California Regional Water Quality Control Board
Central Coast Region

Total Maximum Daily Loads for Fecal Coliform in the Pajaro River Watershed Including, Pajaro River, San Benito River, Llagas Creek, Tequisquita Slough, San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek, in Santa Cruz, Santa Clara, San Benito, and Monterey Counties, California

Phase-5: Regulatory Action Selection

Final TMDL Project Report
March 2009

Item No. 16 Attachment No. 2
March 19-20, 2009 Meeting
TMDLs Pajaro River 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
United States Environmental Protection Agency
on _________________. 200x

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To request copies of the Draft TMDL Project Report for Fecal Coliform in Pajaro River Watershed Waters (Including Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough), in Santa Cruz, Santa Clara, San Benito, and Monterey Counties, California, please contact Pete Osmolovsky at (805) 549-3699, or by email at paosmolovsky@waterboards.ca.gov. Documents also are available at:
http://www.waterboards.ca.gov/centralcoast/TMDL/303dandTMDLprojects.htm

STATE OF CALIFORNIA

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CONTENTS

TABLES

FIGURES

APPENDIX A –DATA AND BASELINE ENVIRONMENTAL CONDITIONS

APPENDIX B – CIWQS SPILL INFORMATION

List of Acronyms and Abbreviations

This report contains numerous acronyms and abbreviations. In general, staff wrote an acronym or abbreviation in parentheses following the first time a title or term was used. Staff wrote the acronym/abbreviation in place of that term from that point throughout this report. The following alphabetical list of acronyms/abbreviations used in this report is provided for the convenience of the reader:

ACRONYM	NAME
CalFERT	California Food Emergency Response Team
CCAMP	Central Coast Ambient Monitoring Program
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFU	Colony Forming Units
CWA	Clean Water Act
E. coli	Escherichia coli bacteria
FIB	Fecal Indicator Bacteria
MPN	Most Probable Number
REC-1	Water Contact Recreation
REC-2	Non-contact Water Recreation
SWMP	Storm Water Management Plan
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
WDR	Waste Discharge Requirements
WWTP	Waste Water Treatment Plant

1 PROJECT DEFINITION

1.1 Introduction

This Final Total Maximum Daily Load (TMDL) Project Report addresses fecal coliform impairment of the Pajaro River Watershed (including the following water bodies: Pajaro River, San Benito River, Llagas Creek, Tequisquita Slough, San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek). Water Board staff prepared this Final TMDL Project Report to describe the project and to present recommendations for addressing water quality impairment. Final TMDL Project Reports, as opposed to Draft Reports, are used for public and legal review prior to being presented to the Water Board for consideration. Staff anticipates Water Board consideration of this TMDL project in March 2009. A 45-day public comment period will precede the Water Board hearing. Staff response to public comments received during the formal public comment period will be made part of the Water Board agenda item considering this TMDL approval.

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

Some fecal coliform genera are pathogenic to humans. Fecal coliform and a subset of fecal coliform, *Escherichia coli* (*E. coli),* are used as indicators for the presence of other pathogenic organisms. Fecal coliform and *E. coli* will be referred to as fecal indicator bacteria (FIB) for the purposes of this report.

Note that the units of *density* and *concentration* are used synonymously in this report when referring to numbers of FIB in a stated volume of water. In addition, the terms log mean, geomean, and geometric mean are also used synonymously when referring to the mathematical operation performed to quantify FIB.

2 WATERSHED DESCRIPTION

The Pajaro River watershed encompasses approximately 1,263 square miles (808,320 acres). It is about 60 miles southeast of San Francisco and Oakland and 120 miles southwest of Sacramento. The watershed is almost 90 miles in length and varies from 7 to 20 miles in width (Figure 2-1). The Pajaro River watershed drains into the Pacific Ocean at Monterey Bay and is the largest coastal stream between San Francisco Bay and the Salinas River.

