	0:3	0%
Nov	245	65	60	610	63	338	1:3	33%
Dec	185	70	30	455	50	263	1:3	33%
All Data	**130**	**80**	**30**	**610**	**46**	**165**	**3:42**	**7%**

G. Noble Gulch at Soquel Creek (S1)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

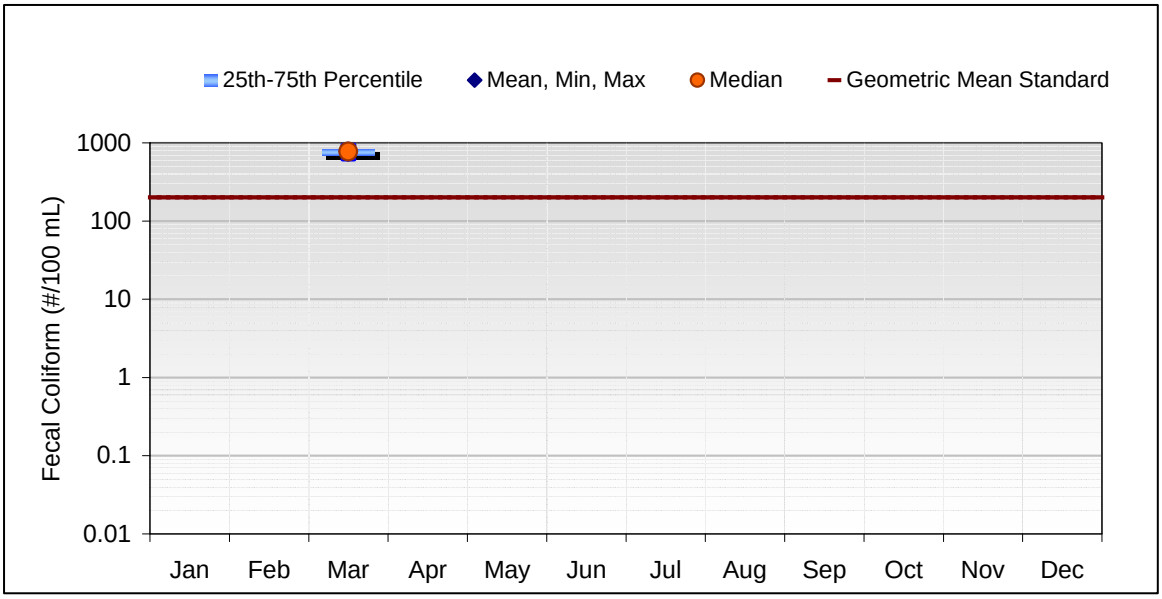

Figure 11. Noble Gulch at Soquel Creek Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (January 13, 2003 through March 22, 2005)

Table 11. Noble Gulch at Soquel Creek Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Geometric Mean Objective

Summary Statistics (Data: 1/13/2003 to 3/22/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	0	0	0	0	0	0	0:0	n/a
Mar	776	776	616	936	696	856	2:2	100%
Apr	0	0	0	0	0	0	0:0	n/a
May	0	0	0	0	0	0	0:0	n/a
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**776**	**776**	**616**	**936**	**696**	**856**	**2:2**	**100%**

Maximum Water Quality Objective (400 MPN/100 ml)

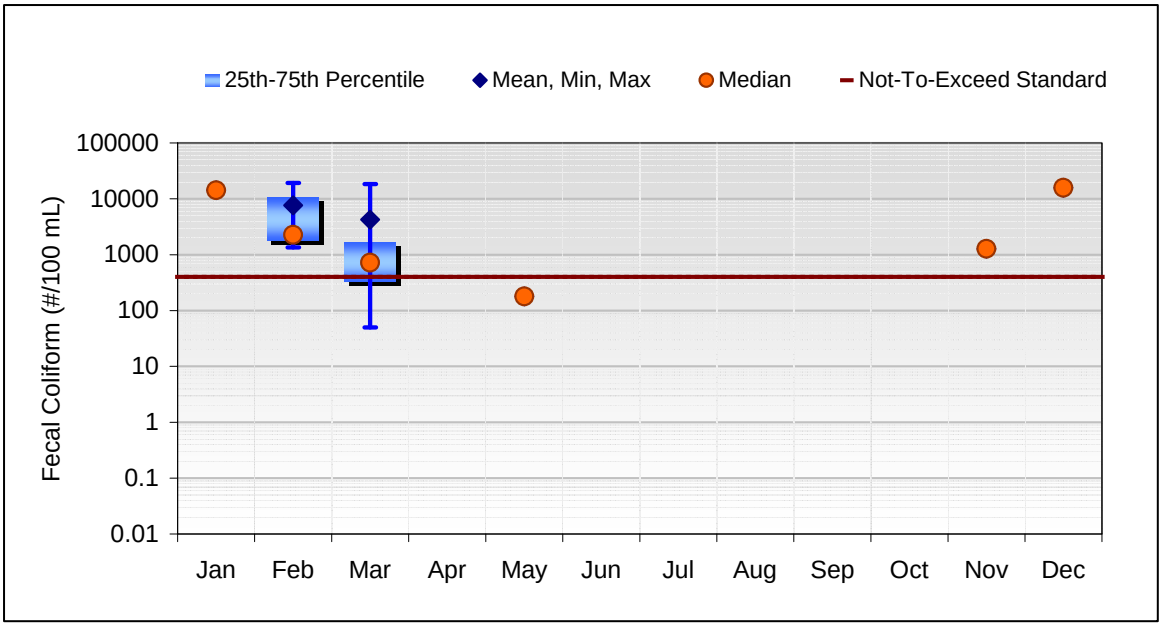

Figure 12. Noble Gulch at Soquel Creek Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (January 13, 2003 through March 22, 2005)

Table 12. Noble Gulch at Soquel Creek Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 1/13/2003 to 3/22/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	14200	14200	14200	14200	14200	14200	1:1	100%
Feb	7633	2260	1340	19300	1800	10780	3:3	100%
Mar	4234	720	50	18340	340	1720	3:5	60%
Apr	0	0	0	0	0	0	0:0	n/a
May	180	180	180	180	180	180	0:1	0%
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	1280	1280	1280	1280	1280	1280	1:1	100%
Dec	15800	15800	15800	15800	15800	15800	2:2	100%
All Data	**7025**	**1720**	**50**	**19300**	**720**	**15800**	**10:13**	**77%**

H. Noble Gulch at Pacific Cove Entrance (S115)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

There was not enough water quality data collected at the Noble Gulch at Pacific Cove Entrance sampling station to calculate geometric means.

Maximum Water Quality Objective (400 MPN/100 ml)

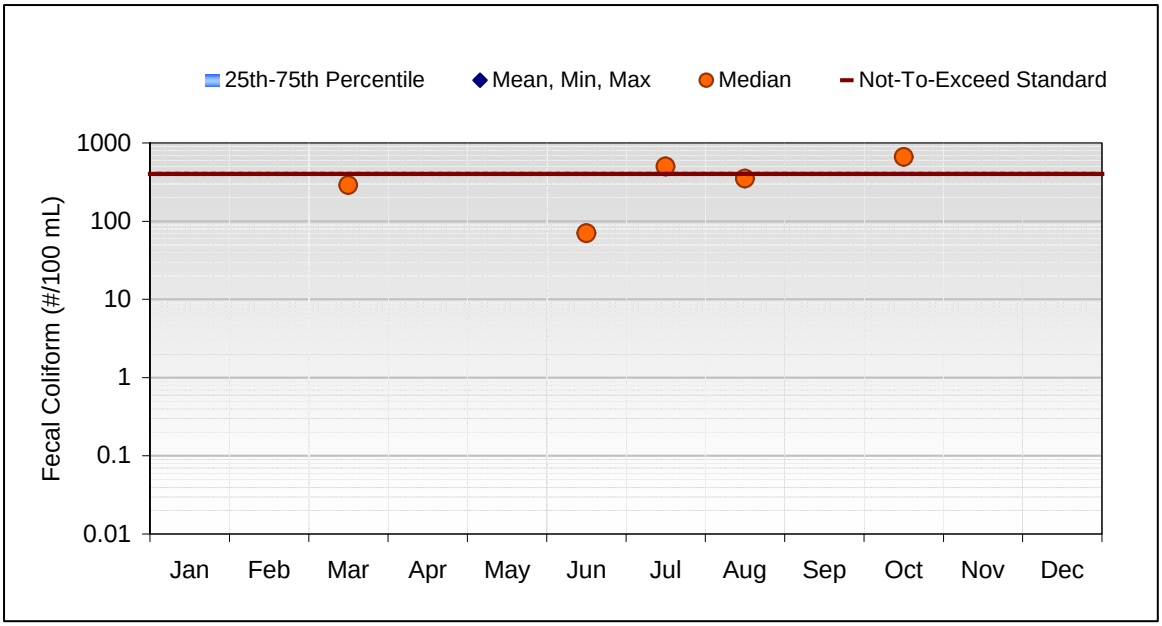

Figure 13. Noble Gulch at Pacific Cove Entrance Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (March 14, 2005 through October 24, 2005)

Table 13. Noble Gulch at Pacific Cove Entrance Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 3/14/2005 to 10/24/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	0	0	0	0	0	0	0:0	n/a
Mar	290	290	290	290	290	290	0:1	0%
Apr	0	0	0	0	0	0	0:0	n/a
May	0	0	0	0	0	0	0:0	n/a
Jun	70	70	70	70	70	70	0:1	0%
Jul	500	500	500	500	500	500	1:1	100%
Aug	350	350	350	350	350	350	0:1	0%
Sep	0	0	0	0	0	0	0:0	n/a
Oct	660	660	660	660	660	660	1:1	100%
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**374**	**350**	**70**	**660**	**290**	**500**	**2:5**	**40%**

I. Noble Gulch at Tunnel at Bay (S12)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

There was not enough water quality data collected at the Noble Gulch at Tunnel at Bay sampling station to calculate geometric means.

Maximum Water Quality Objective (400 MPN/100 ml)

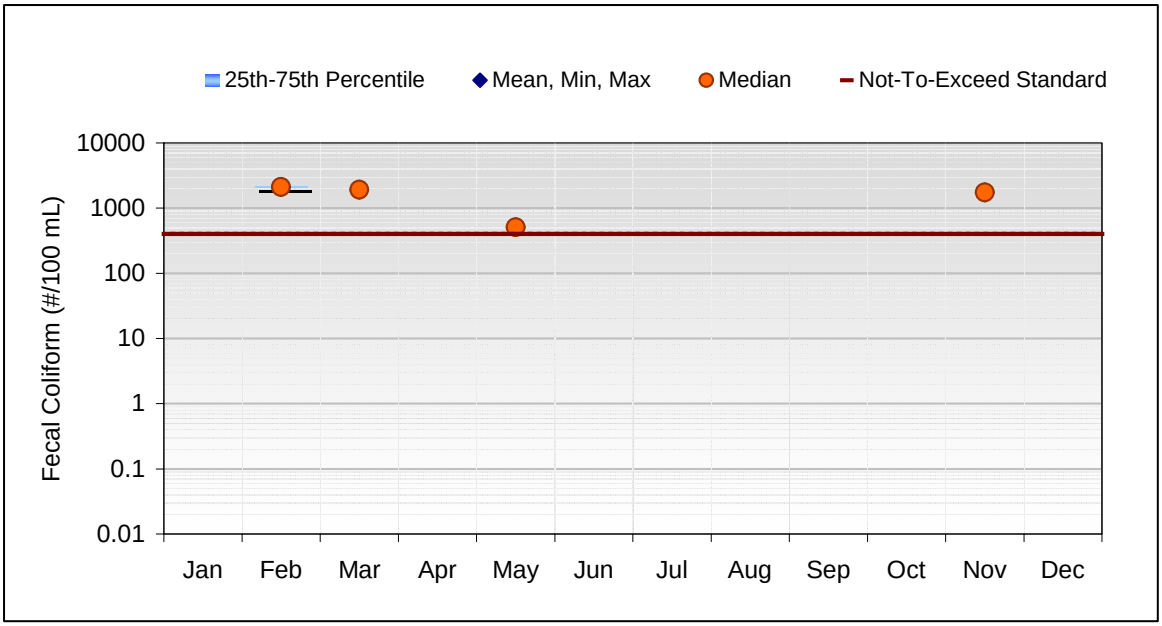

Figure 15. Noble Gulch at Tunnel at Bay Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (February 17, 2005 through March 22, 2005)

Table 15. Noble Gulch at Tunnel at Bay Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 11/19/2003 to 3/1/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	2110	2110	1980	2240	2045	2175	2:2	100%
Mar	1920	1920	1920	1920	1920	1920	1:1	100%
Apr	0	0	0	0	0	0	0:0	n/a
May	510	510	510	510	510	510	1:1	100%
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	1750	1750	1750	1750	1750	1750	1:1	100%
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**1680**	**1920**	**510**	**2240**	**1750**	**1980**	**5:5**	**100%**

J. Noble Gulch at St Joe's Church (S125)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

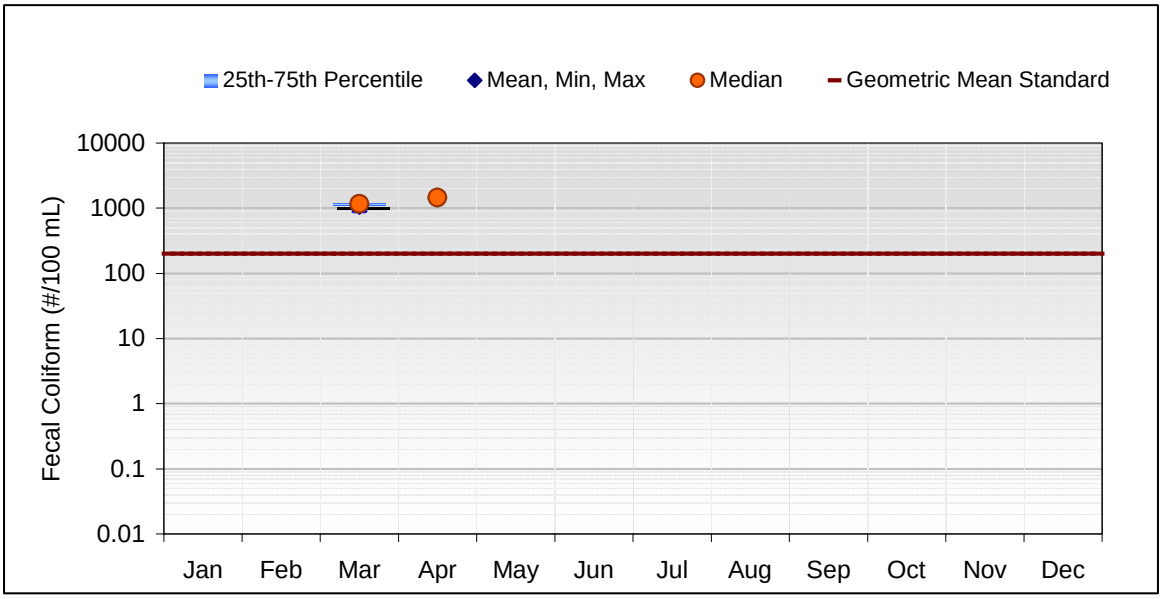

Figure 16. Noble Gulch at St. Joe's Church Fecal Coliform (#/100 ml) and Water Contact Recreation Geometric Mean Water Quality Objective (November 19, 2003 through January 23, 2006)

Table 16. Noble Gulch at St. Joe's Church Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contract Recreation Geometric Mean Water Quality Objective

Summary Statistics (Data: 11/19/2003 to 1/23/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	0	0	0	0	0	0	0:0	n/a
Mar	1121	1166	899	1251	1091	1196	4:4	100%
Apr	1450	1450	1450	1450	1450	1450	1:1	100%
May	0	0	0	0	0	0	0:0	n/a
Jun	0	0	0	0	0	0	0:0	n/a
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	0	0	0	0	0	0	0:0	n/a
Oct	0	0	0	0	0	0	0:0	n/a
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**1187**	**1177**	**899**	**1450**	**1155**	**1251**	**5:5**	**100%**

Maximum Water Quality Objective (400 MPN/100 ml)

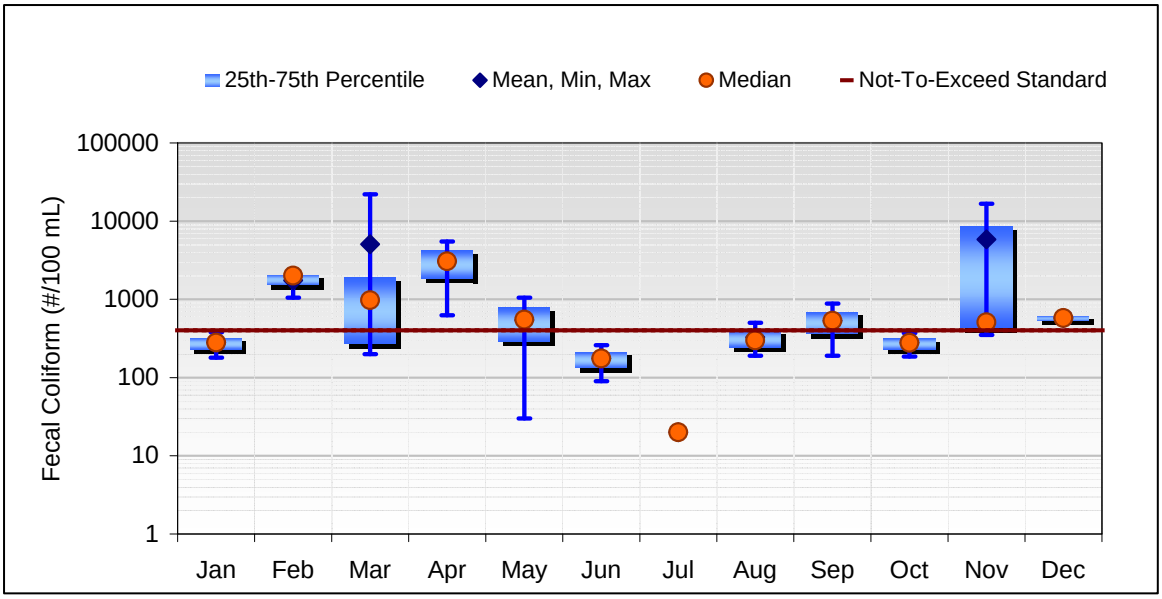

Figure 17. Noble Gulch at St. Joe's Church Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (November 19, 2003 through January 23, 2006)

Table 17. Noble Gulch at St. Joe's Church Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 11/19/2003 to 1/23/2006)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	280	280	180	380	230	330	0:2	0%
Feb	1750	2020	1050	2180	1535	2100	3:3	100%
Mar	5086	980	200	22040	270	1940	3:5	60%
Apr	3063	3063	625	5500	1844	4281	2:2	100%
May	543	550	30	1050	290	800	2:3	67%
Jun	175	175	90	260	133	218	0:2	0%
Jul	20	20	20	20	20	20	0:1	0%
Aug	330	300	190	500	245	400	1:3	33%
Sep	535	535	190	880	363	708	1:2	50%
Oct	278	278	185	370	231	324	0:2	0%
Nov	5860	510	350	16720	430	8615	2:3	67%
Dec	580	580	500	660	540	620	2:2	100%
All Data	**2024**	**500**	**20**	**22040**	**215**	**1033**	**16:30**	**53%**

K. Bates Creek at Soquel Creek (S3)

Geometric Mean Water Quality Objective (200 MPN/100 ml)

There was not enough water quality data collected at the Bates Creek at Soquel Creek sampling station to calculate geometric means.

Maximum Water Quality Objective (400 MPN/100 ml)

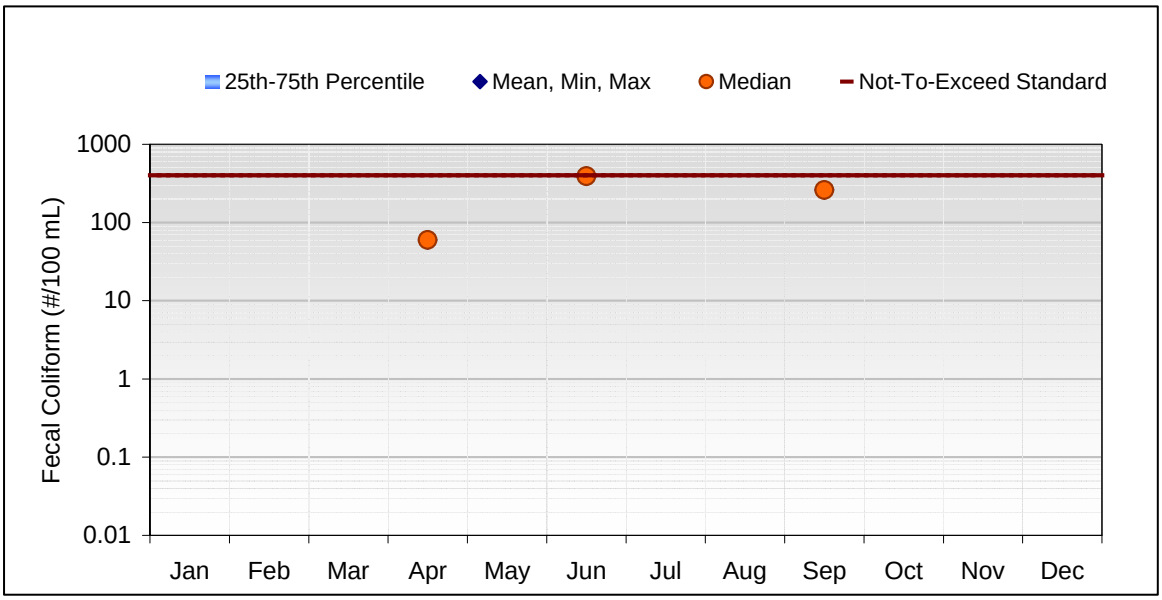

Figure 18. Bates Creek at Soquel Creek Fecal Coliform (#/100 ml) and Water Contact Recreation Maximum Water Quality Objective (April 14, 2004 through September 22, 2005)

Table 18. Bates Creek at Soquel Creek Fecal Coliform (#/100 ml) Data Summary and Exceedance of Water Contact Recreation Maximum Objective

Summary Statistics (Data: 4/14/2004 to 9/22/2005)								
Month	**Mean**	**Median**	**Min**	**Max**	**25th**	**75th**	**XS:Count**	**XS%**
Jan	0	0	0	0	0	0	0:0	n/a
Feb	0	0	0	0	0	0	0:0	n/a
Mar	0	0	0	0	0	0	0:0	n/a
Apr	60	60	60	60	60	60	0:1	0%
May	0	0	0	0	0	0	0:0	n/a
Jun	390	390	390	390	390	390	0:1	0%
Jul	0	0	0	0	0	0	0:0	n/a
Aug	0	0	0	0	0	0	0:0	n/a
Sep	260	260	260	260	260	260	0:1	0%
Oct	0	0	0	0	0	0	0:0	n/a
Nov	0	0	0	0	0	0	0:0	n/a
Dec	0	0	0	0	0	0	0:0	n/a
All Data	**237**	**260**	**60**	**390**	**160**	**325**	**0:3**	**0%**

APPENDIX C. MICROBIAL SOURCE TRACKING DATA

This appendix presents microbial source tracking data. The table headings are defined as follows:

Isolate: A unique number Dr. Samadpour gave to each isolate from the water samples the County of Santa Cruz submitted.

Provider sample: A number that identifies which water sample was analyzed on a given date. In other words, if the County of Santa Cruz took four water samples on a given date, this column identifies which of the four water samples was analyzed.

Stanum: The sampling station number (see Figure 3-1 in report for location).

Note: The specific fecal coliform source

Source: The category of the fecal coliform source

Sample Date: Date the sample was collected

FeColi: Fecal coliform concentration per 100 ml of water

Log FC: The logged fecal coliform concentration per 100 ml of water

Rain-1: Rainfall within the previous 24-hour time period

Rain-3: Rainfall within the previous 72 hour time period

Rain-7: Rainfall within the previous 168-hour time period

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
87135	SO-1	S0	human	Human	1/13/04	1270	3.1038037	0	0	0.35
87136	SO-2	S0	avian	Bird	1/13/04	1120	3.049218	0	0	0.35
87137	SO-2	S0	avian	Bird	1/13/04	1120	3.049218	0	0	0.35
87138	SO-2	S0	avian	Bird	1/13/04	1120	3.049218	0	0	0.35
87139	SO-3	S0	avian	Bird	1/13/04	1070	3.0293838	0	0	0.35
87140	SO-3	S0	rodent	Rodent	1/13/04	1070	3.0293838	0	0	0.35
87141	SO-3	S0	avian	Bird	1/13/04	1070	3.0293838	0	0	0.35
87142	SO-3	S0	rodent	Rodent	1/13/04	1070	3.0293838	0	0	0.35
87419	S0-1	S0	avian	Bird	1/21/04	80	1.90309	0	0	0
87420	S0-1	S0	dog	Dog	1/21/04	80	1.90309	0	0	0
87421	S0-1	S0	Rodent	Rodent	1/21/04	80	1.90309	0	0	0
87422	S0-2	S0	avian	Bird	1/21/04	130	2.1139434	0	0	0
87423	S0-2	S0	rodent	Rodent	1/21/04	130	2.1139434	0	0	0
87424	S0-2	S0	gull	Bird	1/21/04	130	2.1139434	0	0	0
87425	S0-3	S0	gull	Bird	1/21/04	50	1.69897	0	0	0
87426	S0-3	S0	gull	Bird	1/21/04	50	1.69897	0	0	0
87427	S0-3	S0	Unknown	Unknown	1/21/04	50	1.69897	0	0	0
89656	SO-1	S0	Raccoon	Wildlife	3/9/04	160	2.20412	0	0	0
89657	SO-1	S0	avian	Bird	3/9/04	160	2.20412	0	0	0
89658	SO-1	S0	Rodent	Rodent	3/9/04	160	2.20412	0	0	0
89659	SO-1	S0	Raccoon	Wildlife	3/9/04	160	2.20412	0	0	0
89660	SO-2	S0	dog	Dog	3/9/04	10	1	0	0	0
89661	SO-2	S0	avian	Bird	3/9/04	10	1	0	0	0
89662	SO-3	S0	avian	Bird	3/9/04	70	1.845098	0	0	0
89663	SO-3	S0	Unknown	Unknown	3/9/04	70	1.845098	0	0	0
89664	SO-3	S0	avian	Bird	3/9/04	70	1.845098	0	0	0
89665	SO-3	S0	avian	Bird	3/9/04	70	1.845098	0	0	0
89666	SO-3	S0	Rodent	Rodent	3/9/04	70	1.845098	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
90629	S0-1	S0	avian	Bird	3/23/04	310	2.4913617	0	0	0
90630	S0-1	S0	avian	Bird	3/23/04	310	2.4913617	0	0	0
90631	S0-1	S0	dog	Dog	3/23/04	310	2.4913617	0	0	0
90632	S0-2	S0	avian	Bird	3/23/04	250	2.39794	0	0	0
90633	S0-2	S0	rodent	Rodent	3/23/04	250	2.39794	0	0	0
90634	S0-2	S0	avian	Bird	3/23/04	250	2.39794	0	0	0
90635	S0-3	S0	avian	Bird	3/23/04	330	2.5185139	0	0	0
90636	S0-3	S0	dog	Dog	3/23/04	330	2.5185139	0	0	0
90637	S0-3	S0	rodent	Rodent	3/23/04	330	2.5185139	0	0	0
93192	S0-1	S0	avian	Bird	5/18/04	590	2.770852	0	0	0
93193	S0-1	S0	gull	Bird	5/18/04	590	2.770852	0	0	0
93194	S0-1	S0	sewage	Human	5/18/04	590	2.770852	0	0	0
93195	S0-2	S0	Raccoon	Wildlife	5/18/04	590	2.770852	0	0	0
93196	S0-2	S0	dog	Dog	5/18/04	590	2.770852	0	0	0
93197	S0-2	S0	avian	Bird	5/18/04	590	2.770852	0	0	0
93198	S0-3	S0	rodent	Rodent	5/18/04	590	2.770852	0	0	0
93199	S0-3	S0	gull	Bird	5/18/04	590	2.770852	0	0	0
93200	S0-3	S0	avian	Bird	5/18/04	590	2.770852	0	0	0
93201	S0-3	S0	avian	Bird	5/18/04	590	2.770852	0	0	0
95455	6-15-04-S0-1	S0	Raccoon	Wildlife	6/15/04	1580	3.1986571	0	0	0
95456	6-15-04-S0-1	S0	avian	Bird	6/15/04	1580	3.1986571	0	0	0
95457	6-15-04-S0-1	S0	avian	Bird	6/15/04	1580	3.1986571	0	0	0
95458	6-15-04-S0-2	S0	gull	Bird	6/15/04	1620	3.209515	0	0	0
95459	6-15-04-S0-2	S0	avian	Bird	6/15/04	1620	3.209515	0	0	0
95460	6-15-04-S0-2	S0	dog	Dog	6/15/04	1620	3.209515	0	0	0
95461	6-15-04-S0-2	S0	rodent	Rodent	6/15/04	1620	3.209515	0	0	0
95462	6-15-04-S0-3	S0	raccoon	Wildlife	6/15/04	1120	3.049218	0	0	0
95463	6-15-04-S0-3	S0	dog	Dog	6/15/04	1120	3.049218	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
95464	6-15-04-S0-3	S0	gull	Bird	6/15/04	1120	3.049218	0	0	0
95544	6-16-04-S0-1	S0	dog	Dog	6/15/04	1160	3.064458	0	0	0
95545	6-16-04-S0-1	S0	gull	Bird	6/15/04	1160	3.064458	0	0	0
95546	6-16-04-S0-1	S0	avian	Bird	6/15/04	1160	3.064458	0	0	0
95547	6-16-04-S0-2	S0	rodent	Rodent	6/15/04	1460	3.1643529	0	0	0
95548	6-16-04-S0-2	S0	dog	Dog	6/15/04	1460	3.1643529	0	0	0
95549	6-16-04-S0-2	S0	avian	Bird	6/15/04	1460	3.1643529	0	0	0
95550	6-16-04-S0-3	S0	dog	Dog	6/15/04	1200	3.0791812	0	0	0
95551	6-16-04-S0-3	S0	feline	Cat	6/15/04	1200	3.0791812	0	0	0
95552	6-16-04-S0-3	S0	gull	Bird	6/15/04	1200	3.0791812	0	0	0
95849	6-24-04-S0-1	S0	avian	Bird	6/24/04	1100	3.0413927	0	0	0
95850	6-24-04-S0-1	S0	avian	Bird	6/24/04	1100	3.0413927	0	0	0
95851	6-24-04-S0-1	S0	avian	Bird	6/24/04	1100	3.0413927	0	0	0
95852	6-24-04-S0-2	S0	sewage	Human	6/24/04	1480	3.1702617	0	0	0
95853	6-24-04-S0-2	S0	Unknown	Unknown	6/24/04	1480	3.1702617	0	0	0
95854	6-24-04-S0-2	S0	avian	Bird	6/24/04	1480	3.1702617	0	0	0
95855	6-24-04-S0-3	S0	avian	Bird	6/24/04	1420	3.1522883	0	0	0
95856	6-24-04-S0-3	S0	avian	Bird	6/24/04	1420	3.1522883	0	0	0
95857	6-24-04-S0-3	S0	sewage	Human	6/24/04	1420	3.1522883	0	0	0
97590	07-19-2004-S0-1	S0	avian	Bird	7/19/04	1720	3.2355284	0	0	0
97591	07-19-2004-S0-1	S0	Rodent	Rodent	7/19/04	1720	3.2355284	0	0	0
97592	07-19-2004-S0-1	S0	raccoon	Wildlife	7/19/04	1720	3.2355284	0	0	0
97593	07-19-2004-S0-2	S0	avian	Bird	7/19/04	1520	3.1818436	0	0	0
97594	07-19-2004-S0-2	S0	avian	Bird	7/19/04	1520	3.1818436	0	0	0
97595	07-19-2004-S0-2	S0	gull	Bird	7/19/04	1520	3.1818436	0	0	0
97596	07-19-2004-S0-3	S0	avian	Bird	7/19/04	1500	3.1760913	0	0	0
97597	07-19-2004-S0-3	S0	gull	Bird	7/19/04	1500	3.1760913	0	0	0
97598	07-19-2004-S0-3	S0	rodent	Rodent	7/19/04	1500	3.1760913	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
98789	8-02-04-S0-1	S0	gull	Bird	8/2/04	3080	3.4885507	0	0	0
98790	8-02-04-S0-1	S0	rodent	Rodent	8/2/04	3080	3.4885507	0	0	0
98791	8-02-04-S0-1	S0	gull	Bird	8/2/04	3080	3.4885507	0	0	0
98792	8-02-04-S0-2	S0	Unknown	Unknown	8/2/04	3440	3.5365584	0	0	0
98793	8-02-04-S0-2	S0	sewage	Human	8/2/04	3440	3.5365584	0	0	0
98794	8-02-04-S0-2	S0	Raccoon	Wildlife	8/2/04	3440	3.5365584	0	0	0
98795	8-02-04-S0-3	S0	gull	Bird	8/2/04	2980	3.4742163	0	0	0
98796	8-02-04-S0-3	S0	Unknown	Unknown	8/2/04	2980	3.4742163	0	0	0
98797	8-02-04-S0-3	S0	avian	Bird	8/2/04	2980	3.4742163	0	0	0
99830	8-18-04-S0-1	S0	rodent	Rodent	8/18/04	2700	3.4313638	0	0	0
99831	8-18-04-S0-1	S0	avian	Bird	8/18/04	2700	3.4313638	0	0	0
99832	8-18-04-S0-1	S0	gull	Bird	8/18/04	2700	3.4313638	0	0	0
99833	8-18-04-S0-2	S0	avian	Bird	8/18/04	2240	3.350248	0	0	0
99834	8-18-04-S0-2	S0	avian	Bird	8/18/04	2240	3.350248	0	0	0
99835	8-18-04-S0-2	S0	sewage	Human	8/18/04	2240	3.350248	0	0	0
99836	8-18-04-S0-3	S0	canine	Dog	8/18/04	2160	3.3344538	0	0	0
99837	8-18-04-S0-3	S0	dog	Dog	8/18/04	2160	3.3344538	0	0	0
99838	8-18-04-S0-3	S0	gull	Bird	8/18/04	2160	3.3344538	0	0	0
102084	SO-1	S0	raccoon	Wildlife	9/21/04	860	2.9344985	0	0.02	0.02
102085	SO-1	S0	dog	Dog	9/21/04	860	2.9344985	0	0.02	0.02
102086	SO-1	S0	dog	Dog	9/21/04	860	2.9344985	0	0.02	0.02
102087	SO-1	S0	Unknown	Unknown	9/21/04	860	2.9344985	0	0.02	0.02
102472	S0-2	S0	gull	Bird	9/21/04	720	2.8573325	0	0.02	0.02
102473	S0-2	S0	dog	Dog	9/21/04	720	2.8573325	0	0.02	0.02
102474	S0-2	S0	sewage	Human	9/21/04	720	2.8573325	0	0.02	0.02
102475	S0-3	S0	gull	Bird	9/21/04	840	2.9242793	0	0.02	0.02
102476	S0-3	S0	gull	Bird	9/21/04	840	2.9242793	0	0.02	0.02
102477	S0-3	S0	avian	Bird	9/21/04	840	2.9242793	0	0.02	0.02

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
106894	06-06-05-S04-1	S04	rac	Wildlife	6/6/05	230	2.361728	0	0	0
106895	06-06-05-S04-1	S04	gull	Bird	6/6/05	230	2.361728	0	0	0
106896	06-06-05-S04-1	S04	dog	Dog	6/6/05	230	2.361728	0	0	0
106897	06-06-05-S04-2	S04	dog	Dog	6/6/05	230	2.361728	0	0	0
106898	06-06-05-S04-2	S04	raccoon	Wildlife	6/6/05	230	2.361728	0	0	0
106899	06-06-05-S04-2	S04	avian	Bird	6/6/05	230	2.361728	0	0	0
106900	06-06-05-S04-3	S04	gull	Bird	6/6/05	230	2.361728	0	0	0
106901	06-06-05-S04-3	S04	gull	Bird	6/6/05	230	2.361728	0	0	0
106902	06-06-05-S04-3	S04	gull	Bird	6/6/05	230	2.361728	0	0	0
106903	06-06-05-S04-3	S04	dog	Dog	6/6/05	230	2.361728	0	0	0
108143	07-11-05-S04-1	S04	avian	Bird	7/11/05	420	2.623249	0	0	0
108144	07-11-05-S04-1	S04	raccoon	Wildlife	7/11/05	420	2.623249	0	0	0
108145	07-11-05-S04-1	S04	rac	Wildlife	7/11/05	420	2.623249	0	0	0
108146	07-11-05-S04-2	S04	avian	Bird	7/11/05	400	2.60206	0	0	0
108147	07-11-05-S04-2	S04	avian	Bird	7/11/05	400	2.60206	0	0	0
108148	07-11-05-S04-2	S04	gull	Bird	7/11/05	400	2.60206	0	0	0
108149	07-11-05-S04-3	S04	rac	Wildlife	7/11/05	460	2.662758	0	0	0
108150	07-11-05-S04-3	S04	rac	Wildlife	7/11/05	460	2.662758	0	0	0
108151	07-11-05-S04-3	S04	rac	Wildlife	7/11/05	460	2.662758	0	0	0
108432	080105-S04-1	S04	avian	Bird	8/1/05	1100	3.041393	0	0	0
108433	080405-S04-1	S04	avian	Bird	8/1/05	1100	3.041393	0	0	0
108434	080105-S04-1	S04	rac	Wildlife	8/1/05	1100	3.041393	0	0	0
108435	080105-S04-2	S04	avian	Bird	8/1/05	1100	3.041393	0	0	0
108436	080105-S04-2	S04	rac	Wildlife	8/1/05	1100	3.041393	0	0	0
108437	080105-S04-2	S04	raccoon	Wildlife	8/1/05	1100	3.041393	0	0	0
108438	080105-S04-3	S04	feline	Cat	8/1/05	1100	3.041393	0	0	0
108439	080105-S04-3	S04	rac	Wildlife	8/1/05	1100	3.041393	0	0	0
108440	080105-S04-3	S04	avian	Bird	8/1/05	1100	3.041393	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
108441	080105-S04-3	S04	avian	Bird	8/1/05	1100	3.041393	0	0	0
110452	092805-S04-1	S04	rodent	Rodent	9/28/05	420	2.623249	0	0	0
110453	092805-S04-1	S04	rac	Wildlife	9/28/05	420	2.623249	0	0	0
110454	092805-S04-1	S04	rodent	Rodent	9/28/05	420	2.623249	0	0	0
110455	092805-S04-2	S04	avian	Bird	9/28/05	420	2.623249	0	0	0
110456	092805-S04-2	S04	canine	Dog	9/28/05	420	2.623249	0	0	0
110457	092805-S04-2	S04	gull	Bird	9/28/05	420	2.623249	0	0	0
110458	092805-S04-3	S04	gull	Bird	9/28/05	420	2.623249	0	0	0
110459	092805-S04-3	S04	unknown	Unknown	9/28/05	420	2.623249	0	0	0
110460	092805-S04-3	S04	rac	Wildlife	9/28/05	420	2.623249	0	0	0
110461	092805-S04-3	S04	rac	Wildlife	9/28/05	420	2.623249	0	0	0
110695	102405-S04-1	S04	avian	Bird	10/24/05	280	2.447158	0	0	0.04
110696	102405-S04-1	S04	avian	Bird	10/24/05	280	2.447158	0	0	0.04
110697	102405-S04-1	S04	avian	Bird	10/24/05	280	2.447158	0	0	0.04
110698	102405-S04-2	S04	avian	Bird	10/24/05	280	2.447158	0	0	0.04
110699	102405-S04-2	S04	avian	Bird	10/24/05	280	2.447158	0	0	0.04
110700	102405-S04-2	S04	rac	Wildlife	10/24/05	280	2.447158	0	0	0.04
110701	102405-S04-2	S04	gull	Bird	10/24/05	280	2.447158	0	0	0.04
110702	102405-S04-3	S04	avian	Bird	10/24/05	300	2.477121	0	0	0.04
110703	102405-S04-3	S04	avian	Bird	10/24/05	300	2.477121	0	0	0.04
110704	102405-S04-3	S04	rac	Wildlife	10/24/05	300	2.477121	0	0	0.04
111069	111505-S04-1	S04	raccoon	Wildlife	11/15/05	800	2.90309	0	0	0.1
111070	111505-S04-1	S04	raccoon	Wildlife	11/15/05	800	2.90309	0	0	0.1
111071	111505-S04-1	S04	avian	Bird	11/15/05	800	2.90309	0	0	0.1
111072	111505-S04-2	S04	raccoon	Wildlife	11/15/05	550	2.740363	0	0	0.1
111073	111505-S04-2	S04	dog	Dog	11/15/05	550	2.740363	0	0	0.1
111074	111505-S04-2	S04	rodent	Rodent	11/15/05	550	2.740363	0	0	0.1
111075	111505-S04-3	S04	rac	Wildlife	11/15/05	350	2.544068	0	0	0.1