The watershed lies within Santa Cruz, Santa Clara, San Benito, and Monterey counties and includes the cities of Watsonville, Gilroy, Morgan Hill, and Hollister. Headwaters of the Pajaro River originate at San Felipe Lake. The principle tributary to San Felipe Lake is Tequisquita Slough, through which Pacheco Creek and Santa Ana Creek contribute to the lake waters. Major tributaries to the Pajaro River include San Benito River, Tres Pinos Creek, Llagas Creek, Uvas Creek, and Corralitos Creek. Throughout this report, staff collectively refers to all tributaries of the Pajaro River and all tributary watersheds as the Pajaro River watershed.

The Pajaro River watershed is predominantly mountainous and hilly, and level lands are confined to the floodplains of the Pajaro River and its major tributaries. Elevations in the watershed range from sea level where the Pajaro River enters the Monterey Bay to over 4,900 feet at the headwaters of the San Benito River. Average annual precipitation ranges from 13 inches in Hollister to more than 44 inches in the Santa Cruz Mountains. Much of the annual precipitation occurs during the six month period from November through April.

Staff classified land use based on 2005 spatial data derived from the Farmland Mapping and Monitoring Program (FMMP), California Department of Conservation, Division of Land Resource Protection. The FMMP land use categories include prime irrigated agricultural, irrigated agricultural of state significance, orchards and vineyards, dry cropland, grazing land, urban developed land, “other” lands (e.g., forested, government-owned, rural residential), and water. Additional information pertaining to land use descriptions is included in Appendix A, Attachment 3.

Grazing is the predominant land use within the Pajaro River watershed with an area of 62%, followed by the “other” land use category (e.g., forested, government-owned, rural residential) at 21%, irrigated agricultural lands (10%), urban (3%), and dry land farming (3%). See Section 4.6 for details regarding land use areas within the watershed.