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
111076	111505-S04-3	S04	dog	Dog	11/15/05	350	2.544068	0	0	0.1
111077	111505-S04-3	S04	avian	Bird	11/15/05	350	2.544068	0	0	0.1
105194	02-17-05-S04-1	S04	avian	Bird	2/17/05	520	2.716003	1.38	3.42	4.7
105195	02-17-05-S04-1	S04	gull	Bird	2/17/05	520	2.716003	1.38	3.42	4.7
105196	02-17-05-S04-1	S04	avian	Bird	2/17/05	520	2.716003	1.38	3.42	4.7
105197	02-17-05-S04-2	S04	raccoon	Wildlife	2/17/05	520	2.716003	1.38	3.42	4.7
105198	02-17-05-S04-2	S04	feline	Cat	2/17/05	520	2.716003	1.38	3.42	4.7
105199	02-17-05-S04-2	S04	dog	Dog	2/17/05	520	2.716003	1.38	3.42	4.7
105200	02-17-05-S04-3	S04	rodent	Rodent	2/17/05	580	2.763428	1.38	3.42	4.7
105201	02-17-05-S04-3	S04	rodent	Rodent	2/17/05	580	2.763428	1.38	3.42	4.7
105202	02-17-05-S04-3	S04	feline	Cat	2/17/05	580	2.763428	1.38	3.42	4.7
105203	02-17-05-S04-3	S04	avian	Bird	2/17/05	580	2.763428	1.38	3.42	4.7
72437	S1	S1	unknown	Unknown	1/13/03	14200	4.152288	0	0	1.8
72438	S1	S1	human	Human	1/13/03	14200	4.152288	0	0	1.8
72439	S1	S1	human	Human	1/13/03	14200	4.152288	0	0	1.8
106904	06-06-05-S1-1	S1	raccoon	Wildlife	6/6/05	100	2	0	0	0
106905	06-06-05-S1-1	S1	avian	Bird	6/6/05	100	2	0	0	0
106906	06-06-05-S1-1	S1	avian	Bird	6/6/05	100	2	0	0	0
106907	06-06-05-S1-2	S1	avian	Bird	6/6/05	100	2	0	0	0
106908	06-06-05-S1-2	S1	avian	Bird	6/6/05	100	2	0	0	0
106909	06-06-05-S1-2	S1	avian	Bird	6/6/05	100	2	0	0	0
106910	06-06-05-S1-3	S1	avian	Bird	6/6/05	100	2	0	0	0
106911	06-06-05-S1-3	S1	deer	Wildlife	6/6/05	100	2	0	0	0
106912	06-06-05-S1-3	S1	unknown	Unknown	6/6/05	100	2	0	0	0
110705	102405-S1-1	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04
110706	102405-S1-1	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04
110707	102405-S1-1	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04
110708	102405-S1-2	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
110709	102405-S1-2	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04
110710	102405-S1-2	S1	avian	Bird	10/24/05	660	2.819544	0	0	0.04
110711	102405-S1-3	S1	avian	Bird	10/24/05	620	2.792392	0	0	0.04
110712	102405-S1-3	S1	avian	Bird	10/24/05	620	2.792392	0	0	0.04
110713	102405-S1-3	S1	avian	Bird	10/24/05	620	2.792392	0	0	0.04
111078	111505-S1-1	S1	rodent	Rodent	11/15/05	600	2.778151	0	0	0.1
111079	111505-S1-1	S1	gull	Bird	11/15/05	600	2.778151	0	0	0.1
111080	111505-S1-1	S1	rodent	Rodent	11/15/05	600	2.778151	0	0	0.1
111081	111505-S1-1	S1	rodent	Rodent	11/15/05	600	2.778151	0	0	0.1
111082	111505-S1-2	S1	gull	Bird	11/15/05	570	2.755875	0	0	0.1
111083	111505-S1-2	S1	gull	Bird	11/15/05	570	2.755875	0	0	0.1
111084	111505-S1-2	S1	gull	Bird	11/15/05	570	2.755875	0	0	0.1
111085	111505-S1-3	S1	rodent	Rodent	11/15/05	680	2.832509	0	0	0.1
111086	111505-S1-3	S1	rodent	Rodent	11/15/05	680	2.832509	0	0	0.1
111087	111505-S1-3	S1	gull	Bird	11/15/05	680	2.832509	0	0	0.1
104695	12-27-04-S1-1	S1	avian	Bird	12/27/04	15800	4.198657	1.92	3.85	3.85
104696	12-27-04-S1-1	S1	raccoon	Wildlife	12/27/04	15800	4.198657	1.92	3.85	3.85
104697	12-27-04-S1-1	S1	gull	Bird	12/27/04	15800	4.198657	1.92	3.85	3.85
104698	12-27-04-S1-2	S1	dog	Dog	12/27/04	16750	4.224015	1.92	3.85	3.85
104699	12-27-04-S1-2	S1	gull	Bird	12/27/04	16750	4.224015	1.92	3.85	3.85
104700	12-27-04-S1-2	S1	gull	Bird	12/27/04	16750	4.224015	1.92	3.85	3.85
104701	12-27-04-S1-2	S1	raccoon	Wildlife	12/27/04	16750	4.224015	1.92	3.85	3.85
104702	12-27-04-S1-3	S1	gull	Bird	12/27/04	19100	4.281033	1.92	3.85	3.85
104703	12-27-04-S1-3	S1	raccoon	Wildlife	12/27/04	19100	4.281033	1.92	3.85	3.85
104704	12-27-04-S1-3	S1	avian	Bird	12/27/04	19100	4.281033	1.92	3.85	3.85
105204	02-17-05-S1-1	S1	avian	Bird	2/17/05	2260	3.354108	1.38	3.42	4.7
105205	02-17-05-S1-1	S1	raccoon	Wildlife	2/17/05	2260	3.354108	1.38	3.42	4.7
105206	02-17-05-S1-1	S1	gull	Bird	2/17/05	2260	3.354108	1.38	3.42	4.7

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
105207	02-17-05-S1-2	S1	raccoon	Wildlife	2/17/05	1940	3.287802	1.38	3.42	4.7
105208	02-17-05-S1-2	S1	gull	Bird	2/17/05	1940	3.287802	1.38	3.42	4.7
105209	02-17-05-S1-2	S1	gull	Bird	2/17/05	1940	3.287802	1.38	3.42	4.7
105210	02-17-05-S1-3	S1	raccoon	Wildlife	2/17/05	2340	3.369216	1.38	3.42	4.7
105211	02-17-05-S1-3	S1	gull	Bird	2/17/05	2340	3.369216	1.38	3.42	4.7
105212	02-17-05-S1-3	S1	gull	Bird	2/17/05	2340	3.369216	1.38	3.42	4.7
108133	07-11-05-S11-1	S11D	rodent	Rodent	7/11/05	300	2.477121	0	0	0
108134	07-11-05-S11-1	S11D	raccoon	Wildlife	7/11/05	300	2.477121	0	0	0
108135	07-11-05-S11-1	S11D	dog	Dog	7/11/05	300	2.477121	0	0	0
108136	07-11-05-S11-2	S11D	raccoon	Wildlife	7/11/05	400	2.60206	0	0	0
108137	07-11-05-S11-2	S11D	gull	Bird	7/11/05	400	2.60206	0	0	0
108138	07-11-05-S11-2	S11D	dog	Dog	7/11/05	400	2.60206	0	0	0
108139	07-11-05-S11-3	S11D	sewage	Human	7/11/05	360	2.556303	0	0	0
108140	07-11-05-S11-3	S11D	raccoon	Wildlife	7/11/05	360	2.556303	0	0	0
108141	07-11-05-S11-3	S11D	raccoon	Wildlife	7/11/05	360	2.556303	0	0	0
108142	07-11-05-S11-3	S11D	avian	Bird	7/11/05	360	2.556303	0	0	0
108442	080105-S11-1	S11D	avian	Bird	8/1/05	800	2.90309	0	0	0
108443	080105-S11-1	S11D	avian	Bird	8/1/05	800	2.90309	0	0	0
108444	080105-S11-1	S11D	avian	Bird	8/1/05	800	2.90309	0	0	0
108445	080105-S11-2	S11D	rodent	Rodent	8/1/05	800	2.90309	0	0	0
108446	080105-S11-2	S11D	rodent	Rodent	8/1/05	800	2.90309	0	0	0
108447	080105-S11-2	S11D	canine	Dog	8/1/05	800	2.90309	0	0	0
108448	080105-S11-3	S11D	avian	Bird	8/1/05	800	2.90309	0	0	0
108449	080105-S11-3	S11D	avian	Bird	8/1/05	800	2.90309	0	0	0
108450	080105-S11-3	S11D	horse	Horse	8/1/05	800	2.90309	0	0	0
110462	092805-S11-1	S11D	dog	Dog	9/28/05	260	2.414973	0	0	0
110463	092805-S11-1	S11D	canine	Dog	9/28/05	260	2.414973	0	0	0
110464	092805-S11-1	S11D	avian	Bird	9/28/05	260	2.414973	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
110465	092805-S11-2	S11D	deer	Wildlife	9/28/05	260	2.414973	0	0	0
110466	092805-S11-2	S11D	raccoon	Wildlife	9/28/05	260	2.414973	0	0	0
110467	092805-S11-2	S11D	rodent	Rodent	9/28/05	260	2.414973	0	0	0
110468	092805-S11-3	S11D	avian	Bird	9/28/05	260	2.414973	0	0	0
110469	092805-S11-3	S11D	avian	Bird	9/28/05	260	2.414973	0	0	0
110470	092805-S11-3	S11D	dog	Dog	9/28/05	260	2.414973	0	0	0
87428	S23-1	S23	rodent	Rodent	1/21/04	50	1.69897	0	0	0
87429	S23-1	S23	sewage	Human	1/21/04	50	1.69897	0	0	0
87430	S23-1	S23	Unknown	Unknown	1/21/04	50	1.69897	0	0	0
87431	S23-2	S23	Unknown	Unknown	1/21/04	50	1.69897	0	0	0
87432	S23-2	S23	avian	Bird	1/21/04	50	1.69897	0	0	0
87433	S23-2	S23	rodent	Rodent	1/21/04	50	1.69897	0	0	0
87434	S23-3	S23	rodent	Rodent	1/21/04	30	1.4771213	0	0	0
87435	S23-3	S23	avian	Bird	1/21/04	30	1.4771213	0	0	0
87436	S23-3	S23	avian	Bird	1/21/04	30	1.4771213	0	0	0
89667	S23-1	S23	sewage	Human	3/9/04	10	1	0	0	0
89668	S23-1	S23	rodent	Rodent	3/9/04	10	1	0	0	0
89669	S23-2	S23	dog	Dog	3/9/04	20	1.30103	0	0	0
89670	S23-2	S23	sewage	Human	3/9/04	20	1.30103	0	0	0
90638	S23-1	S23	avian	Bird	3/23/04	3010	3.4785665	0	0	0
90639	S23-1	S23	canine	Dog	3/23/04	3010	3.4785665	0	0	0
90640	S23-1	S23	avian	Bird	3/23/04	3010	3.4785665	0	0	0
90641	S23-2	S23	avian	Bird	3/23/04	3200	3.50515	0	0	0
90642	S23-2	S23	Raccoon	Wildlife	3/23/04	3200	3.50515	0	0	0
90643	S23-2	S23	rodent	Rodent	3/23/04	3200	3.50515	0	0	0
90644	S23-3	S23	Raccoon	Wildlife	3/23/04	2970	3.4727564	0	0	0
90645	S23-3	S23	avian	Bird	3/23/04	2970	3.4727564	0	0	0
90646	S23-3	S23	avian	Bird	3/23/04	2970	3.4727564	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
93164	S23-1	S23	deer	Wildlife	5/18/04	210	2.3222193	0	0	0
93165	S23-1	S23	rodent	Rodent	5/18/04	210	2.3222193	0	0	0
93166	S23-1	S23	gull	Bird	5/18/04	210	2.3222193	0	0	0
93167	S23-2	S23	Unknown	Unknown	5/18/04	210	2.3222193	0	0	0
93168	S23-2	S23	sewage	Human	5/18/04	210	2.3222193	0	0	0
93169	S23-2	S23	avian	Bird	5/18/04	210	2.3222193	0	0	0
93170	S23-3	S23	avian	Bird	5/18/04	210	2.3222193	0	0	0
93171	S23-3	S23	avian	Bird	5/18/04	210	2.3222193	0	0	0
93172	S23-3	S23	avian	Bird	5/18/04	210	2.3222193	0	0	0
95474	6-15-04-S23-1	S23	avian	Bird	6/15/04	680	2.8325089	0	0	0
95475	6-15-04-S23-1	S23	raccoon	Wildlife	6/15/04	680	2.8325089	0	0	0
95476	6-15-04-S23-1	S23	feline	Cat	6/15/04	680	2.8325089	0	0	0
95477	6-15-04-S23-2	S23	human	Human	6/15/04	NO SAMPLE	#VALUE!	0	0	0
95478	6-15-04-S23-2	S23	human	Human	6/15/04	NO SAMPLE	#VALUE!	0	0	0
95479	6-15-04-S23-3	S23	avian	Bird	6/15/04	440	2.6434527	0	0	0
95563	6-16-04-S23-1	S23	dog	Dog	6/15/04	420	2.6232493	0	0	0
95564	6-16-04-S23-1	S23	avian	Bird	6/15/04	420	2.6232493	0	0	0
95565	6-16-04-S23-1	S23	gull	Bird	6/15/04	420	2.6232493	0	0	0
95566	6-16-04-S23-2	S23	avian	Bird	6/15/04	480	2.6812412	0	0	0
95567	6-16-04-S23-2	S23	avian	Bird	6/15/04	480	2.6812412	0	0	0
95568	6-16-04-S23-2	S23	avian	Bird	6/15/04	480	2.6812412	0	0	0
95569	6-16-04-S23-3	S23	avian	Bird	6/15/04	540	2.7323938	0	0	0
95570	6-16-04-S23-3	S23	rodent	Rodent	6/15/04	540	2.7323938	0	0	0
95571	6-16-04-S23-3	S23	avian	Bird	6/15/04	540	2.7323938	0	0	0
95824	6-24-04-S23-1	S23	gull	Bird	6/24/04	200	2.30103	0	0	0
95825	6-24-04-S23-1	S23	avian	Bird	6/24/04	200	2.30103	0	0	0
95826	6-24-04-S23-1	S23	gull	Bird	6/24/04	200	2.30103	0	0	0
95827	6-24-04-S23-2	S23	avian	Bird	6/24/04	150	2.1760913	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
95828	6-24-04-S23-2	S23	rodent	Rodent	6/24/04	150	2.1760913	0	0	0
95829	6-24-04-S23-2	S23	avian	Bird	6/24/04	150	2.1760913	0	0	0
97599	07-19-2004-S23-1	S23	avian	Bird	7/19/04	520	2.7160033	0	0	0
97600	07-19-2004-S23-1	S23	avian	Bird	7/19/04	520	2.7160033	0	0	0
97601	07-19-2004-S23-1	S23	avian	Bird	7/19/04	520	2.7160033	0	0	0
97602	07-19-2004-S23-1	S23	Unknown	Unknown	7/19/04	520	2.7160033	0	0	0
97603	07-19-2004-S23-2	S23	avian	Bird	7/19/04	520	2.7160033	0	0	0
97604	07-19-2004-S23-2	S23	avian	Bird	7/19/04	520	2.7160033	0	0	0
97605	07-19-2004-S23-2	S23	dog	Dog	7/19/04	520	2.7160033	0	0	0
97606	07-19-2004-S23-3	S23	avian	Bird	7/19/04	470	2.6720979	0	0	0
97607	07-19-2004-S23-3	S23	gull	Bird	7/19/04	470	2.6720979	0	0	0
97608	07-19-2004-S23-3	S23	avian	Bird	7/19/04	470	2.6720979	0	0	0
98808	8-02-04-S23-1	S23	avian	Bird	8/2/04	330	2.5185139	0	0	0
98809	8-02-04-S23-1	S23	avian	Bird	8/2/04	330	2.5185139	0	0	0
98810	8-02-04-S23-1	S23	avian	Bird	8/2/04	330	2.5185139	0	0	0
98811	8-02-04-S23-2	S23	avian	Bird	8/2/04	310	2.4913617	0	0	0
98812	8-02-04-S23-2	S23	avian	Bird	8/2/04	310	2.4913617	0	0	0
98813	8-02-04-S23-2	S23	avian	Bird	8/2/04	310	2.4913617	0	0	0
98814	8-02-04-S23-3	S23	Unknown	Unknown	8/2/04	390	2.5910646	0	0	0
98815	8-02-04-S23-3	S23	avian	Bird	8/2/04	390	2.5910646	0	0	0
98816	8-02-04-S23-3	S23	avian	Bird	8/2/04	390	2.5910646	0	0	0
99849	8-18-04-S23-1	S23	avian	Bird	8/18/04	40	1.60206	0	0	0
99850	8-18-04-S23-1	S23	Unknown	Unknown	8/18/04	40	1.60206	0	0	0
99851	8-18-04-S23-3	S23	gull	Bird	8/18/04	140	2.146128	0	0	0
99852	8-18-04-S23-3	S23	gull	Bird	8/18/04	140	2.146128	0	0	0
99853	8-18-04-S23-3	S23	canine	Dog	8/18/04	140	2.146128	0	0	0
106913	06-06-05-S23-1	S23	avian	Bird	6/6/05	220	2.342423	0	0	0
106914	06-06-05-S23-1	S23	avian	Bird	6/6/05	220	2.342423	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
106915	06-06-05-S23-1	S23	raccoon	Wildlife	6/6/05	220	2.342423	0	0	0
106916	06-06-05-S23-2	S23	sewage	Human	6/6/05	220	2.342423	0	0	0
106917	06-06-05-S23-2	S23	feline	Cat	6/6/05	220	2.342423	0	0	0
106918	06-06-05-S23-2	S23	avian	Bird	6/6/05	220	2.342423	0	0	0
106919	06-06-05-S23-3	S23	rodent	Rodent	6/6/05	220	2.342423	0	0	0
106920	06-06-05-S23-3	S23	avian	Bird	6/6/05	220	2.342423	0	0	0
106921	06-06-05-S23-3	S23	avian	Bird	6/6/05	220	2.342423	0	0	0
106922	06-06-05-S23-3	S23	rac	Wildlife	6/6/05	220	2.342423	0	0	0
108152	07-11-05-S23-1	S23	avian	Bird	7/11/05	80	1.90309	0	0	0
108153	07-11-05-S23-1	S23	rac	Wildlife	7/11/05	80	1.90309	0	0	0
108154	07-11-05-S23-1	S23	rodent	Rodent	7/11/05	80	1.90309	0	0	0
108155	07-11-05-S23-2	S23	gull	Bird	7/11/05	60	1.778151	0	0	0
108156	07-11-05-S23-3	S23	waterfowl	Bird	7/11/05	60	1.778151	0	0	0
108157	07-11-05-S23-3	S23	unknown	Unknown	7/11/05	60	1.778151	0	0	0
108451	080105-S23-1	S23	sewage	Human	8/1/05	240	2.380211	0	0	0
108452	080105-S23-1	S23	avian	Bird	8/1/05	240	2.380211	0	0	0
108453	080105-S23-1	S23	dog	Dog	8/1/05	240	2.380211	0	0	0
108454	080105-S23-2	S23	deer	Wildlife	8/1/05	240	2.380211	0	0	0
108455	080105-S23-2	S23	deer	Wildlife	8/1/05	240	2.380211	0	0	0
108456	080105-S23-2	S23	avian	Bird	8/1/05	240	2.380211	0	0	0
108457	080105-S23-3	S23	unknown	Unknown	8/1/05	240	2.380211	0	0	0
108458	080105-S23-3	S23	dog	Dog	8/1/05	240	2.380211	0	0	0
108459	080105-S23-3	S23	feline	Cat	8/1/05	240	2.380211	0	0	0
110471	092805-S23-1	S23	rodent	Rodent	9/28/05	130	2.113943	0	0	0
110472	092805-S23-1	S23	unknown	Unknown	9/28/05	130	2.113943	0	0	0
110473	092805-S23-1	S23	avian	Bird	9/28/05	130	2.113943	0	0	0
110474	092805-S23-2	S23	avian	Bird	9/28/05	130	2.113943	0	0	0
110475	092805-S23-2	S23	unknown	Unknown	9/28/05	130	2.113943	0	0	0