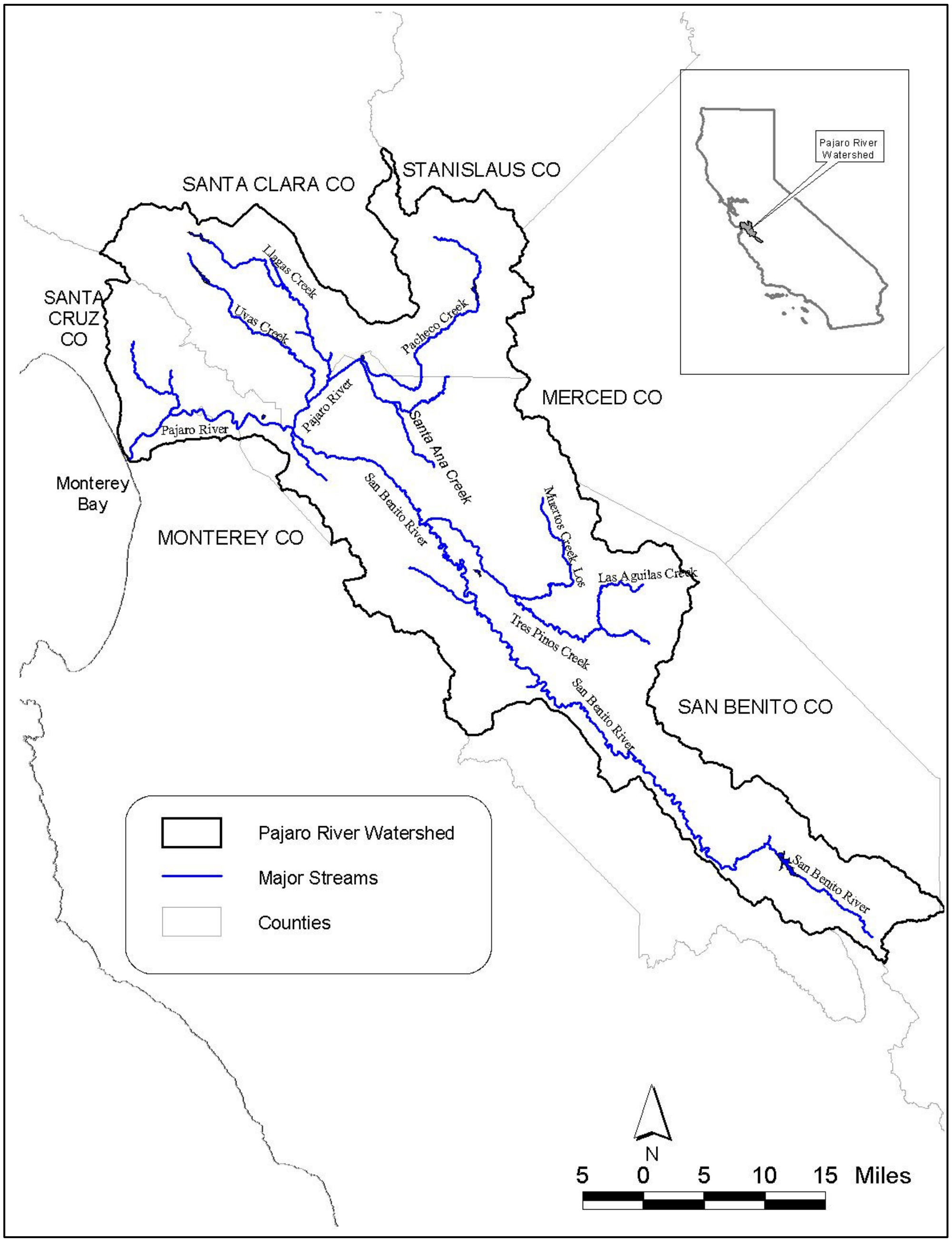

Figure 2-1. Location of the Pajaro River watershed.

2.1 Beneficial Uses

The California Regional Water Quality Control Board (Water Board) is responsible for protecting water resources from pollution and nuisance that may occur as a result of waste discharges. The Water Board determines beneficial uses that need protection and adopts water quality objectives that are necessary to protect the beneficial water uses. The beneficial uses and water quality objectives are contained in the Water Quality Control Plan (Basin Plan).

Fecal indicator bacteria (FIB, e.g. fecal coliform and *E. coli)*, are commonly used for predicting the presence of organisms that may be pathogenic (e.g., virus, bacteria, protozoa). If a concentration of FIB is detected in a sample, pathogenic organisms may also be present. Elevated levels of FIB are an indication that waterbodies may be unsafe for swimming, fishing, or other forms of water contact and non-contact (REC-1 and REC-2 beneficial uses, respectively) activities. Water contact recreation is the most sensitive water recreation use (i.e., it carries the strictest numeric objectives for FIB).

The Basin Plan identifies beneficial uses for some of the listed waterbodies included in this analysis. The Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough have designated beneficial uses in the Basin Plan. The beneficial uses cited in the Basin Plan are listed in Table 2-1.

The Basin Plan also states that surface waterbodies within the region that do not have beneficial uses specifically designated for them are assigned the beneficial uses of “municipal and domestic water supply” and “protection of both recreation and aquatic life.” Staff interpreted this general statement of beneficial uses to encompass MUN, REC-1, REC-2, COLD, and WARM.

Table 2-1. Beneficial uses for Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough.

Waterbody	**Pajaro River**	**San Benito River**	**Llagas Creek**	**Tequisquita Slough**
Municipal and Domestic Supply (MUN)	X	X	X	
Agricultural Supply (AGR)	X	X	X	
Industrial Service Supply (IND)	X		X	
Ground Water Recharge (GWR)	X	X	X	X
Water Contact Recreation (REC-1)	X	X	X	X
Non-Contact Water Recreation (REC-2)	X	X	X	X
Wildlife Habitat (WILD)	X	X	X	X
Cold Fresh Water Habitat (COLD)	X		X	
Warm Fresh Water Habitat (WARM)	X	X	X	X
Migration of Aquatic Organisms (MIGR)	X		X	
Spawning, Reproduction, and/or Early Development (SPWN)	X	X	X	X
Preservation of Biological Habitats of Special Significance (BIOL)				
Rare, Threatened, or Endangered Species (RARE)		X	X	
Freshwater Replenishment (FRSH)	X			
Commercial and Sport Fishing (COMM)	X	X	X	X