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
110476	092805-S23-2	S23	unknown	Unknown	9/28/05	130	2.113943	0	0	0
110477	092805-S23-3	S23	waterfowl	Bird	9/28/05	130	2.113943	0	0	0
110478	092805-S23-3	S23	rodent	Rodent	9/28/05	130	2.113943	0	0	0
110479	092805-S23-3	S23	dog	Dog	9/28/05	130	2.113943	0	0	0
110714	102405-S23-1	S23	gull	Bird	10/24/05	400	2.60206	0	0	0.04
110715	102405-S23-1	S23	canine	Dog	10/24/05	400	2.60206	0	0	0.04
110716	102405-S23-1	S23	avian	Bird	10/24/05	400	2.60206	0	0	0.04
110717	102405-S23-2	S23	rodent	Rodent	10/24/05	370	2.568202	0	0	0.04
110718	102405-S23-2	S23	canine	Dog	10/24/05	370	2.568202	0	0	0.04
110719	102405-S23-2	S23	dog	Dog	10/24/05	370	2.568202	0	0	0.04
110720	102405-S23-3	S23	gull	Bird	10/24/05	360	2.556303	0	0	0.04
110721	102405-S23-3	S23	gull	Bird	10/24/05	360	2.556303	0	0	0.04
110722	102405-S23-3	S23	avian	Bird	10/24/05	360	2.556303	0	0	0.04
110723	102405-S23-3	S23	rodent	Rodent	10/24/05	360	2.556303	0	0	0.04
111088	111505-S23-1	S23	canine	Dog	11/15/05	340	2.531479	0	0	0.1
111089	111505-S23-1	S23	rodent	Rodent	11/15/05	340	2.531479	0	0	0.1
111090	111505-S23-1	S23	avian	Bird	11/15/05	340	2.531479	0	0	0.1
111091	111505-S23-2	S23	avian	Bird	11/15/05	250	2.39794	0	0	0.1
111092	111505-S23-2	S23	rodent	Rodent	11/15/05	250	2.39794	0	0	0.1
111093	111505-S23-2	S23	rodent	Rodent	11/15/05	250	2.39794	0	0	0.1
111094	111505-S23-3	S23	opossum	Wildlife	11/15/05	450	2.653213	0	0	0.1
111095	111505-S23-3	S23	feline	Cat	11/15/05	450	2.653213	0	0	0.1
111096	111505-S23-3	S23	feline	Cat	11/15/05	450	2.653213	0	0	0.1
102112	S23-1	S23	rodent	Rodent	9/21/04	120	2.0791812	0	0.02	0.02
102113	S23-1	S23	gull	Bird	9/21/04	120	2.0791812	0	0.02	0.02
102114	S23-1	S23	avian	Bird	9/21/04	120	2.0791812	0	0.02	0.02
102115	S23-1	S23	Unknown	Unknown	9/21/04	120	2.0791812	0	0.02	0.02
102116	S23-1	S23	rodent	Rodent	9/21/04	120	2.0791812	0	0.02	0.02

Isolate	Provider Sample.	Stanum	Note	Source	Sample Date	FeColi	LogFC	RAIN-1	RAIN-3	RAIN-7
102478	S23-2	S23	human	Human	9/21/04	100	2	0	0.02	0.02
102479	S23-2	S23	raccoon	Wildlife	9/21/04	100	2	0	0.02	0.02
102480	S23-2	S23	Raccoon	Wildlife	9/21/04	100	2	0	0.02	0.02
102481	S23-2	S23	Raccoon	Wildlife	9/21/04	100	2	0	0.02	0.02
102482	S23-3	S23	gull	Bird	9/21/04	190	2.2787536	0	0.02	0.02
102483	S23-3	S23	gull	Bird	9/21/04	190	2.2787536	0	0.02	0.02
102484	S23-3	S23	gull	Bird	9/21/04	190	2.2787536	0	0.02	0.02
105213	02-17-05-S23-1	S23	unknown	Unknown	2/17/05	100	2	1.38	3.42	4.7
105214	02-17-05-S23-1	S23	horse	Horse	2/17/05	100	2	1.38	3.42	4.7
105215	02-17-05-S23-1	S23	avian	Bird	2/17/05	100	2	1.38	3.42	4.7
105216	02-17-05-S23-2	S23	rac	Wildlife	2/17/05	40	1.60206	1.38	3.42	4.7
105217	02-17-05-S23-2	S23	deer	Wildlife	2/17/05	40	1.60206	1.38	3.42	4.7
105218	02-17-05-S23-2	S23	unknown	Unknown	2/17/05	40	1.60206	1.38	3.42	4.7
105219	02-17-05-S23-3	S23	avian	Bird	2/17/05	80	1.90309	1.38	3.42	4.7
105220	02-17-05-S23-3	S23	dog	Dog	2/17/05	80	1.90309	1.38	3.42	4.7
105221	02-17-05-S23-3	S23	rodent	Rodent	2/17/05	80	1.90309	1.38	3.42	4.7
105222	02-17-05-S23-3	S23	rodent	Rodent	2/17/05	80	1.90309	1.38	3.42	4.7

APPENDIX-D

USE ATTAINABILITY ANALYSIS FOR SOQUEL LAGOON IN SANTA CRUZ COUNTY, CALIFORNIA

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List of Acronyms and Abbreviations

This document contains numerous acronyms and abbreviations. In general, an abbreviation will be given in parentheses ( ) following the first time a title or term is used, and the abbreviation will be used in almost all cases in place of that term later. The following alphabetical list of abbreviations used in this document is provided for the convenience of the reader:

CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
City	City of Capitola
County	The County of Santa Cruz
CWA	Clean Water Act
CWC	California Water Code
DHS	California Department of Health Services
E. coli	*Escherichia coli* bacteria
FDA	United States Department of Health and Human Services Food and Drug Administration
Lagoon	Soquel Lagoon
MF	Membrane Filter
MPN	Most Probable Number
NMFs	National Marine Fisheries
NOAA	National Oceanic and Atmospheric Administration
REC-1	Water Contact Recreation
REC-2	Non-contact Water Recreation
SHELL	Referring to the beneficial use of shellfishing
SSO	Site Specific Objective
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
Water Board	Central Coast Water Board
WDR	Waste Discharge Requirements
WQO	Water Quality Objective
WWTP	Waste Water Treatment Plant

1. Introduction

Section 303(c) of the Clean Water Act (CWA) requires each State to develop water quality standards that protect the chemical, physical, and biological integrity of the State's waterbodies. Water quality standards under the Clean Water Act consist of three elements: Use Classification, Water Quality Criteria, and Antidegradation Policy (CWA § 303(c)(2); 40 C.F.R §§ 130.3, 131.6, 131.10, 131.11). Use Classification, termed "beneficial uses" under California law, are "uses specified in water quality standards for each water body or segment whether or not they are being attained." (40 C.F.R § 131.3(f)). Beneficial uses must be consistent with the goal of CWA section 101(a)(2)[1], which is to provide for "the protection and propagation of fish, shellfish, and wildlife and ... recreation in and on the water" (the so-called "fishable/swimmable" uses), unless the state demonstrates that those uses are not attainable. Beneficial uses must also consider, among others, the use and value of water for public water supplies, agriculture and industry, and the water quality standards of downstream waters (40 C.F.R. § 131.10).

Beneficial uses for surface waters in the Central Coast Region of California are designated in The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Coast Region, 1994. The Basin Plan lists the beneficial uses for approximately 1,000 water bodies under their jurisdiction.

Soquel Lagoon is located within the City of Capitola. Beneficial uses for this water body include: Contact and Non-contact Recreation (REC-1 and REC-2), Wildlife Habitat (WILD), Cold Freshwater Habitat (COLD), Migration of Aquatic Organisms (MIGR), Spawning, Reproduction, and/or Early Development (SPWN), Rare, Threatened, or Endangered Species (RARE), Estuarine Habitat (EST), Commercial and Sport Fishing (COMM), and Shellfish Harvesting (SHELL).

Recently, while reviewing bacteria water quality objectives related to Total Maximum Daily Loads (TMDLs), Water Board staff questioned the validity of assigning the SHELL beneficial use to an area where it is highly unlikely that any shellfish are living. The Soquel Lagoon has never been thoroughly examined to determine if the SHELL beneficial use is appropriate for this waterbody. The definition of this beneficial use is:

> *Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.*

Preliminary assessments indicate that the beneficial use of shellfishing may not be appropriate. Beneficial uses attained on or after November 28, 1975 are "existing uses" and indicate that there is evidence that the use is occurring or that water quality is sufficient to allow the use to occur. A beneficial use that is determined to be "existing"

[1] Hereto referred to as the fishable/swimmable use.

may not be removed. To remove a use that is not intended to satisfy the minimum of "fishable/swimmable," it must be demonstrated that the use is not attainable through one of the factors listed in 40 CFR 131.10(g). To remove "fishable/swimmable" uses, a use attainability analysis (UAA), supported by at least one of the factors listed in 40 CFR 131.10(g), must be conducted. (U.S. EPA Water Quality Standards Handbook, pp. [2-6]-[2-8].)

The purpose of this UAA is to provide an assessment of the beneficial use of shellfishing for Soquel Lagoon that would serve as the basis for amending the Basin Plan to remove the beneficial use of shellfishing for this waterbody. Such a determination must coordinate with the pathogen Total Maximum Daily Load (TMDL) for this waterbody so the TMDL sets the proper level of water quality protection.

2. Characterization of the Segments and Watershed

Soquel Lagoon is located in Santa Cruz County, California (see Figure 1).

In general, the lagoon systems along the Central California coastline typically develop a sandbar at the ocean interface in the spring or summer months, due to decreased summer and fall fresh water flows and increased tidal delivery of sand to the beach environment (Swanson, 2003).

Soquel Lagoon is located approximately 5 miles due east of San Lorenzo River Estuary. Soquel Lagoon (Figure 2 and Figure 3) is an example of a managed Lagoon that is manually closed and opened every spring and fall by the City of Capitola. The water clarity is high and the fresh water column appears to remain well oxygenated throughout the closed season (Swanson, 2003).

Figure 1: Map of Santa Cruz area (Swanson Hydrology)

The following watershed characterization is from a State Water Resources Control Board draft staff report (SWRCB, 1982, pp. 12) regarding San Lorenzo River Estuary. We are presenting it here because the climate and topography of the San Lorenzo River Estuary is very similar to Soquel Lagoon:

"The San Lorenzo River drains an area of 138 square miles in northern Santa Cruz County. The river flows southward to empty into Monterey Bay at the City of Santa Cruz. Much of the watershed is rugged and forested as is typical of the Coast Range south of San Francisco.

"The climate of the watershed is affected by its proximity to the Pacific Ocean. Winters are cool and wet with an average annual rainfall of about 47 inches, ranging from about 30 inches in the City of Santa Cruz to 60 inches at the community of Boulder Creek. Summers are warm and dry although cooled at times by morning fog at the lower elevations. Eighty-two percent of the rainfall occurs in the period December through April."

The following is a characterization from Swanson Hydrology & Geomorphology's Biogeochemical Function of the San Lorenzo River Lagoon (2003):

"Hydrologic alterations have restricted the summer lagoon habitat in coastal streams such as the San Lorenzo River, resulting in relatively rapid increases in groundwater elevations and the inundation of an unvegetated beach environment. Therefore, the San Lorenzo River Lagoon rarely remains closed for a sustained period of time [anywhere between a couple days and a 3-4 weeks], either due to natural exceedance of the water storage area in the Lagoon or unauthorized breachings of the sandbar (pp. 2).

"The physical distribution of water within the San Lorenzo Lagoon has a direct impact on the amount and the quality of the available aquatic habitat. When the mouth of the lagoon is breached, the water depth and areas of inundation are controlled by the tidal elevations, as shown by the diurnal variations in water depth recorded during the early 2002 season. Following closure (the development of the sand bar at the mouth), the lower stream channel gradually continues to inundate upstream locations as the water surface elevation increases and water backs up behind the sandbar (pp. 9)."

For the purposes of this report, Soquel Lagoon will be defined as the creek's outlet at the ocean to just upstream of Perry Park on Soquel Creek (where the saltwater influence ceases). The saltwater influence ends somewhere between the Trestle and just upstream of Perry Park on Soquel Creek, depending on tidal influence. We will use Perry Park as our boundary for the Lagoon because that is the furthest tidally influenced point.

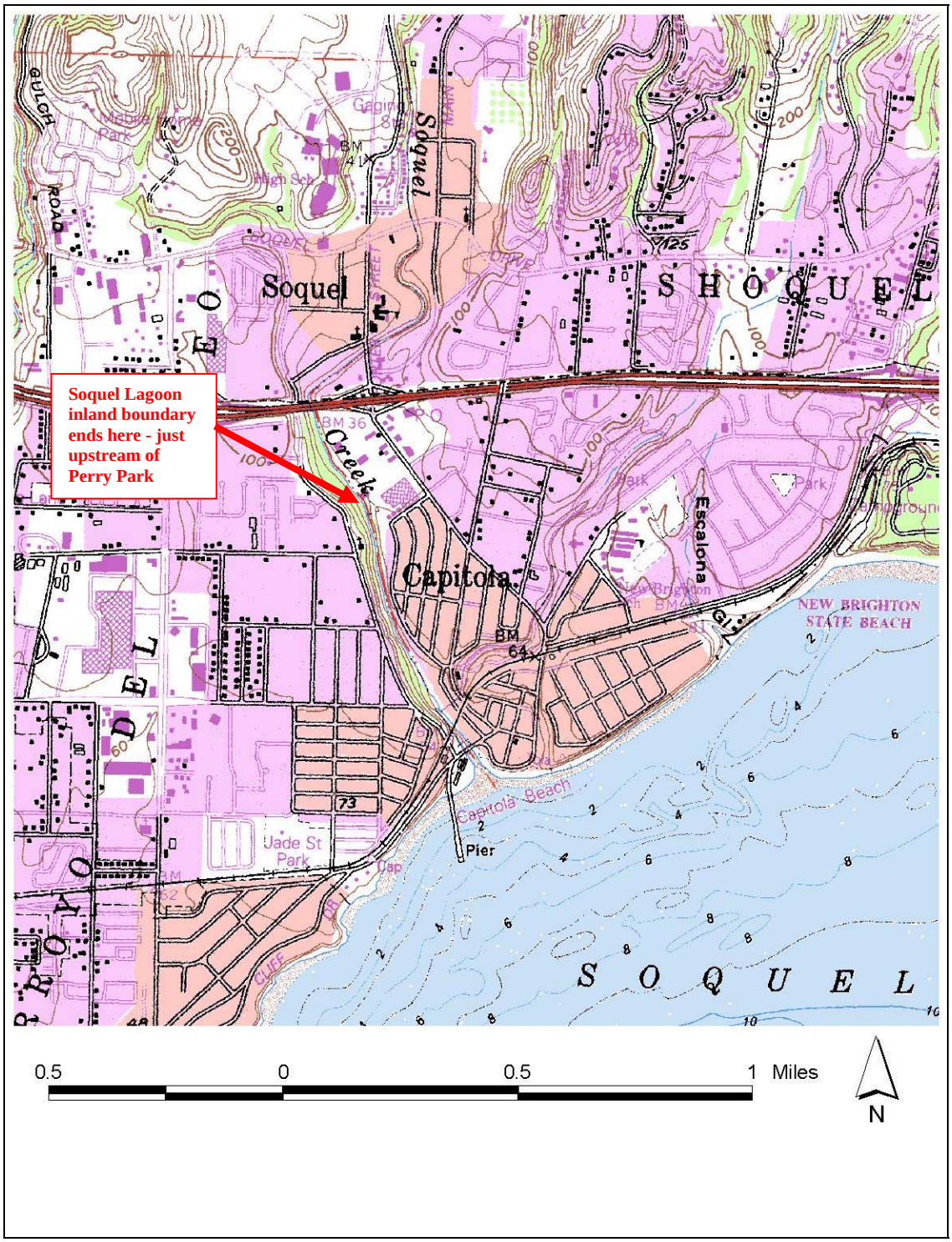

Figure 2: Map of Soquel Lagoon

Figure 3: Photos of Soquel Lagoon (Swanson Hydrology)

3. Methodology

A use attainability analysis (UAA) is a structured scientific assessment of the physical, chemical, biological, and economic factors affecting the attainment of a designated use (40 CFR 131.3). The purpose of a UAA is to provide information in order to decide whether a designated use is attainable or not.

Staff used the following methodology for this UAA: Staff analyzed existing water quality data, conducted reconnaissance work in the area, contacted persons with knowledge of the area and performed a literature review on the lifecycle and habitat requirements of shellfish. These methods allowed staff to compare information gathered to the six factors that may provide a legal basis for changing or removing a designated use (40 CFR 131.10(g)). These factors are:

(1) Naturally occurring pollutant concentrations prevent the attainment of the use.

(2) Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met.

(3) Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place.

(4) Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.

(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unless these

conditions may be compensated, unrelated to water quality preclude attainment of aquatic life protection uses.

(6) Controls more stringent than those required by Sections 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.

To remove a designated use that is not an existing use the state must demonstrate that attaining the designated use is not feasible under one or more of the six conditions listed above. If a state wishes to remove any fishable/swimmable uses, it must perform a UAA (40 C.F.R. § 131.10(j)). Prior to removing a use, the state also must provide notice and an opportunity for a public hearing (40 C.F.R § 131.10(e)).

The determination of whether or not a use is "existing" must include an evaluation of both the actual occurrence of the use activity (e.g., have shellfish been present?) and whether or not the level of water quality necessary to support the use has been achieved at any time since November 28, 1975. If the level of water quality necessary to support a use has been achieved within that time period, the use is considered "existing" and must be protected, regardless of whether or not the use activity has actually occurred.

Figure 4 shows the generalized methodology used in this UAA process. This methodology was taken from the Impaired Waters Guidance (SWRCB, 2005) for completing a UAA. Explicit in these analyses is a determination of specific waterbody attributes that are either conducive to attaining or preventing a given use. These attributes are evaluated to determine if certain modifications or controls would allow the use to be attainable and, if so, the feasibility or reasonableness of those options.