2.2 Listing Basis

The Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough were listed in 1998 as impaired waterbodies due to excessive fecal coliform levels. These listings are based on 1997-1998 Central Coast Ambient Monitoring Program (CCAMP) results for fecal coliform. Figure 2-2 shows the four listed waterbodies within the Pajaro River watershed. CCAMP data collection results and additional Water Board sampling data are discussed in Section 4 *Data Analysis*.

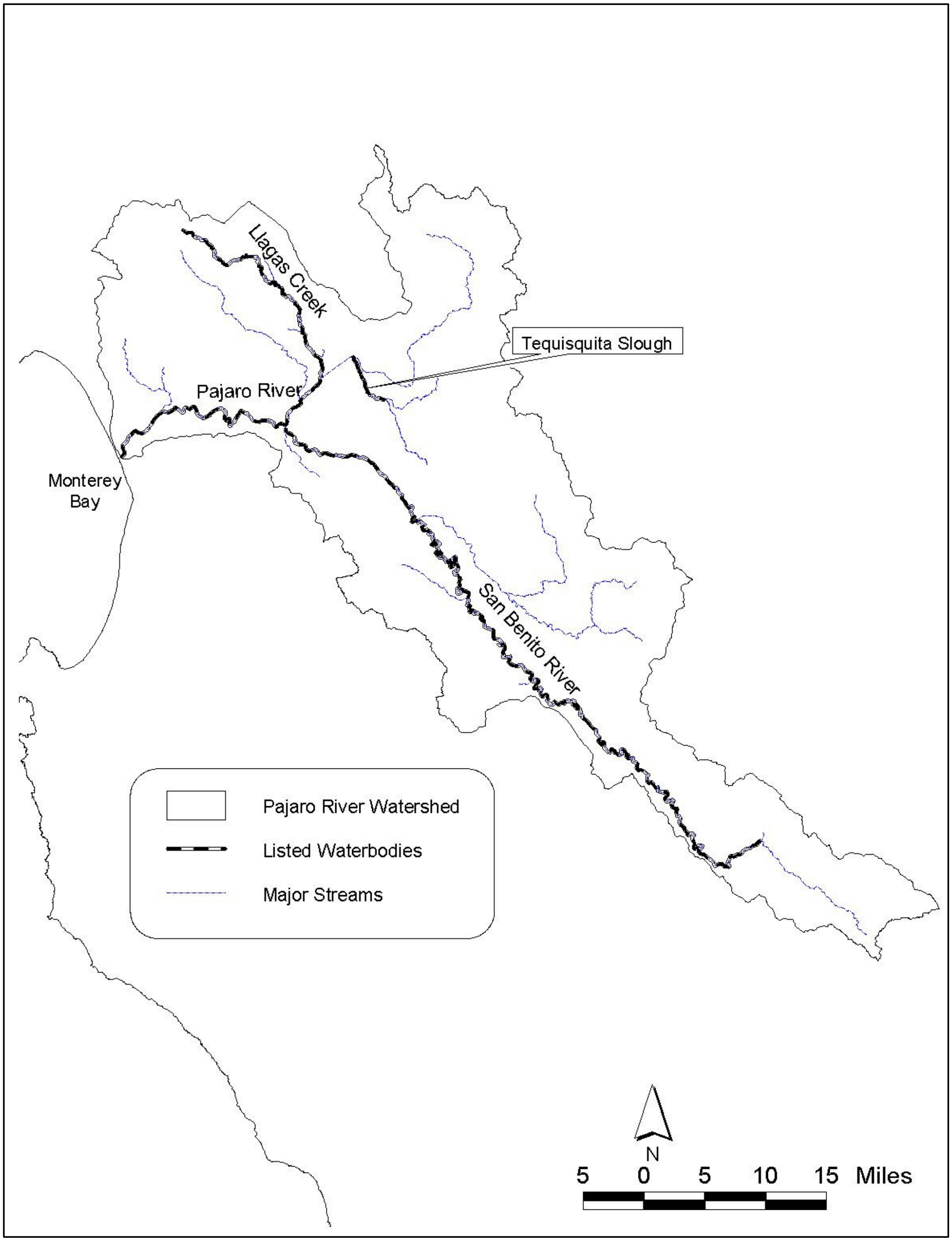

Figure 2-2. Fecal coliform listed waterbodies of the Pajaro River watershed.

3 WATER QUALITY OBJECTIVES

This section presents applicable water quality objectives that are contained in the Basin Plan (Chapter 3), impairment assessment guidelines as contained in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d), and USEPA-recommended water quality criteria.

3.1 Water Contact Recreation (REC-1)

The Basin Plan (pg. III-5) defines water contact recreation as "uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs."

The Basin Plan contains the following objective to protect the water contact recreation beneficial use:

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

3.2 Non-Contact Water Recreation (REC-2)

The Basin Plan (pg. III-10) contains the following objective to protect the non-contact water recreation 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 per 100 mL, nor shall more than 10 percent of samples collected during any 30-day period exceed 4000 per 100 ml."

3.3 Controllable Water Quality Conditions

Controllable water quality must conform to the water quality objectives stated in the Basin Plan (pg. III-2). The Basin Plan defines controllable water quality conditions as:

[1] Throughout this document, fecal coliform units are expressed as colony forming units (CFU) (#/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).

"Controllable water quality conditions are those actions or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled."

3.4 Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy)