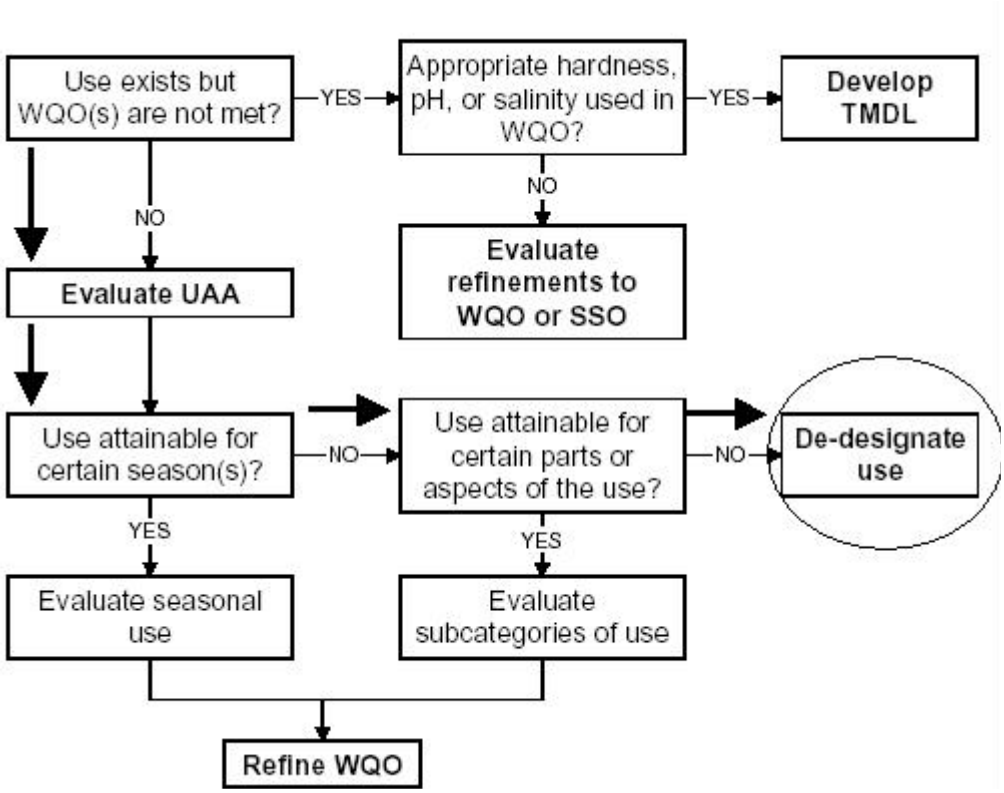

Figure 4: Summary of steps to determine whether to de-designate the SHELL beneficial use.

3.1 Methodology Steps

3.1.1 Step 1: Is the designated use being attained?

A beneficial use that is currently being attained, or that has been attained anytime on or after November 28, 1975 (the date on which the Federal Water Quality regulations took effect), is defined as an "existing use." A beneficial use that is defined as an existing use is evidence that the use is occurring or that water quality is sufficient to allow the use to occur. An existing designated use may not be removed.

Staff researched reports, performed literature reviews and contacted knowledgeable individuals in order to ascertain if the use is being attained.

3.1.2 Step 2: Is water quality sufficient to attain the beneficial use?

When a beneficial use does not appear to exist, the waterbody may still "attain" the use. For example, a waterbody that is not being used as a drinking water supply source may be of sufficient quality and quantity to be a future source of drinking water. In this case, the beneficial use is being attained (although it is not being used) and that beneficial use may not be removed from the waterbody.

Therefore, for the SHELL beneficial use, we evaluated the concentration of bacteria in the waterbody from 1987 to present. (Data were unavailable before 1987.) Additionally,

Water Board staff tried to determine if the hydrology, salinity and temperature of the water, along with the substrate of the waterbody, would allow shellfish to live in these environments.

Step 2a: Can the condition be compensated for with effluent discharges without violating water conservation requirements?

If the condition can be compensated for with effluent discharges without violating water conservation requirements, the use may not be removed.

3.1.3 Step 3: What factors preclude the attainment of the beneficial use?

This step determined what factors preclude the attainment of the beneficial use.

3.1.4 Step 4: Is restoration feasible?

In this step we evaluated if there was any practical way to restore the beneficial use of shellfishing.

4. Data Collection and Evaluation

4.1 Discussion of Bacterial Water Quality Objectives to Protect the Beneficial Use of Shellfishing

The Central Coast Water Board's Basin Plan's numeric water quality objective for bacteria for the SHELL beneficial use reads as follows:

> *At all areas where shellfish may be harvested for human consumption, the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 mL, nor shall more than 10% of the samples collected during any 30-day period exceed 230/100 mL for a five-tube decimal dilution test or 330/100 mL when a three-tube decimal dilution test is used.*

The DHS' standards for fecal coliform are as follows[2]:

> *i. The total coliform median or geometric mean MPN of the water does not exceed 70 per 100 mL and not more than 10 percent of the samples exceed a MPN of 230 per 100 mL for a five-tube decimal dilution test.*
>
> *ii. The fecal coliform median or geometric mean MPN of the water does not exceed 14 per 100 mL and not more than 10 percent of the samples exceed a MPN of 43 for a five-tube decimal dilution test.*

[2] These numbers are derived from the United States Department of Health and Human Services Food and Drug Administration (FDA), which operates a specific regulatory program directed at shellfish known as the National Shellfish Sanitation Program (1990). If these standards are not attained, the growing areas will be shut down on either a conditional or restricted basis.

In California, the fecal coliform standard that DHS uses is most often used to classify growing areas (as opposed to total coliform).

Staff chose to use DHS' standards of fecal coliform concentrations for the beneficial use of shellfishing for the UAA because they are the most conservative and are the most protective of the beneficial use of shellfishing. The Basin Plan's total coliform standards will not be used because 1) fecal coliform standards are more stringent and therefore more protective of water quality, and 2) total coliform standards in the Basin Plan are not currently used by DHS to manage the shellfish growing areas in other areas of California, and, 3) the majority of data we have from the County of Santa Cruz are fecal coliform numbers as opposed to total coliform. DHS uses fecal coliform standards to determine whether or not a growing area should be open or closed, therefore, monitoring for fecal coliform is more protective of the beneficial use of shellfishing, since that is the numeric objective that determines whether the public may consume the shellfish, commercially or recreationally.

4.2 Water Quality Data

The County of Santa Cruz has been collecting bacterial water quality data in Soquel Lagoon since April 1, 1987. From April 1, 1987 to June 9, 2004, Soquel Lagoon has never achieved the United States Department of Health Service's National Shellfish Sanitation Program's standards of 14 MPN fecal coliform. (Please see Appendix A for Water Quality Data.) To the best of staff's knowledge, there are no water quality data available for the period before 1987. Nor do we have any basis for inferring that water quality conditions would differ substantially from data collected from 1987 to the present day.

4.3 Site Visit

Staff visited Soquel Lagoon at a low tide on July 14, 2004. Staff visually inspected the area to look for the presence of shellfish. Staff took water quality measurements (pH, specific conductivity, dissolved oxygen, temperature and salinity) and observed the substrate characteristics. Please see Appendix B for the field sheets.

Staff visited the mouth of Soquel Lagoon. Visual inspection did not show any shellfish present. Additionally, during staff's site inspection, we came across NOAA (National Oceanic and Atmospheric Administration) staff scuba diving in the Lagoon. They reported that they did not observe any shellfish during their inspection.

4.4 Information From Other Agencies

Staff contacted several other agencies to gather information on the potential presence of shellfishing in Soquel Lagoon. The following is what we discovered:

4.4.1 California Department of Health Services

Discussions with A. Marc Commandatore of the California Department of Health Services (DHS) (pers. comm. A. Commandatore, 6/7/04) indicate that there have not been any commercial shellfish leases in the area. The closest historic commercial shellfishing lease was in Elkhorn Slough, which is approximately 15 miles south east of Soquel Lagoon. During historic shellfish operations, seed shellfish were used. In other words, Elkhorn Slough was not harvesting native shellfish for commercial sale.

DHS does not do bacterial sampling for recreationally collected shellfish and therefore does not have data on if/where shellfish are collected in this waterbody.

4.4.2 California Department of Fish and Game

Department of Fish and Game staff person Paul Reilly (pers. Comm. Reilly, 6/23/04) is unsure if people are collecting shellfish or if they exist in this waterbody.

4.4.3 County of Santa Cruz, Environmental Health Services

County of Santa Cruz, Environmental Health Services staff person Steve Peters (pers. comm. Peters 6/16/04) indicated that they are not aware of any recreational shellfish collection in Soquel Lagoon. He indicated that there might be too much flushing for shellfish to occur in this area. Additionally, Soquel Lagoon has pilings and the pilings do not have any mussels attached to them. Pilings would be a typical place that mussels would attach themselves to. Peters did mention that there are some tiny–size of a thumbnail–fresh water clams where the water is continually fresh. He is not aware of anyone who consumes these clams.

4.4.4 Consultants – 2nd Nature

Nicole Beck and Maggie Mathias (pers. comm. 11/30/04), are evaluating Scott Creek Lagoon, Laguna Creek Lagoon, San Lorenzo Lagoon (upper and lower), Aptos Lagoon and Soquel Lagoon. Their project is entitled, Comparative Lagoon Ecological Assessment Project. This study is being conducted in conjunction with NOAA and NMFs (National Marine Fisheries).

Although the purpose of their study is not to determine whether filter-feeding shellfish are present in Soquel Lagoon, Beck and Mathias are very familiar with the sampling efforts that have taken place in these areas and therefore are able to inform Water Board staff of their observations.

Sampling, of one kind or another, has been taking place in Soquel Lagoon for 5 or 6 years now (approximately 1999–2004). During their sample collections and observations of these lagoons, samplers have not seen any living shellfish, whether during snorkeling, wading, or performing benthic invertebrate sampling.

There was no evidence of shellfish material found in Soquel Lagoon during benthic invertebrate sampling.

Since there were no living shellfish found, it is difficult to assert that shellfish are actually able to live and reproduce in this lagoon.

4.4.5 UC Santa Cruz Biology Professor

Dr. Peter Raimondi, a Biology Professor at UC Santa Cruz, stated there were not any shellfish present in Soquel Lagoon (pers. comm. 2/23/05).

4.4.5 City of Capitola

Steve Jesberg, of the City of Capitola, said he had never seen any shellfish in Soquel Lagoon nor had he seen anyone collecting shellfish in the area (pers. comm. 1/11/05).

4.5 Literature Review

Staff conducted library research at the California Polytechnic State University, San Luis Obispo. Staff looked for journal articles as well as textbooks to determine if shellfish are or were present in Soquel Lagoon. Additionally, staff looked for information regarding typical habitats for shellfish to see if this waterbody would support hypothetical shellfish populations; i.e. do these waterbodies have the correct temperature, salinity, substrate, etc.

Staff did not find any journal articles that indicated that shellfish were living in Soquel Lagoon. Subsequently, staff found no information that there were individuals collecting shellfish in this area.

Textbook information was broad. The textbooks did not give any specific information on shellfish living in this waterbody. The biological, chemical and physical information regarding shellfish reproduction and habitat was wide-ranging for all the different species of shellfish. For example, some shellfish are able to tolerate a wider range of salinities than others. Others had more specific requirements having to do with temperature and salinity. This made it difficult to determine whether shellfish would be able to survive or not in this waterbody.

4.6 Basin Plan Designation Questionable

Soquel [Point] Lagoon was listed as having SHELL as a beneficial use in the 1975 Basin Plan. Staff found no documentation as to why SHELL was designated for this waterbody.

4.7 Public Outreach Meeting, November 15, 2005

Staff sought stakeholder input during a public meeting held at the Health Services Agency in Santa Cruz on November 15, 2005. The County of Santa Cruz facilitated the meeting. Staff presented our consideration to de-designate the beneficial use of shellfishing from the Soquel Lagoon and gave a brief presentation why. Staff asked all in attendance (see Appendix C for details) the following questions and asked them to fill out a form with any information they might have:

1) Do YOU think the shellfishing beneficial use exists in either the San Lorenzo River Estuary or the Soquel Lagoon? If you think shellfishing is occurring, why do you think so? Or if not, why do you think so?
2) Do you know of anyone you think Regional Board staff should contact regarding this issue?

There were over 20 people in attendance at this meeting and no one submitted a form. At that time staff had already spoken in detail with four of the attendees at the meeting.

5. Evaluation of Attainability of the Shellfishing Beneficial Use

The shellfishing beneficial use specifies uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries (emphasis added). In this next section, we evaluate the attainability of the shellfishing beneficial use.

5.1 Attainability of Shellfishing Beneficial Use

5.1.1 Step 1: Is the beneficial use being attained?

The presence of shellfish and/or any records of shellfish being present *since* November 28, 1975 would demonstrate that the SHELL beneficial use exists. Staff's investigation found no known records, individual or agency knowledge that shows shellfish collection occurred anytime after November 28, 1975.

5.1.2 Step 2: Is water quality sufficient to attain the beneficial use?

Bacterial concentrations are persistently higher than water quality objectives, as presented in section 4, and water quality has never been sufficient to attain the beneficial use of shellfishing since November 28, 1975.

Step 2a: Can the condition be compensated for with effluent discharges without violating water conservation requirements?

Soquel Lagoon is not an effluent dominated waterbody. Nor would any amount of increased effluent discharges help to create an environment where shellfish would be able to survive.

5.1.3 Step 3: What factors preclude the attainment of the beneficial use?

The habitat of this area is not conducive to the growth and reproduction of shellfish. Staff does not completely understand exactly why the habitat is not supportive of shellfish but hypothesizes that it has to do with the substrate of the Lagoon, along with seasonal closures of the mouth and the subsequent effects this creates. Historically, Soquel Lagoon temporarily lost its connection to the ocean, or "closed," during the portions of the dry season.

The contemporary conditions of closure in this waterbody, while still driven principally by natural phenomenon, are affected by both the infrastructure surrounding the waterbody and by activities relating to habitat enhancement, flood control, and recreational use. Soquel Lagoon is manually opened and closed and maintained by the City of Capitola.

5.1.4 Step 4: Is restoration feasible?

"Restoration" does not seem feasible because habitat and closures at certain times of the year are very similar to the natural conditions of the Lagoon. Additionally, even if changes were made to this waterbody (which seems economically infeasible), the return of shellfish to the area is highly questionable as it is unclear when/if shellfish inhabited these areas in the last half of the 1900's.

6. Findings of the UAA

6.1 Basis for Removal of Designated Use

The CFR factors for allowing a State to remove a designated use are listed in 131.10(g). Based on staff's UAA, three factors preclude attainment of SHELL in Soquel Lagoon.

(2) Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;

(4) Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.

(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unless these conditions may be compensated, unrelated to water quality preclude attainment of aquatic life protection uses.

6.2 Alternatives for Addressing the SHELL Beneficial Use Designation

6.2.1 Alternative A – Removing the SHELL beneficial use

In this case, SHELL is determined to be an inappropriate beneficial use for Soquel Lagoon. Additionally, it seems the Central Coast Water Board designated the Lagoon as SHELL, assuming this waterbody had shellfishing present, without an evaluation to confirm the use. Soquel Lagoon has not demonstrated the SHELL beneficial use qualities nor have there been any societal demands to use this waterbody in this way. Therefore, as a result of a combination of factors described in 40 CFR 131.10(g)(2), (4), and (5) of the Federal water quality standards regulation, Central Coast Water Board staff concludes that the SHELL designation of Soquel Lagoon does not apply.

6.2.2 Alternative B – No action. Maintain SHELL beneficial use designation

In this case, the status quo is maintained. Not taking any action would make it difficult to write and enforce a pathogen TMDL for Soquel Lagoon because the numeric targets would have to be SHELL targets, even though the SHELL use is questionable. Enforcing a TMDL with SHELL numeric targets may impose unnecessary economic impacts on the City and County when they try to implement management measures to achieve a low level of bacteria concentration to protect a use that does not exist. Additionally, it may not be possible to achieve a level that is this low due to potential amounts of natural background levels of coliform.

6.3 Considerations Required for Recommended Alternative

Staff recommends alternative A. In making this recommendation, staff has considered all factors set out in §13241 of the Porter-Cologne Water Quality Control Act:

(a) *Past, present, and probable future beneficial uses of water.*
Shellfish collection did not likely exist in the recent past (i.e. the last 50 years, 1950 - present); shellfishing does not appear to exist currently; and shellfishing is unlikely to be a beneficial use in the future.

(b) *Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.*
Water quality objectives are currently not being met to support the beneficial use of SHELL, however the Soquel Lagoon pathogen TMDL addresses bacterial water quality objectives and bacterial loading in the context of the REC-1 and REC-2 beneficial uses. Once the requirements in the TMDL are implemented, the environmental characteristics (bacterial concentrations) are expected to improve over existing conditions.

(c) *Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.*
Although past and current water quality conditions do not allow for the attainment of SHELL beneficial use, there are other habitat factors such as substrate, salinity, temperature and flow that cannot be reasonably achieved through coordinated control of various factors in the area. However, improved concentrations of bacteria should occur via TMDL implementation, regardless of removal of the SHELL beneficial use.

(d) *Economic considerations.*
With regard to economic considerations, the recommended alternative is not expected to impose any additional cost on either the City or County and may reduce costs by making it more likely to achieve the REC-1 bacterial water quality objectives as opposed to the SHELL bacterial water quality objectives.

(e) *The need for developing housing within the region.*
Alternative A will have no significant impact on the need for developing housing within the region.

(f) *The need to develop and use recycled water.*
The need to develop and use recycled water will not be affected by the proposed modifications.

6.4 Anti-Degradation

Staff considered that there might be concern about the following: Does removal of the SHELL beneficial use allow higher levels of bacteria to further impair the Lagoon? The current bacteria level in this waterbody regularly exceeds water quality objectives for REC-1 and REC-2 uses. The pathogen TMDL for Soquel Lagoon establishes substantial reductions in allowable bacteria loading, regardless of the proposed de-designation.

The recommended alternative is also consistent with the Anti-degradation Policy, as it will not lower the water quality of the Lagoon, relative to existing conditions. In assigning water quality objectives to the REC-1 and REC-2 uses that exist, this alternative fulfills the requirement of protecting the level of water quality necessary to protect existing and anticipated beneficial uses.

6.5 Future Considerations

Amending the potential SHELL designated use of Soquel Lagoon does not preclude re-designation of this use should conditions within this waterbody change in the future. For example, should some major hydrologic changes modify the habitat of this waterbody to the point where shellfish would be able to grow and thrive in numbers that would allow for their collection and consumption, the beneficial use designation could be modified.

7. References

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Appendix A

STANUM	DATE	LOCATION	Fecal coliform (CFU)	Total coliform (CFU)
S0	1-Apr-87	SOQUEL CR @ FLUME OUTLET	440	
S0	11-May-92	SOQUEL CR @ FLUME OUTLET	1280	
S0	1-Jun-94	SOQUEL CR @ FLUME OUTLET	500	
S0	8-Jun-94	SOQUEL C @ FLUME OUTLET	2280	
S0	14-Jun-94	SOQUEL C @ FLUME OUTLET	1440	
S0	5-Jan-95	SOQUEL CR @ FLUME OUTLET	2300	
S0	8-Jun-95	SOQUEL CR @ FLUME OUTLET	260	
S0	17-Jul-95	SOQUEL CR @ FLUME OUTLET	700	
S0	27-Sep-95	SOQUEL CR @ FLUME OUTLET	3120	
S0	11-Dec-95	SOQUEL CR @ FLUME OUTLET	19000	
S0	12-Jun-96	SOQUEL C @ FLUME OUTLET	1420	
S0	20-Jun-96	SOQUEL C @ FLUME OUTLET	400	
S0	14-Aug-96	SOQUEL CR @ FLUME OUTLET	4100	16000
S0	24-Sep-96	SOQUEL CR @ FLUME OUTLET	760	
S0	8-Oct-96	SOQUEL C @ FLUME OUTLET	850	
S0	30-Oct-96	SOQUEL CR @ FLUME OUTLET	6300	
S0	5-Nov-96	SOQUEL CR @ FLUME OUTLET	1280	
S0	12-Nov-96	SOQUEL CR @ FLUME OUTLET	400	
S0	19-Nov-96	SOQUEL CR @ FLUME OUTLET	700	
S0	25-Nov-96	SOQUEL CR @ FLUME OUTLET	1640	
S0	3-Dec-96	SOQUEL CR @ FLUME OUTLET	4660	
S0	8-Jan-97	SOQUEL CR @ FLUME OUTLET	160	
S0	13-Jan-97	SOQUEL CR @ FLUME OUTLET	80	
S0	27-Jan-97	SOQUEL CR @ FLUME OUTLET	200	
S0	4-Feb-97	SOQUEL CR @ FLUME OUTLET	240	
S0	11-Feb-97	SOQUEL CR @ FLUME OUTLET	80	
S0	18-Feb-97	SOQUEL CR @ FLUME OUTLET	560	
S0	25-Feb-97	SOQUEL CR @ FLUME OUTLET	100	
S0	4-Mar-97	SOQUEL CR @ FLUME OUTLET	200	
S0	11-Mar-97	SOQUEL CR @ FLUME OUTLET	160	
S0	18-Mar-97	SOQUEL CR @ FLUME OUTLET	200	
S0	26-Mar-97	SOQUEL CR @ FLUME OUTLET	2880	
S0	1-Apr-97	SOQUEL CR @ FLUME OUTLET	80	
S0	15-Apr-97	SOQUEL C @ FLUME OUTLET	260	
S0	8-May-97	SOQUEL CR @ FLUME OUTLET	5040	
S0	13-May-97	SOQUEL C @ FLUME OUTLET	520	
S0	14-May-97	SOQUEL C @ FLUME OUTLET	500	
S0	21-May-97	SOQUEL C @ FLUME OUTLET	1820	
S0	5-Jun-97	SOQUEL CR @ FLUME OUTLET	840	
S0	11-Jun-97	SOQUEL CR @ FLUME OUTLET	460	
S0	25-Jun-97	SOQUEL CR @ FLUME OUTLET	240	
S0	1-Jul-97	SOQUEL C @ FLUME OUTLET	220	
S0	8-Jul-97	SOQUEL C @ FLUME OUTLET	300	
S0	15-Jul-97	SOQUEL C @ FLUME OUTLET	1640	
S0	23-Jul-97	SOQUEL CR @ FLUME OUTLET	780	
S0	29-Jul-97	SOQUEL CR @ FLUME OUTLET	360	
S0	5-Aug-97	SOQUEL CR @ FLUME OUTLET	1380	
S0	11-Aug-97	SOQUEL CR @ FLUME OUTLET	4020	
S0	14-Aug-97	SOQUEL C @ FLUME OUTLET	770	
S0	19-Aug-97	SOQUEL CR @ FLUME OUTLET	320	
S0	26-Aug-97	SOQUEL C @ FLUME OUTLET	480	

S0	22-Sep-97	SOQUEL C @ FLUME OUTLET	590	
S0	7-Oct-97	SOQUEL C @ FLUME OUTLET	460	
S0	15-Oct-97	SOQUEL C @ FLUME OUTLET	140	
S0	22-Oct-97	SOQUEL C @ FLUME OUTLET	5400	
S0	3-Nov-97	SOQUEL C @ FLUME OUTLET	2170	
S0	10-Nov-97	SOQUEL C @ FLUME OUTLET	3180	
S0	12-Nov-97	SOQUEL C @ FLUME OUTLET	6660	
S0	17-Nov-97	SOQUEL C @ FLUME OUTLET	1430	
S0	19-Nov-97	SOQUEL C @ FLUME OUTLET	2900	
S0	2-Dec-97	SOQUEL C @ FLUME OUTLET	280	
S0	11-Dec-97	SOQUEL C @ FLUME OUTLET	660	
S0	16-Dec-97	SOQUEL C @ FLUME OUTLET	320	
S0	23-Dec-97	SOQUEL C @ FLUME OUTLET	220	
S0	29-Dec-97	SOQUEL C @ FLUME OUTLET	30	
S0	5-Jan-98	SOQUEL C @ FLUME OUTLET	1950	
S0	13-Jan-98	SOQUEL C @ FLUME OUTLET	300	
S0	18-Jan-98	SOQUEL C @ FLUME OUTLET	430	
S0	1-Feb-98	SOQUEL C @ FLUME OUTLET	5680	
S0	8-Feb-98	SOQUEL C @ FLUME OUTLET	470	
S0	15-Feb-98	SOQUEL C @ FLUME OUTLET	20	
S0	18-Feb-98	SOQUEL C @ FLUME OUTLET	60	
S0	21-Feb-98	SOQUEL CR @ FLUME OUTLET	120	
S0	1-Mar-98	SOQUEL CR @ FLUME OUTLET	70	
S0	8-Mar-98	SOQUEL CR @ FLUME OUTLET	100	
S0	12-Mar-98	SOQUEL CR @ FLUME OUTLET	180	
S0	25-Mar-98	SOQUEL CR @ FLUME OUTLET	5560	
S0	30-Mar-98	SOQUEL CR @ FLUME OUTLET	690	
S0	12-Apr-98	SOQUEL CR @ FLUME OUTLET	190	
S0	10-May-98	SOQUEL CR @ FLUME OUTLET	170	
S0	11-Jun-98	SOQUEL CR @ FLUME OUTLET	984	
S0	1-Jul-98	SOQUEL CR @ FLUME OUTLET	1010	1770
S0	6-Jul-98	SOQUEL CR @ FLUME OUTLET	610	1280
S0	15-Jul-98	SOQUEL CR @ FLUME OUTLET	330	
S0	21-Jul-98	SOQUEL CR @ FLUME OUTLET	480	
S0	28-Jul-98	SOQUEL CR @ FLUME OUTLET	200	
S0	4-Aug-98	SOQUEL CR @ FLUME OUTLET	180	
S0	11-Aug-98	SOQUEL CR @ FLUME OUTLET	280	
S0	18-Aug-98	SOQUEL CR @ FLUME OUTLET	1010	
S0	25-Aug-98	SOQUEL CR @ FLUME OUTLET	420	
S0	1-Sep-98	SOQUEL CR @ FLUME OUTLET	300	
S0	10-Sep-98	SOQUEL CR @ FLUME OUTLET	490	
S0	15-Sep-98	SOQUEL CR @ FLUME OUTLET	380	
S0	22-Sep-98	SOQUEL CR @ FLUME OUTLET	450	
S0	7-Oct-98	SOQUEL CR @ FLUME OUTLET	970	
S0	26-Apr-99	SOQUEL CR @ FLUME OUTLET	200	
S0	5-May-99	SOQUEL CR @ FLUME OUTLET	160	
S0	11-May-99	SOQUEL CR @ FLUME OUTLET	180	430
S0	19-May-99	SOQUEL CR @ FLUME OUTLET	200	
S0	25-May-99	SOQUEL CR @ FLUME OUTLET	160	
S0	2-Jun-99	SOQUEL CR @ FLUME OUTLET	420	
S0	8-Jun-99	SOQUEL CR @ FLUME OUTLET	340	
S0	9-Jun-99	SOQUEL CR @ FLUME OUTLET	590	690

S0	14-Jun-99	SOQUEL CR @ FLUME OUTLET	440	
S0	21-Jun-99	SOQUEL CR @ FLUME OUTLET	500	
S0	28-Jun-99	SOQUEL CR @ FLUME OUTLET	180	2000
S0	6-Jul-99	SOQUEL CR @ FLUME OUTLET		1060
S0	8-Jul-99	SOQUEL CR @ FLUME OUTLET	290	
S0	15-Jul-99	SOQUEL CR @ FLUME OUTLET	230	
S0	19-Jul-99	SOQUEL CR @ FLUME OUTLET	140	
S0	2-Aug-99	SOQUEL CR @ FLUME OUTLET	280	
S0	9-Aug-99	SOQUEL CR @ FLUME OUTLET	260	
S0	16-Aug-99	SOQUEL CR @ FLUME OUTLET	290	
S0	23-Aug-99	SOQUEL CR @ FLUME OUTLET	630	
S0	30-Aug-99	SOQUEL CR @ FLUME OUTLET	760	
S0	7-Sep-99	SOQUEL CR @ FLUME OUTLET	1075	
S0	14-Sep-99	SOQUEL CR @ FLUME OUTLET	400	
S0	20-Sep-99	SOQUEL CR @ FLUME OUTLET	840	1840
S0	27-Sep-99	SOQUEL CR @ FLUME OUTLET	480	
S0	6-Oct-99	SOQUEL CR @ FLUME OUTLET	160	4800
S0	12-Oct-99	SOQUEL CR @ FLUME OUTLET	100	
S0	19-Oct-99	SOQUEL CR @ FLUME OUTLET	19	
S0	25-Oct-99	SOQUEL CR @ FLUME OUTLET	120	
S0	27-Oct-99	SOQUEL CR @ FLUME OUTLET	120	
S0	2-Nov-99	SOQUEL CR @ FLUME OUTLET	560	
S0	10-Nov-99	SOQUEL CR @ FLUME OUTLET	950	
S0	18-Nov-99	SOQUEL CR @ FLUME OUTLET	1300	
S0	23-Nov-99	SOQUEL CR @ FLUME OUTLET	230	
S0	1-Dec-99	SOQUEL CR @ FLUME OUTLET	2640	
S0	7-Dec-99	SOQUEL CR @ FLUME OUTLET	920	
S0	14-Dec-99	SOQUEL CR @ FLUME OUTLET	20	
S0	22-Dec-99	SOQUEL CR @ FLUME OUTLET	80	
S0	28-Dec-99	SOQUEL CR @ FLUME OUTLET	240	
S0	5-Jan-00	SOQUEL CR @ FLUME OUTLET	60	
S0	10-Jan-00	SOQUEL CR @ FLUME OUTLET	240	
S0	27-Jan-00	SOQUEL CR @ FLUME OUTLET	140	
S0	31-Jan-00	SOQUEL CR @ FLUME OUTLET	880	
S0	7-Feb-00	SOQUEL CR @ FLUME OUTLET	260	
S0	14-Feb-00	SOQUEL CR @ FLUME OUTLET	1250	
S0	27-Feb-00	SOQUEL CR @ FLUME OUTLET	60	
S0	8-Mar-00	SOQUEL CR @ FLUME OUTLET	756	
S0	15-Mar-00	SOQUEL CR @ FLUME OUTLET	190	
S0	22-Mar-00	SOQUEL CR @ FLUME OUTLET	190	
S0	29-Mar-00	SOQUEL CR @ FLUME OUTLET	70	
S0	3-Apr-00	SOQUEL CR @ FLUME OUTLET	76	
S0	10-Apr-00	SOQUEL CR @ FLUME OUTLET	248	1520
S0	12-Apr-00	SOQUEL CR @ FLUME OUTLET	320	
S0	12-Apr-00	SOQUEL CR @ FLUME OUTLET	1032	3888
S0	12-Apr-00	SOQUEL CR @ FLUME OUTLET	1760	
S0	14-Apr-00	SOQUEL CR @ FLUME OUTLET	1300	6850
S0	15-Apr-00	SOQUEL CR @ FLUME OUTLET	2900	
S0	17-Apr-00	SOQUEL CR @ FLUME OUTLET	3400	
S0	17-Apr-00	SOQUEL CR @ FLUME OUTLET	5885	
S0	20-Apr-00	SOQUEL CR @ FLUME OUTLET	380	180
S0	26-Apr-00	SOQUEL CR @ FLUME OUTLET	896	

S0	2-May-00	SOQUEL CR @ FLUME OUTLET	124
S0	9-May-00	SOQUEL CR @ FLUME OUTLET	160
S0	17-May-00	SOQUEL CR @ FLUME OUTLET	310
S0	23-May-00	SOQUEL CR @ FLUME OUTLET	120
S0	31-May-00	SOQUEL CR @ FLUME OUTLET	290
S0	14-Jun-00	SOQUEL CR @ FLUME OUTLET	600
S0	20-Jun-00	SOQUEL CR @ FLUME OUTLET	131
S0	27-Jun-00	SOQUEL CR @ FLUME OUTLET	1780
S0	5-Jul-00	SOQUEL CR @ FLUME OUTLET	100
S0	11-Jul-00	SOQUEL CR @ FLUME OUTLET	388
S0	18-Jul-00	SOQUEL CR @ FLUME OUTLET	110
S0	25-Jul-00	SOQUEL CR @ FLUME OUTLET	270
S0	2-Aug-00	SOQUEL CR @ FLUME OUTLET	250
S0	8-Aug-00	SOQUEL CR @ FLUME OUTLET	110
S0	21-Aug-00	SOQUEL CR @ FLUME OUTLET	400
S0	24-Aug-00	SOQUEL CR @ FLUME OUTLET	240
S0	29-Aug-00	SOQUEL CR @ FLUME OUTLET	350
S0	11-Sep-00	SOQUEL CR @ FLUME OUTLET	510
S0	18-Sep-00	SOQUEL CR @ FLUME OUTLET	290
S0	25-Sep-00	SOQUEL CR @ FLUME OUTLET	530
S0	2-Oct-00	SOQUEL CR @ FLUME OUTLET	510
S0	9-Oct-00	SOQUEL CR @ FLUME OUTLET	1350
S0	16-Oct-00	SOQUEL CR @ FLUME OUTLET	580
S0	25-Oct-00	SOQUEL CR @ FLUME OUTLET	340
S0	30-Oct-00	SOQUEL CR @ FLUME OUTLET	2890
S0	6-Nov-00	SOQUEL CR @ FLUME OUTLET	450
S0	13-Nov-00	SOQUEL CR @ FLUME OUTLET	950
S0	22-Nov-00	SOQUEL CR @ FLUME OUTLET	420
S0	27-Nov-00	SOQUEL CR @ FLUME OUTLET	3390
S0	5-Dec-00	SOQUEL CR @ FLUME OUTLET	1130
S0	11-Dec-00	SOQUEL CR @ FLUME OUTLET	900
S0	18-Dec-00	SOQUEL CR @ FLUME OUTLET	370
S0	26-Dec-00	SOQUEL CR @ FLUME OUTLET	280
S0	2-Jan-01	SOQUEL CR @ FLUME OUTLET	920
S0	8-Jan-01	SOQUEL CR @ FLUME OUTLET	3970
S0	16-Jan-01	SOQUEL CR @ FLUME OUTLET	3900
S0	18-Jan-01	SOQUEL CR @ FLUME OUTLET	20
S0	29-Jan-01	SOQUEL CR @ FLUME OUTLET	360
S0	5-Feb-01	SOQUEL CR @ FLUME OUTLET	180
S0	13-Feb-01	SOQUEL CR @ FLUME OUTLET	240
S0	21-Feb-01	SOQUEL CR @ FLUME OUTLET	480
S0	26-Feb-01	SOQUEL CR @ FLUME OUTLET	2380
S0	28-Feb-01	SOQUEL CR @ FLUME OUTLET	220
S0	6-Mar-01	SOQUEL CR @ FLUME OUTLET	460
S0	12-Mar-01	SOQUEL CR @ FLUME OUTLET	320
S0	19-Mar-01	SOQUEL CR @ FLUME OUTLET	610
S0	27-Mar-01	SOQUEL CR @ FLUME OUTLET	1550
S0	2-Apr-01	SOQUEL CR @ FLUME OUTLET	320
S0	3-Apr-01	SOQUEL CR @ FLUME OUTLET	820
S0	9-Apr-01	SOQUEL CR @ FLUME OUTLET	390
S0	16-Apr-01	SOQUEL CR @ FLUME OUTLET	180
S0	23-Apr-01	SOQUEL CR @ FLUME OUTLET	480

S0	30-Apr-01	SOQUEL CR @ FLUME OUTLET	620	
S0	2-May-01	SOQUEL CR @ FLUME OUTLET		5172
S0	3-May-01	SOQUEL CR @ FLUME OUTLET		2359
S0	7-May-01	SOQUEL CR @ FLUME OUTLET	1610	
S0	14-May-01	SOQUEL CR @ FLUME OUTLET	1750	
S0	15-May-01	SOQUEL CR @ FLUME OUTLET		1664
S0	16-May-01	SOQUEL CR @ FLUME OUTLET		3654
S0	17-May-01	SOQUEL CR @ FLUME OUTLET		2909
S0	21-May-01	SOQUEL CR @ FLUME OUTLET	2360	
S0	22-May-01	SOQUEL CR @ FLUME OUTLET	212	
S0	23-May-01	SOQUEL CR @ FLUME OUTLET	160	
S0	24-May-01	SOQUEL CR @ FLUME OUTLET	160	
S0	29-May-01	SOQUEL CR @ FLUME OUTLET	110	
S0	4-Jun-01	SOQUEL CR @ FLUME OUTLET	410	
S0	13-Jun-01	SOQUEL CR @ FLUME OUTLET	1050	
S0	15-Jun-01	SOQUEL CR @ FLUME OUTLET		10460
S0	16-Jun-01	SOQUEL CR @ FLUME OUTLET		7270
S0	17-Jun-01	SOQUEL CR @ FLUME OUTLET		7701
S0	18-Jun-01	SOQUEL CR @ FLUME OUTLET		24192
S0	2-Jul-01	SOQUEL CR @ FLUME OUTLET	580	
S0	9-Jul-01	SOQUEL CR @ FLUME OUTLET	7190	
S0	11-Jul-01	SOQUEL CR @ FLUME OUTLET	820	
S0	17-Jul-01	SOQUEL CR @ FLUME OUTLET	150	
S0	18-Jul-01	SOQUEL CR @ FLUME OUTLET		25000
S0	19-Jul-01	SOQUEL CR @ FLUME OUTLET		1935
S0	20-Jul-01	SOQUEL CR @ FLUME OUTLET		23820
S0	21-Jul-01	SOQUEL CR @ FLUME OUTLET		18600
S0	24-Jul-01	SOQUEL CR @ FLUME OUTLET		57940
S0	24-Jul-01	SOQUEL CR @ FLUME OUTLET	530	
S0	25-Jul-01	SOQUEL CR @ FLUME OUTLET		10540
S0	26-Jul-01	SOQUEL CR @ FLUME OUTLET		7430
S0	27-Jul-01	SOQUEL CR @ FLUME OUTLET		10500
S0	28-Jul-01	SOQUEL CR @ FLUME OUTLET		12810
S0	29-Jul-01	SOQUEL CR @ FLUME OUTLET		7890
S0	30-Jul-01	SOQUEL CR @ FLUME OUTLET		7440
S0	31-Jul-01	SOQUEL CR @ FLUME OUTLET		13980
S0	1-Aug-01	SOQUEL CR @ FLUME OUTLET		9330
S0	2-Aug-01	SOQUEL CR @ FLUME OUTLET		12740
S0	3-Aug-01	SOQUEL CR @ FLUME OUTLET		13734
S0	6-Aug-01	SOQUEL CR @ FLUME OUTLET		19890
S0	7-Aug-01	SOQUEL CR @ FLUME OUTLET		25950
S0	8-Aug-01	SOQUEL CR @ FLUME OUTLET	1100	1100
S0	13-Aug-01	SOQUEL CR @ FLUME OUTLET	50	
S0	20-Aug-01	SOQUEL CR @ FLUME OUTLET	1010	
S0	27-Aug-01	SOQUEL CR @ FLUME OUTLET	710	
S0	4-Sep-01	SOQUEL CR @ FLUME OUTLET	510	
S0	10-Sep-01	SOQUEL CR @ FLUME OUTLET	1020	
S0	17-Sep-01	SOQUEL CR @ FLUME OUTLET	470	
S0	18-Sep-01	SOQUEL CR @ FLUME OUTLET		3450
S0	24-Sep-01	SOQUEL CR @ FLUME OUTLET	290	
S0	9-Oct-01	SOQUEL CR @ FLUME OUTLET	510	
S0	10-Oct-01	SOQUEL CR @ FLUME OUTLET	310	