The Listing Policy (State Water Resources Control Board, September 2004) provides guidance for interpreting data and information as they are compared to beneficial uses and existing numeric and narrative water quality objectives. A water segment shall be placed on the section 303(d) list if bacteria water quality objectives are exceeded at the frequencies and sample sizes indicated in Table 3-1.

Table 3-1. Data required to assert impairment.

Sample Size	Number of Exceedances[1] needed to assert impairment
5-30	5
31-36	6
37-42	7
43-48	8
49-54	9
55-60	10
61-66	11
67-72	12
73-78	13
79-84	14
85-91	15
92-97	16
98-103	17
104-109	18
110-115	19
116-121	20

[1] Equal to or greater than 400 MPN/100 ml fecal coliform or 235 MPN/100 ml generic *E. coli*.

Exceedance criteria are equal to or greater than 400 MPN/100 ml for fecal coliform or 235 MPN/100 ml generic *E. coli*. Generic *E. coli* criteria are discussed in the following section.

Note from the table that at least five data and exceedances are required to assert impairment.

3.5 USEPA Recommended Water Quality Criteria

The United States Environmental Protection Agency (USEPA) periodically updates and publishes water quality criteria recommendations. Table 3-2 summarizes USEPA recommended bacterial water quality criteria for the protection of human health in recreational waters.

Table 3-2. USEPA recommended criteria for *E. coli*.

Indicator	Risk Level	Geometric Mean Density (per 100 mL)	Single Sample Maximum Allowable Density (per 100 mL)[a]			
			Designated Beach Area (75th percentile)	Moderate Full Body Contact Recreation (82nd percentile)	Lightly Used Full Body Contact Recreation (90th percentile)	Infrequently Used Full Body Contact Recreation (95th percentile)
E. coli	8	126[b]	235	298	409	575

Source: U.S. EPA (1986).
a. Calculated using the following: single sample maximum = geometric mean * 10^(confidence level factor * log standard deviation), where the confidence level factor is: 75%: 0.675; 82%: 0.935; 90%: 1.28; 95%: 1.65. The log standard deviation from EPA's epidemiological studies is 0.4 for fresh waters.
b. Calculated to nearest whole number using equation: geometric mean = antilog_{10} [(risk level + 11.74) / 9.40].