S0	15-Oct-01	SOQUEL CR @ FLUME OUTLET	750	
S0	22-Oct-01	SOQUEL CR @ FLUME OUTLET	750	
S0	29-Oct-01	SOQUEL CR @ FLUME OUTLET	460	
S0	30-Oct-01	SOQUEL CR @ FLUME OUTLET	200	
S0	5-Nov-01	SOQUEL CR @ FLUME OUTLET	1210	
S0	13-Nov-01	SOQUEL CR @ FLUME OUTLET	2910	
S0	19-Nov-01	SOQUEL CR @ FLUME OUTLET	1420	
S0	26-Nov-01	SOQUEL CR @ FLUME OUTLET	1610	
S0	3-Dec-01	SOQUEL CR @ FLUME OUTLET	720	
S0	10-Dec-01	SOQUEL CR @ FLUME OUTLET	310	
S0	11-Dec-01	SOQUEL CR @ FLUME OUTLET		512
S0	17-Dec-01	SOQUEL CR @ FLUME OUTLET	2060	
S0	26-Dec-01	SOQUEL CR @ FLUME OUTLET	90	
S0	7-Jan-02	SOQUEL CR @ FLUME OUTLET	170	
S0	14-Jan-02	SOQUEL CR @ FLUME OUTLET	320	
S0	22-Jan-02	SOQUEL CR @ FLUME OUTLET	60	
S0	28-Jan-02	SOQUEL CR @ FLUME OUTLET	400	
S0	4-Feb-02	SOQUEL CR @ FLUME OUTLET	40	
S0	11-Feb-02	SOQUEL CR @ FLUME OUTLET	60	
S0	19-Feb-02	SOQUEL CR @ FLUME OUTLET	240	
S0	25-Feb-02	SOQUEL CR @ FLUME OUTLET	780	
S0	4-Mar-02	SOQUEL CR @ FLUME OUTLET	80	
S0	11-Mar-02	SOQUEL CR @ FLUME OUTLET	260	
S0	19-Mar-02	SOQUEL CR @ FLUME OUTLET	5	
S0	25-Mar-02	SOQUEL CR @ FLUME OUTLET	80	
S0	1-Apr-02	SOQUEL CR @ FLUME OUTLET	430	
S0	3-Apr-02	SOQUEL CR @ FLUME OUTLET		581
S0	8-Apr-02	SOQUEL CR @ FLUME OUTLET	120	
S0	15-Apr-02	SOQUEL CR @ FLUME OUTLET	190	
S0	24-Apr-02	SOQUEL CR @ FLUME OUTLET	240	
S0	29-Apr-02	SOQUEL CR @ FLUME OUTLET	920	
S0	30-Apr-02	SOQUEL CR @ FLUME OUTLET		888
S0	1-May-02	SOQUEL CR @ FLUME OUTLET		1669
S0	6-May-02	SOQUEL CR @ FLUME OUTLET		1585
S0	8-May-02	SOQUEL CR @ FLUME OUTLET		1607
S0	9-May-02	SOQUEL CR @ FLUME OUTLET		932
S0	13-May-02	SOQUEL CR @ FLUME OUTLET	40	
S0	14-May-02	SOQUEL CR @ FLUME OUTLET		11199
S0	15-May-02	SOQUEL CR @ FLUME OUTLET		9804
S0	16-May-02	SOQUEL CR @ FLUME OUTLET		24000
S0	19-May-02	SOQUEL CR @ FLUME OUTLET		5794
S0	20-May-02	SOQUEL CR @ FLUME OUTLET		14136
S0	28-May-02	SOQUEL CR @ FLUME OUTLET	160	
S0	3-Jun-02	SOQUEL CR @ FLUME OUTLET	890	
S0	11-Jun-02	SOQUEL CR @ FLUME OUTLET	260	
S0	17-Jun-02	SOQUEL CR @ FLUME OUTLET	150	
S0	25-Jun-02	SOQUEL CR @ FLUME OUTLET	50	
S0	1-Jul-02	SOQUEL CR @ FLUME OUTLET	110	
S0	8-Jul-02	SOQUEL CR @ FLUME OUTLET	20	
S0	16-Jul-02	SOQUEL CR @ FLUME OUTLET	130	
S0	23-Jul-02	SOQUEL CR @ FLUME OUTLET	130	
S0	29-Jul-02	SOQUEL CR @ FLUME OUTLET	140	

S0	5-Aug-02	SOQUEL CR @ FLUME OUTLET	280	
S0	13-Aug-02	SOQUEL CR @ FLUME OUTLET	400	
S0	20-Aug-02	SOQUEL CR @ FLUME OUTLET	550	
S0	27-Aug-02	SOQUEL CR @ FLUME OUTLET	190	
S0	3-Sep-02	SOQUEL CR @ FLUME OUTLET	110	
S0	19-Sep-02	SOQUEL CR @ FLUME OUTLET	210	
S0	24-Sep-02	SOQUEL CR @ FLUME OUTLET	190	
S0	26-Sep-02	SOQUEL CR @ FLUME OUTLET	240	3500
S0	1-Oct-02	SOQUEL CR @ FLUME OUTLET	390	
S0	8-Oct-02	SOQUEL CR @ FLUME OUTLET	260	
S0	16-Oct-02	SOQUEL CR @ FLUME OUTLET	1340	
S0	21-Oct-02	SOQUEL CR @ FLUME OUTLET	700	
S0	28-Oct-02	SOQUEL CR @ FLUME OUTLET	180	
S0	4-Nov-02	SOQUEL CR @ FLUME OUTLET	7660	
S0	12-Nov-02	SOQUEL CR @ FLUME OUTLET	290	
S0	19-Nov-02	SOQUEL CR @ FLUME OUTLET	880	
S0	26-Nov-02	SOQUEL CR @ FLUME OUTLET	310	
S0	2-Dec-02	SOQUEL CR @ FLUME OUTLET	340	
S0	9-Dec-02	SOQUEL CR @ FLUME OUTLET	2150	
S0	17-Dec-02	SOQUEL CR @ FLUME OUTLET	1050	
S0	23-Dec-02	SOQUEL CR @ FLUME OUTLET	110	
S0	30-Dec-02	SOQUEL CR @ FLUME OUTLET	210	
S0	6-Jan-03	SOQUEL CR @ FLUME OUTLET	190	
S0	6-Jan-03	SOQUEL CR @ FLUME OUTLET	10000	
S0	7-Jan-03	SOQUEL CR @ FLUME OUTLET		2481
S0	7-Jan-03	SOQUEL CR @ FLUME OUTLET		6488
S0	9-Jan-03	SOQUEL CR @ FLUME OUTLET		2046
S0	13-Jan-03	SOQUEL CR @ FLUME OUTLET		888
S0	13-Jan-03	SOQUEL CR @ FLUME OUTLET		1169
S0	14-Jan-03	SOQUEL CR @ FLUME OUTLET		5172
S0	16-Jan-03	SOQUEL CR @ FLUME OUTLET		52
S0	16-Jan-03	SOQUEL CR @ FLUME OUTLET		1169
S0	22-Jan-03	SOQUEL CR @ FLUME OUTLET	210	
S0	27-Jan-03	SOQUEL CR @ FLUME OUTLET	350	
S0	3-Feb-03	SOQUEL CR @ FLUME OUTLET	370	
S0	10-Feb-03	SOQUEL CR @ FLUME OUTLET	1460	
S0	18-Feb-03	SOQUEL CR @ FLUME OUTLET	420	
S0	24-Feb-03	SOQUEL CR @ FLUME OUTLET	2660	
S0	3-Mar-03	SOQUEL CR @ FLUME OUTLET	760	
S0	4-Mar-03	SOQUEL CR @ FLUME OUTLET		933
S0	5-Mar-03	SOQUEL CR @ FLUME OUTLET		1067
S0	6-Mar-03	SOQUEL CR @ FLUME OUTLET		2063
S0	7-Mar-03	SOQUEL CR @ FLUME OUTLET		9139
S0	8-Mar-03	SOQUEL CR @ FLUME OUTLET		2382
S0	11-Mar-03	SOQUEL CR @ FLUME OUTLET		496
S0	17-Mar-03	SOQUEL CR @ FLUME OUTLET	710	
S0	24-Mar-03	SOQUEL CR @ FLUME OUTLET	930	
S0	1-Apr-03	SOQUEL CR @ FLUME OUTLET	880	
S0	7-Apr-03	SOQUEL CR @ FLUME OUTLET	450	
S0	14-Apr-03	SOQUEL CR @ FLUME OUTLET		984
S0	14-Apr-03	SOQUEL CR @ FLUME OUTLET		2613
S0	15-Apr-03	SOQUEL CR @ FLUME OUTLET		1450

S0	16-Apr-03	SOQUEL CR @ FLUME OUTLET		984
S0	21-Apr-03	SOQUEL CR @ FLUME OUTLET	600	
S0	23-Apr-03	SOQUEL CR @ FLUME OUTLET		1455
S0	28-Apr-03	SOQUEL CR @ FLUME OUTLET		17329
S0	29-Apr-03	SOQUEL CR @ FLUME OUTLET		17329
S0	29-Apr-03	SOQUEL CR @ FLUME OUTLET	320	
S0	30-Apr-03	SOQUEL CR @ FLUME OUTLET		1565
S0	1-May-03	SOQUEL CR @ FLUME OUTLET		1421
S0	5-May-03	SOQUEL CR @ FLUME OUTLET	90	
S0	12-May-03	SOQUEL CR @ FLUME OUTLET	40	
S0	19-May-03	SOQUEL CR @ FLUME OUTLET	490	
S0	27-May-03	SOQUEL CR @ FLUME OUTLET	410	
S0	2-Jun-03	SOQUEL CR @ FLUME OUTLET	540	
S0	9-Jun-03	SOQUEL CR @ FLUME OUTLET	640	
S0	16-Jun-03	SOQUEL CR @ FLUME OUTLET	630	
S0	23-Jun-03	SOQUEL CR @ FLUME OUTLET	530	
S0	25-Jun-03	SOQUEL CR @ FLUME OUTLET		1725
S0	30-Jun-03	SOQUEL CR @ FLUME OUTLET	570	
S0	7-Jul-03	SOQUEL CR @ FLUME OUTLET	2020	
S0	14-Jul-03	SOQUEL CR @ FLUME OUTLET	500	
S0	21-Jul-03	SOQUEL CR @ FLUME OUTLET	610	
S0	28-Jul-03	SOQUEL CR @ FLUME OUTLET	260	
S0	19-Aug-03	SOQUEL CR @ FLUME OUTLET	670	
S0	26-Aug-03	SOQUEL CR @ FLUME OUTLET	570	
S0	2-Sep-03	SOQUEL CR @ FLUME OUTLET	1300	
S0	8-Sep-03	SOQUEL CR @ FLUME OUTLET	242	
S0	15-Sep-03	SOQUEL CR @ FLUME OUTLET	690	
S0	22-Sep-03	SOQUEL CR @ FLUME OUTLET	1170	
S0	29-Sep-03	SOQUEL CR @ FLUME OUTLET	750	
S0	2-Oct-03	SOQUEL CR @ FLUME OUTLET		52
S0	2-Oct-03	SOQUEL CR @ FLUME OUTLET		17329
S0	6-Oct-03	SOQUEL CR @ FLUME OUTLET	830	
S0	14-Oct-03	SOQUEL CR @ FLUME OUTLET	360	
S0	16-Oct-03	SOQUEL CR @ FLUME OUTLET		3448
S0	20-Oct-03	SOQUEL CR @ FLUME OUTLET	780	
S0	28-Oct-03	SOQUEL CR @ FLUME OUTLET	480	
S0	3-Nov-03	SOQUEL CR @ FLUME OUTLET	3060	
S0	6-Nov-03	SOQUEL CR @ FLUME OUTLET		2359
S0	10-Nov-03	SOQUEL CR @ FLUME OUTLET	990	
S0	12-Nov-03	SOQUEL CR @ FLUME OUTLET		25000
S0	17-Nov-03	SOQUEL CR @ FLUME OUTLET	1470	
S0	24-Nov-03	SOQUEL CR @ FLUME OUTLET	870	
S0	1-Dec-03	SOQUEL CR @ FLUME OUTLET	2000	
S0	3-Dec-03	SOQUEL CR @ FLUME OUTLET		2098
S0	8-Dec-03	SOQUEL CR @ FLUME OUTLET	320	
S0	11-Dec-03	SOQUEL CR @ FLUME OUTLET		12997
S0	15-Dec-03	SOQUEL CR @ FLUME OUTLET	1430	
S0	22-Dec-03	SOQUEL CR @ FLUME OUTLET	550	
S0	29-Dec-03	SOQUEL CR @ FLUME OUTLET	11370	
S0	30-Dec-03	SOQUEL CR @ FLUME OUTLET		2359
S0	31-Dec-03	SOQUEL CR @ FLUME OUTLET		4884
S0	5-Jan-04	SOQUEL CR @ FLUME OUTLET	200	

S0	12-Jan-04	SOQUEL CR @ FLUME OUTLET	80	
S0	20-Jan-04	SOQUEL CR @ FLUME OUTLET	510	
S0	26-Jan-04	SOQUEL CR @ FLUME OUTLET	50	
S0	2-Feb-04	SOQUEL CR @ FLUME OUTLET	1500	
S0	3-Feb-04	SOQUEL CR @ FLUME OUTLET		4611
S0	4-Feb-04	SOQUEL CR @ FLUME OUTLET		1467
S0	5-Feb-04	SOQUEL CR @ FLUME OUTLET		2247
S0	9-Feb-04	SOQUEL CR @ FLUME OUTLET	350	
S0	17-Feb-04	SOQUEL CR @ FLUME OUTLET	510	
S0	23-Feb-04	SOQUEL CR @ FLUME OUTLET	80	
S0	1-Mar-04	SOQUEL CR @ FLUME OUTLET	770	
S0	8-Mar-04	SOQUEL CR @ FLUME OUTLET	540	
S0	22-Mar-04	SOQUEL CR @ FLUME OUTLET	430	
S0	29-Mar-04	SOQUEL CR @ FLUME OUTLET	470	
S0	5-Apr-04	SOQUEL CR @ FLUME OUTLET	580	
S0	13-Apr-04	SOQUEL CR @ FLUME OUTLET	530	
S0	19-Apr-04	SOQUEL CR @ FLUME OUTLET	360	
S0	26-Apr-04	SOQUEL CR @ FLUME OUTLET	910	
S0	3-May-04	SOQUEL CR @ FLUME OUTLET	1670	
S0	10-May-04	SOQUEL CR @ FLUME OUTLET	950	
S0	17-May-04	SOQUEL CR @ FLUME OUTLET	590	
S0	24-May-04	SOQUEL CR @ FLUME OUTLET	490	
S0	1-Jun-04	SOQUEL CR @ FLUME OUTLET	670	
S0	7-Jun-04	SOQUEL CR @ FLUME OUTLET		3255
S0	8-Jun-04	SOQUEL CR @ FLUME OUTLET		6867
S0	9-Jun-04	SOQUEL CR @ FLUME OUTLET		2014
S07	17-Nov-86	SOQUEL C @ TRESTLE	900	
S07	5-Jan-87	SOQUEL C @ TRESTLE	833.3	
S07	14-Mar-88	SOQUEL C @ TRESTLE	100	
S07	21-Jun-88	SOQUEL C @ TRESTLE	320	
S07	25-Jul-88	SOQUEL C @ TRESTLE	200	
S07	9-Aug-88	SOQUEL C @ TRESTLE	60	
S07	16-Aug-88	SOQUEL C @ TRESTLE	40	
S07	23-Aug-88	SOQUEL C @ TRESTLE	232	
S07	30-Aug-88	SOQUEL C @ TRESTLE	150	
S07	6-Sep-88	SOQUEL C @ TRESTLE	230	
S07	13-Sep-88	SOQUEL C @ TRESTLE	635	
S07	27-Sep-88	SOQUEL C @ TRESTLE	90	
S07	4-Oct-88	SOQUEL C @ TRESTLE	0.9	
S07	11-Oct-88	SOQUEL C @ TRESTLE	168	
S07	18-Oct-88	SOQUEL C @ TRESTLE	244	
S07	25-Oct-88	SOQUEL C @ TRESTLE	632	
S07	1-Nov-88	SOQUEL C @ TRESTLE	170	
S07	8-Nov-88	SOQUEL C @ TRESTLE	245	
S07	15-Nov-88	SOQUEL C @ TRESTLE	780	
S07	21-Nov-88	SOQUEL C @ TRESTLE	220	
S07	29-Nov-88	SOQUEL C @ TRESTLE	2010	
S07	6-Dec-88	SOQUEL C @ TRESTLE	750	
S07	13-Dec-88	SOQUEL C @ TRESTLE	360	
S07	28-Dec-88	SOQUEL C @ TRESTLE	140	
S07	3-Jan-89	SOQUEL C @ TRESTLE	55	
S07	27-Feb-89	SOQUEL C @ TRESTLE	48	

S07	7-Mar-89	SOQUEL C @ TRESTLE	402
S07	15-Mar-89	SOQUEL C @ TRESTLE	285
S07	20-Mar-89	SOQUEL C @ TRESTLE	390
S07	27-Mar-89	SOQUEL C @ TRESTLE	210
S07	3-Apr-89	SOQUEL C @ TRESTLE	150
S07	10-Apr-89	SOQUEL C @ TRESTLE	470
S07	17-Apr-89	SOQUEL C @ TRESTLE	680
S07	24-Apr-89	SOQUEL C @ TRESTLE	1080
S07	1-May-89	SOQUEL C @ TRESTLE	4020
S07	5-May-89	SOQUEL C @ TRESTLE	2550
S07	15-May-89	SOQUEL C @ TRESTLE	1400
S07	22-May-89	SOQUEL C @ TRESTLE	200
S07	30-May-89	SOQUEL C @ TRESTLE	320
S07	5-Jun-89	SOQUEL C @ TRESTLE	590
S07	13-Jun-89	SOQUEL C @ TRESTLE	320
S07	19-Jun-89	SOQUEL C @ TRESTLE	60
S07	26-Jun-89	SOQUEL C @ TRESTLE	480
S07	27-Jun-89	SOQUEL C @ TRESTLE	80
S07	5-Jul-89	SOQUEL C @ TRESTLE	430
S07	17-Jul-89	SOQUEL C @ TRESTLE	10
S07	8-Aug-89	SOQUEL C @ TRESTLE	160
S07	16-Aug-89	SOQUEL C @ TRESTLE	55
S07	22-Aug-89	SOQUEL C @ TRESTLE	110
S07	28-Aug-89	SOQUEL C @ TRESTLE	30
S07	5-Sep-89	SOQUEL C @ TRESTLE	122
S07	12-Sep-89	SOQUEL C @ TRESTLE	384
S07	20-Sep-89	SOQUEL C @ TRESTLE	160
S07	26-Sep-89	SOQUEL C @ TRESTLE	190
S07	4-Oct-89	SOQUEL C @ TRESTLE	125
S07	10-Oct-89	SOQUEL C @ TRESTLE	65
S07	17-Oct-89	SOQUEL C @ TRESTLE	235
S07	30-Oct-89	SOQUEL C @ TRESTLE	220
S07	7-Nov-89	SOQUEL C @ TRESTLE	210
S07	14-Nov-89	SOQUEL C @ TRESTLE	490
S07	21-Nov-89	SOQUEL C @ TRESTLE	130
S07	28-Nov-89	SOQUEL C @ TRESTLE	170
S07	5-Dec-89	SOQUEL C @ TRESTLE	210
S07	12-Dec-89	SOQUEL C @ TRESTLE	60
S07	19-Dec-89	SOQUEL C @ TRESTLE	675
S07	26-Dec-89	SOQUEL C @ TRESTLE	400
S07	23-Jan-90	SOQUEL C @ TRESTLE	350
S07	30-Jan-90	SOQUEL C @ TRESTLE	920
S07	6-Feb-90	SOQUEL C @ TRESTLE	90
S07	13-Feb-90	SOQUEL C @ TRESTLE	1005
S07	21-Feb-90	SOQUEL C @ TRESTLE	100
S07	27-Feb-90	SOQUEL C @ TRESTLE	110
S07	6-Mar-90	SOQUEL C @ TRESTLE	110
S07	13-Mar-90	SOQUEL C @ TRESTLE	10
S07	20-Mar-90	SOQUEL C @ TRESTLE	550
S07	27-Mar-90	SOQUEL C @ TRESTLE	750
S07	3-Apr-90	SOQUEL C @ TRESTLE	490
S07	10-Apr-90	SOQUEL C @ TRESTLE	2530

S07	17-Apr-90	SOQUEL C @ TRESTLE	680
S07	24-Apr-90	SOQUEL C @ TRESTLE	1180
S07	1-May-90	SOQUEL C @ TRESTLE	40
S07	8-May-90	SOQUEL C @ TRESTLE	440
S07	15-May-90	SOQUEL C @ TRESTLE	40
S07	22-May-90	SOQUEL C @ TRESTLE	2140
S07	29-May-90	SOQUEL C @ TRESTLE	840
S07	5-Jun-90	SOQUEL C @ TRESTLE	860
S07	12-Jun-90	SOQUEL C @ TRESTLE	580
S07	26-Jun-90	SOQUEL C @ TRESTLE	440
S07	10-Jul-90	SOQUEL C @ TRESTLE	340
S07	17-Jul-90	SOQUEL C @ TRESTLE	240
S07	7-Aug-90	SOQUEL C @ TRESTLE	60
S07	13-Aug-90	SOQUEL C @ TRESTLE	380
S07	20-Aug-90	SOQUEL C @ TRESTLE	400
S07	28-Aug-90	SOQUEL C @ TRESTLE	400
S07	4-Sep-90	SOQUEL C @ TRESTLE	220
S07	6-Sep-90	SOQUEL C @ TRESTLE	300
S07	11-Sep-90	SOQUEL C @ TRESTLE	30
S07	18-Sep-90	SOQUEL C @ TRESTLE	10
S07	25-Sep-90	SOQUEL C @ TRESTLE	250
S07	2-Oct-90	SOQUEL C @ TRESTLE	220
S07	10-Oct-90	SOQUEL C @ TRESTLE	170
S07	16-Oct-90	SOQUEL C @ TRESTLE	110
S07	23-Oct-90	SOQUEL C @ TRESTLE	40
S07	30-Oct-90	SOQUEL C @ TRESTLE	80
S07	6-Nov-90	SOQUEL C @ TRESTLE	580
S07	13-Nov-90	SOQUEL C @ TRESTLE	10
S07	19-Nov-90	SOQUEL C @ TRESTLE	75
S07	27-Nov-90	SOQUEL C @ TRESTLE	760
S07	4-Dec-90	SOQUEL C @ TRESTLE	30
S07	11-Dec-90	SOQUEL C @ TRESTLE	1140
S07	18-Dec-90	SOQUEL C @ TRESTLE	90
S07	2-Jan-91	SOQUEL C @ TRESTLE	50
S07	8-Jan-91	SOQUEL C @ TRESTLE	270
S07	15-Jan-91	SOQUEL C @ TRESTLE	470
S07	28-Jan-91	SOQUEL C @ TRESTLE	120
S07	11-Feb-91	SOQUEL C @ TRESTLE	376
S07	25-Feb-91	SOQUEL C @ TRESTLE	128
S07	11-Mar-91	SOQUEL C @ TRESTLE	920
S07	18-Mar-91	SOQUEL C @ TRESTLE	760
S07	1-Apr-91	SOQUEL C @ TRESTLE	160
S07	8-Apr-91	SOQUEL C @ TRESTLE	540
S07	15-Apr-91	SOQUEL C @ TRESTLE	80
S07	23-Apr-91	SOQUEL C @ TRESTLE	280
S07	30-Apr-91	SOQUEL C @ TRESTLE	280
S07	7-May-91	SOQUEL C @ TRESTLE	1840
S07	14-May-91	SOQUEL C @ TRESTLE	440
S07	21-May-91	SOQUEL C @ TRESTLE	480
S07	28-May-91	SOQUEL C @ TRESTLE	60
S07	4-Jun-91	SOQUEL C @ TRESTLE	320
S07	11-Jun-91	SOQUEL C @ TRESTLE	280

S07	18-Jun-91	SOQUEL C @ TRESTLE	160
S07	25-Jun-91	SOQUEL C @ TRESTLE	160
S07	1-Jul-91	SOQUEL C @ TRESTLE	240
S07	9-Jul-91	SOQUEL C @ TRESTLE	140
S07	16-Jul-91	SOQUEL C @ TRESTLE	3540
S07	22-Jul-91	SOQUEL C @ TRESTLE	100
S07	29-Jul-91	SOQUEL C @ TRESTLE	40
S07	6-Aug-91	SOQUEL C @ TRESTLE	80
S07	13-Aug-91	SOQUEL C @ TRESTLE	180
S07	19-Aug-91	SOQUEL C @ TRESTLE	240
S07	27-Aug-91	SOQUEL C @ TRESTLE	20
S07	3-Sep-91	SOQUEL C @ TRESTLE	0.1
S07	10-Sep-91	SOQUEL C @ TRESTLE	60
S07	17-Sep-91	SOQUEL C @ TRESTLE	2740
S07	23-Sep-91	SOQUEL C @ TRESTLE	20
S07	1-Oct-91	SOQUEL C @ TRESTLE	180
S07	8-Oct-91	SOQUEL C @ TRESTLE	1460
S07	15-Oct-91	SOQUEL C @ TRESTLE	20
S07	22-Oct-91	SOQUEL C @ TRESTLE	880
S07	28-Oct-91	SOQUEL C @ TRESTLE	1880
S07	5-Nov-91	SOQUEL C @ TRESTLE	7300
S07	12-Nov-91	SOQUEL C @ TRESTLE	2700
S07	19-Nov-91	SOQUEL C @ TRESTLE	1460
S07	25-Nov-91	SOQUEL C @ TRESTLE	480
S07	3-Dec-91	SOQUEL C @ TRESTLE	240
S07	9-Dec-91	SOQUEL C @ TRESTLE	380
S07	17-Dec-91	SOQUEL C @ TRESTLE	960
S07	30-Dec-91	SOQUEL C @ TRESTLE	400
S07	7-Jan-92	SOQUEL C @ TRESTLE	2600
S07	13-Jan-92	SOQUEL C @ TRESTLE	100
S07	21-Jan-92	SOQUEL C @ TRESTLE	100
S07	28-Jan-92	SOQUEL C @ TRESTLE	960
S07	4-Feb-92	SOQUEL C @ TRESTLE	80
S07	11-Feb-92	SOQUEL C @ TRESTLE	2180
S07	25-Feb-92	SOQUEL C @ TRESTLE	80
S07	3-Mar-92	SOQUEL C @ TRESTLE	140
S07	10-Mar-92	SOQUEL C @ TRESTLE	100
S07	17-Mar-92	SOQUEL C @ TRESTLE	200
S07	24-Mar-92	SOQUEL C @ TRESTLE	280
S07	31-Mar-92	SOQUEL C @ TRESTLE	200
S07	7-Apr-92	SOQUEL C @ TRESTLE	200
S07	15-Apr-92	SOQUEL C @ TRESTLE	280
S07	28-Apr-92	SOQUEL C @ TRESTLE	160
S07	5-May-92	SOQUEL C @ TRESTLE	780
S07	11-May-92	SOQUEL C @ TRESTLE	1320
S07	12-May-92	SOQUEL C @ TRESTLE	900
S07	19-May-92	SOQUEL C @ TRESTLE	400
S07	26-May-92	SOQUEL C @ TRESTLE	320
S07	10-Jun-92	SOQUEL C @ TRESTLE	540
S07	16-Jun-92	SOQUEL C @ TRESTLE	160
S07	24-Jun-92	SOQUEL C @ TRESTLE	260
S07	30-Jun-92	SOQUEL C @ TRESTLE	4020

S07	7-Jul-92	SOQUEL C @ TRESTLE	340
S07	14-Jul-92	SOQUEL C @ TRESTLE	20
S07	22-Jul-92	SOQUEL C @ TRESTLE	300
S07	28-Jul-92	SOQUEL C @ TRESTLE	160
S07	4-Aug-92	SOQUEL C @ TRESTLE	60
S07	10-Aug-92	SOQUEL C @ TRESTLE	520
S07	17-Aug-92	SOQUEL C @ TRESTLE	200
S07	25-Aug-92	SOQUEL C @ TRESTLE	60
S07	1-Sep-92	SOQUEL C @ TRESTLE	40
S07	8-Sep-92	SOQUEL C @ TRESTLE	60
S07	14-Sep-92	SOQUEL C @ TRESTLE	80
S07	22-Sep-92	SOQUEL C @ TRESTLE	40
S07	30-Sep-92	SOQUEL C @ TRESTLE	40
S07	6-Oct-92	SOQUEL C @ TRESTLE	20
S07	13-Oct-92	SOQUEL C @ TRESTLE	0.9
S07	20-Oct-92	SOQUEL C @ TRESTLE	40
S07	27-Oct-92	SOQUEL C @ TRESTLE	20
S07	3-Nov-92	SOQUEL C @ TRESTLE	320
S07	17-Nov-92	SOQUEL C @ TRESTLE	160
S07	1-Dec-92	SOQUEL C @ TRESTLE	145
S07	15-Dec-92	SOQUEL C @ TRESTLE	40
S07	22-Dec-92	SOQUEL C @ TRESTLE	1000
S07	29-Dec-92	SOQUEL C @ TRESTLE	200
S07	5-Jan-93	SOQUEL C @ TRESTLE	80
S07	2-Feb-93	SOQUEL C @ TRESTLE	80
S07	16-Feb-93	SOQUEL C @ TRESTLE	100
S07	23-Feb-93	SOQUEL C @ TRESTLE	1200
S07	2-Mar-93	SOQUEL C @ TRESTLE	0.90
S07	10-Mar-93	SOQUEL C @ TRESTLE	180
S07	25-May-93	SOQUEL C @ TRESTLE	1980
S07	20-Jul-93	SOQUEL C @ TRESTLE	360
S07	28-Jul-93	SOQUEL C @ TRESTLE	450
S07	3-Aug-93	SOQUEL C @ TRESTLE	400
S07	10-Aug-93	SOQUEL C @ TRESTLE	800
S07	17-Aug-93	SOQUEL C @ TRESTLE	120
S07	24-Aug-93	SOQUEL C @ TRESTLE	320
S07	14-Jun-94	SOQUEL C @ TRESTLE	860
S07	22-Sep-94	SOQUEL C @ TRESTLE	80
S07	3-Oct-94	SOQUEL C @ TRESTLE	60
S07	4-Oct-94	SOQUEL C @ TRESTLE	4020
S07	13-Oct-94	SOQUEL C @ TRESTLE	120
S07	17-Oct-94	SOQUEL C @ TRESTLE	140
S07	19-Oct-94	SOQUEL C @ TRESTLE	220
S07	31-Oct-94	SOQUEL C @ TRESTLE	400
S07	2-Nov-94	SOQUEL C @ TRESTLE	1080
S07	21-Nov-94	SOQUEL C @ TRESTLE	220
S07	28-Nov-94	SOQUEL C @ TRESTLE	360
S07	19-Dec-94	SOQUEL C @ TRESTLE	170
S07	5-Apr-95	SOQUEL C @ TRESTLE	260
S07	7-Jun-95	SOQUEL C @ TRESTLE	240
S07	26-Jul-95	SOQUEL C @ TRESTLE	440
S07	2-Aug-95	SOQUEL C @ TRESTLE	600

S07	7-Aug-95	SOQUEL C @ TRESTLE	500	
S07	14-Aug-95	SOQUEL C @ TRESTLE	360	
S07	27-Sep-95	SOQUEL C @ TRESTLE	240	
S07	4-Oct-95	SOQUEL C @ TRESTLE	150	
S07	6-Nov-95	SOQUEL C @ TRESTLE	160	
S07	12-Jun-96	SOQUEL C @ TRESTLE	970	
S07	13-Jun-96	SOQUEL C @ TRESTLE	370	
S07	20-Jun-96	SOQUEL C @ TRESTLE	482	
S07	30-Dec-96	SOQUEL C @ TRESTLE	650	
S07	1-Aug-01	SOQUEL C @ TRESTLE		49600
S07	20-Feb-02	SOQUEL C @ TRESTLE		836
S07	9-May-02	SOQUEL C @ TRESTLE		717
S07	8-Mar-03	SOQUEL C @ TRESTLE		1212

Site	Description	Date	Time	GPS (north)	GPS (south)	pH	SpC	DO	DO%	Temp (C)	Sal	Substrate	Notes
SLRE 1	100 yards south (towards the ocean) of trestle	7/14/2004	10:30 AM	36.96545	-122.01145	7.9	28000	7.66	94.6	18.98	16	Completely sandy bottom. Rocky on one edge of lagoon.	This site had water flowing in from ocean. Numbers may fluctuate. Picked up a mussel shell (no organism inside) and small broken shell. May have washed in from the ocean. Visual search didn't show any mussels on piers or rocks.
SLRE 2	3rd house from the end closest to the ocean	7/14/2004	10:45 AM	36.96456	-122.01753	8.22	50900	8.02	100.3	16.22	33.4	Completely sandy bottom. Rocky on one edge of lagoon.	
SLRE 3	@ Water St. Bridge	7/14/2004	11:15 AM	36.978213	-122.02352	8.4	430.5	11.9	118.8	15.06	0.21	Rocky.	Fresh water flow. Lots of algae. Snails. No bivalves found.
Soquel Lagoon	if facing ocean, sampled on the right side of the lagoon	7/14/2004	12:30 PM	36.97194	-122.95177	8.74	752	11.24	125.5	20.73	0.39	Sandy.	Lagoon was completely shut off from the ocean at the time of sampling. NOAA folks were scuba diving at the time of sampling and indicated that they did not see any bivalves while diving.

On 7/14/04, Shanta Keeling, Doug Gouzie and Angela Carpenter visited San Lorenzo River Estuary and Soquel Lagoon to do some reconnaissance work regarding the presence (or absence) of shellfish in these two areas. Staff took water quality measurements. Visual observations of the substrate were noted. Additionally, staff looked for the presence of any type of bivalve in the area. No indications of any bivalves were noted. Water quality measurements and observations are located on the next worksheet.

Seeking stakeholder input on Regional Board's consideration of de-designating the SHELL beneficial use in both the San Lorenzo River Estuary and the Soquel Lagoon

Regional Board staff is considering de-designating the beneficial use of shellfishing from the San Lorenzo River Estuary and the Soquel Lagoon.

Staff has found no evidence of the shellfish harvesting beneficial use in the San Lorenzo River Estuary or the Soquel Lagoon. Hydraulic modifications, seasonal lagoon closure to tidal circulation, and lack of evidence of any historical or contemporary shellfish harvesting, have led Regional Board staff to consider removing the SHELL beneficial use in San Lorenzo River Estuary and Soquel Lagoon. These would be proposed as two separate items.

> Staff feels the 1976 listing of a shellfish beneficial use for San Lorenzo River Estuary was in error. In the 1975 Basin Plan, San Lorenzo River Estuary did not have shellfishing listed as a beneficial use. In 1976, the Estuary was listed as having shellfishing as a beneficial use, with no supporting documentation or rationale. Shanta Keeling questioned staff at Region 3 as to why this change was made. Region 3 staffs' recollection was that in 1976, several waterbodies in the region were given a SHELL beneficial use, without supporting documentation, for what appeared to be administrative reasons. **Although legally, a UAA must be performed in order to remove the beneficial use of shellfishing from the San Lorenzo River Estuary, staff wants to emphasize that the initial listing of this waterbody for SHELL did not appear to be scientifically based.**
>
> Soquel Lagoon was listed as part of a larger grouping of waterbodies in the 1975 Basin Plan. Again, staff did not find documentation to point out why this waterbody was listed for the SHELL beneficial use.

Staff has questioned numerous individuals who are knowledgeable about the areas. These include, but are not limited to County and City staff, researchers, Department of Fish and Game staff, and Department of Health Services. We have tried to contact anyone who might have information on this subject matter.

We bring this subject up today to ask if anyone has any information on the presence of shellfishing in either of these waterbodies.

If you could help us out and please fill out this form.

Angela Carpenter read this at a Nov. 15, 2005 meeting in Santa Cruz. The meeting was facilitated by the County of Santa Cruz. No one in attendance filled out a form and no one had any oral comments to Angela. No phone calls or emails were received by staff after the meeting. An attendance sheet is attached.

1/4 pages

1) Do YOU think the shellfishing beneficial use exists in either the San Lorenzo River Estuary or the Soquel Lagoon?

San Lorenzo River Estuary		Soquel Lagoon	
YES	NO	YES	NO

If you think the shellfishing use is occurring, why do you think so? Or if not, why do you think so?

_____

_____

_____

_____

2) Do you know of anyone you think Regional Board staff should contact regarding this issue (please include name and contact info)?

_____

Your contact information:
Name_____
Phone no._____
Email address_____
Affiliation_____

1) Do YOU think the shellfishing beneficial use exists in either the San Lorenzo River Estuary or the Soquel Lagoon?

San Lorenzo River Estuary		Soquel Lagoon	
YES	NO	YES	NO

If you think the shellfishing use is occurring, why do you think so? Or if not, why do you think so?

_____

_____

_____

_____

2) Do you know of anyone you think Regional Board staff should contact regarding this issue (please include name and contact info)?

_____

Your contact information:
Name_____
Phone no._____
Email address_____
Affiliation_____

MEETING NOTICE

Technical Advisory Committee

ASSESSMENT OF SANTA CRUZ COUNTY BEACH POLLUTION

November 15, 2005
Tuesday, 1:00 – 3:00 pm

Health Services Agency Small Auditorium, Basement
Building D, 1080 Emeline Street, Santa Cruz, CA

AGENDA

1. Introductions

2. Review of Draft Report: Assessment of Bacterial Contamination at Santa Cruz County Beaches
   a. Findings
   b. Recommendations

3. Regional Board Efforts
   a. Pathogen TMDL Development for San Lorenzo, Capitola Lagoon, Aptos/Valencia Creeks – Use of Beach Water Quality Report for Implementation Plan
   b. Use Attainability Analysis to remove the Shellfish Harvesting Beneficial Use from San Lorenzo River Estuary and Soquel Lagoon

4. Update on Status of Related Efforts?
   a. Integrated Watershed Restoration Program: Countywide Lagoons
   b. Sanctuary Water Quality Protection Program: Urban Runoff and Beach Action Plans
   c. Prop 13 Capitola Lagoon Cooperative Water Quality Assessment
   d. County Stormwater Program
   e. Clean Beach Initiative Projects: Santa Cruz and Capitola
   f. Others?

Please contact John Ricker (831-454-2750), if you have questions or comments.

3/4 pages

To: Shanta Keeling - RWQCB 805-788-5516

Beach Water Quality - 11/15/05

Name	Affiliation
John Ricker	S.C. Co Env Hlth
Chris CAVE	City of Santa Cruz
Chris Coburn	MBNMS
Nicole Beck	2ndNature
~~Russ Peterson~~	S.C. County Pub. Wks
~~Steven Tesberg~~	Capitola
Dan Chua	S.C. County Sanitation District
AKIN BABATOLA	City of Santa Cruz
Angela Cargent	Ca Regional Water Quality Control Board
PATRICIA MATTICK	Surfrider Fdn + Sierra Club
John Alexiou	City of S.C. Marine Safety (P&R)
Steve Peters	County of Santa Cruz EHS
Monica Reid	Kestrel Consulting, Inc.
DAN SEIDEL	City of Santa Cruz
Kristy Morris	UCSC (more los Huertos)
Suzanne Healy	City of Santa Cruz
Alyson Tom	SC County
Rachel Lather	SCCSD
Monica Reed	
Tamara Dan.	Coastal Watershed Council
~~Steve Wolfman~~	~~City of SC~~
Siobhan O'Neil	City of Santa Cruz - DPW
Steve Wolfman	City of Santa Cruz
	~~UCSC - more los Huertos~~

4/4 pages