Note that the USEPA water quality criteria are in terms of *E. coli*, whereas the Central Coast Water Board water quality objectives for bacteria are in terms of fecal coliform.

According to USEPA guidance, the preferred criteria level is the geometric mean of 126 MPN/100mL; the single sample maximums are simply statistical extensions of the analysis used to determine the recommended geometric mean density (126 MPN/100mL).

USEPA gave staff guidance in using the recommended criteria to evaluate whether water bodies are impaired (Mary Adams, Central Coast Water Board, December 2007, personal communication). USEPA recommended having at least three samples in a 30-day period to apply the geometric mean criteria of 126 MPN/100mL. If three samples in a 30-day period were not available, USEPA recommended using the concentration of 235 MPN/100mL as a benchmark, with the number of exceedances of 235 MPN/100mL needed to assert impairment increasing with the number of available data. Table 3-1 (previous page) shows the number of data necessary to assert impairment with an exceedance criterion of 235 MPN/100mL for generic *E. coli*. Note from the table that at least five data and exceedances are required to assert impairment.

4 DATA ANALYSIS

Water Board staff analyzed water quality data, land use data, and the results of bacteria indicator studies from the Central Coast Region. This section provides a summary of the data analysis conducted for the project. Please note that site identification (tags) or site descriptions may contain a 305 prefix. The 305 prefix refers to the Pajaro River watershed hydrologic unit number. Data analysis details are contained as Appendix A.

4.1 Water Quality Data - CCAMP

The CCAMP conducted two periods of water quality monitoring within the Pajaro River watershed, from 1997-1998 and from 2005-2006. The first sampling period (1997-1998) included fecal coliform results only while the second sampling period (2005-2006) included results for both fecal coliform and *E. coli*. Water samples from each monitoring site were obtained on a monthly basis (e.g., 1-sample per month). It is important to note that additional monitoring sites were added to the 2005-2006 sampling round. Table 4-1 lists the sampling sites for both periods and Figure 4-1 shows the CCAMP monitoring locations. Detailed CCAMP data is contained in Appendix A, Attachment 1.

Table 4-1. CCAMP Monitoring Sites.

Site ID	Site Description
BRI	305BRI-San Benito River @ Hwy 25 d/s Willow Creek
CAN	305CAN-Carnadero Creek @ Private Property Access
CHE	305CHE-Llagas Creek @ Chesbro Reservoir
CHI	305CHI-Pajaro River @ Chittenden Gap
COR	305COR-Salsipuedes Creek d/s of Corralitos Creek
COR2	305COR2-Upper Corralitos Creek
FRA	305FRA-Miller's Canal @ Frazier Lake Road
FUF	305FUF-Furlong (Jones) Creek @ Fraiser Lake Road
HOL	305HOL-Llagas Creek @ Holsclaw and Leavesley Roads
LLA	305LLA-Llagas Creek @ Bloomfield Avenue
LUC	305LUC-Llagas Creek @ Luchessa Avenue/Southside Drive
MON	305MON-Llagas Creek @ Monterey Road
MUR	305MUR-Pajaro River @ Murphy's Crossing
OAK	305OAK-Llagas Creek @ Oak Glen Avenue
PAC	305PAC-Pacheco Creek @ San Felipe Road
PAJ	305PAJ-Pajaro River @ Betabel Road
PES	305PES-Pescadero Creek
PJP	305PJP-Pajaro River @ Main Street
SAF	305SAF-Santa Ana Creek @ Fallon Road
SAN	305SAN-San Benito @ Y Road
SBA	305SBA-San Benito River above unknown tributary
SJN	305SJN-San Juan Creek @ Anzar

TES	305TES-Tequisquita Slough
THU	305THU-Pajaro River @ Thurwachter Bridge
TRE	305TRE-Tres Pinos Creek
UVA	305UVA-Uvas Creek @ Bloomfield Avenue
VIS	305VIS-Llagas Creek @ Buena Vista Avenue

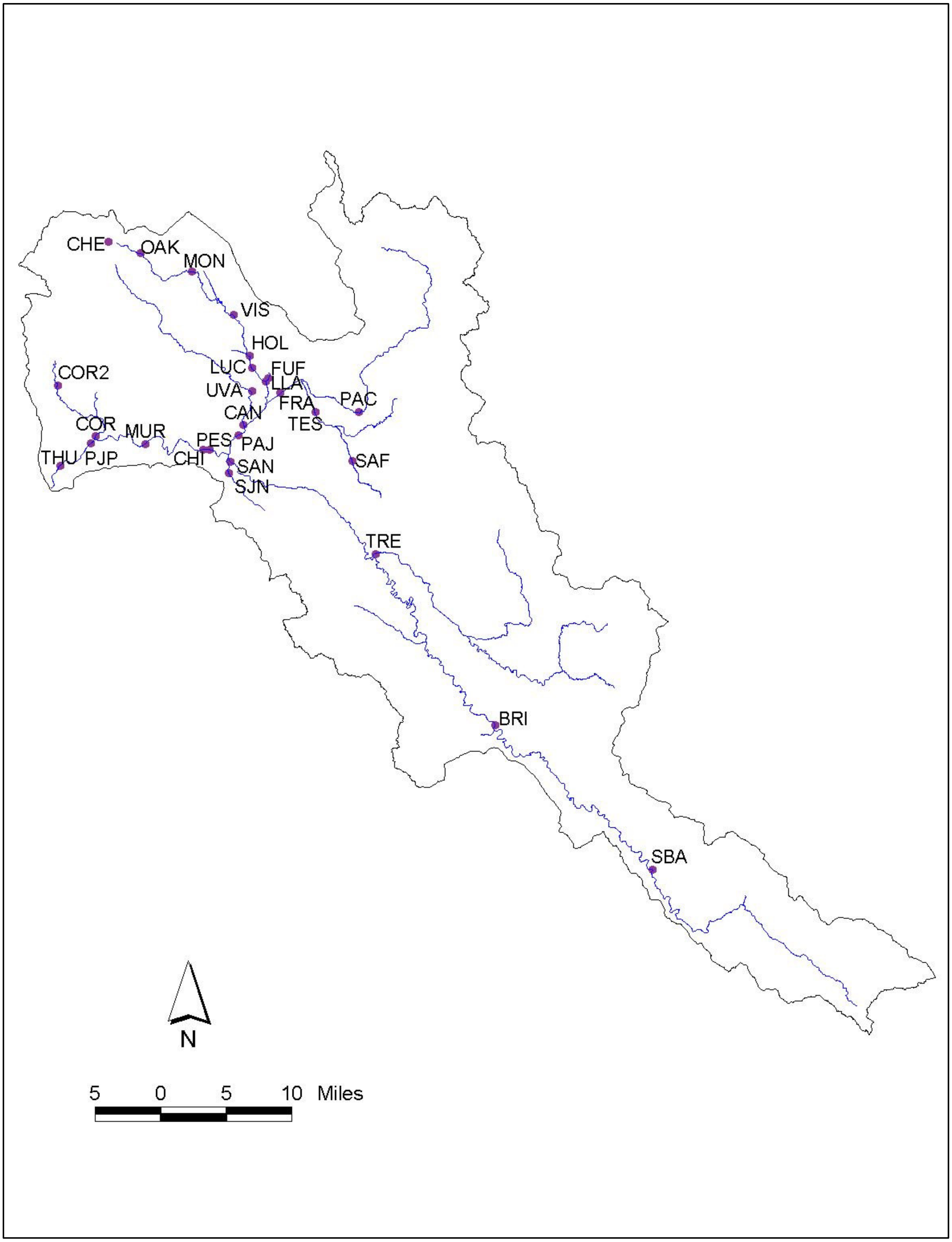

Figure 4-1. CCAMP monitoring locations.

Table 4-2. Summary of CCAMP data (1997-1998 and 2005-2006).

Waterbody	Site ID*	Fecal Coliform (n[1])	Fecal Coliform Max[2]	Fecal Coliform ≥ 400[2] No. / %	Fecal Coliform Geomean[2]	E. coli (n[1])	E. coli Max[2]	E. coli Geomean[2]
Pajaro R.	305THU[3]	59	54000	18 / 30	236	16	7500	80
	305PJP[3]	24	9000	5 / 20	188	15	11000	102
	305MUR[3]	25	50000	5 / 20	212	15	4600	81
	305CHI[3]	37	90000	12 / 32	269	15	13000	100
	305PAJ[3]	37	16000	10 / 27	266	15	2900	168
	305FRA[3]	25	24000	15 / 60	424	15	3000	159
Corralitos Cr.	305COR[4]	27	5000	10 / 37	336	15	1600	170
	305COR2	11	30000	2 / 18	177	11	13000	108
Pescadero Cr.	305PES	1	900	1 /100	900			
San Juan Cr.	305SJN[3]	15	160001	11 / 73	902	15	130000	377
San Benito R.	305SAN[3]	26	50000	14 / 54	635	14	61000	473
	305TRE[3]	17	160000	6 / 35	401	7	160000	1066
	305BRI[3]	15	90000	7 / 47	581	15	2000	255
	305SBA	1	50000	1 / 100	50000	1	61000	61000
Carnadero/ Uvas Cr.	305CAN[3]	16	2400	6 / 37	387	16	1300	132
	305UVA	17	3000	3 / 18	169	10	170	72
Llagas Cr.	305LLA[3]	37	5000	16 / 43	403	15	930	172
	305FUF[3]	15	90000	7 / 47	837	14	69000	655
	305LUC[3]	10	3000	5 / 50	586			
	305HOL[3]	15	16000	6 / 40	291	7	1800	179
	305VIS	3	900	2 / 67	316			
	305MON	10	300	0 / 0	125			
	305OAK	10	500	1 / 10	91			
	305CHE	10	2400	3 / 30	154			
Tequisquita Slough	305TES[3]	12	24000	11 / 92	4153			
	305SAF	1	24000	1 / 100	24000	1	20000	20000
	305PAC[3]	27	1400	11 / 41	272	15	1200	154
Watsonville Slough	305HAR[4]	14	11000	9 / 64	1103	14	8300	753
	305STL	13	700	1 / 7	88	12	240	50
	305WSA[4]	12	30000	4 / 33	347	10	41000	210

* Shaded Site ID cell indicates impaired waterbody
[1] Number of data.
[2] Values expressed as Most Probable Number (MPN) per 100ml.
[3] Fecal coliform water quality data indicate impairment in accordance with Listing Policy.
[4] Fecal coliform water quality data indicate impairment in accordance with Listing Policy; however impairment is being addressed via separate TMDL projects.

Table 4-2 summarizes fecal coliform and *E. coli* data for each CCAMP site during two monitoring periods (1997-1998 and 2005-2006); including the waterbody associated with each sampling site, number of samples, maximum values, geomean values, and percent of fecal coliform values over 400 MPN/100ml.

Please note that Table 4-2 includes monitoring results for Watsonville Slough (sites 305HAR, 305STL, and 305WSA) and Corralitos Creek (sites 305COR and 305COR2) as background information only. Watsonville Slough drains to the mouth of the Pajaro River at Monterey Bay (sites not mapped in Figure 4-1) and Corralitos Creek drains to the Pajaro River approximately five miles east of Monterey Bay (sites mapped in Figure 4-1). Monitoring results for these two waterbodies are not included as part of this data analysis because separate fecal coliform TMDLs are being developed. The Watsonville Slough Pathogen TMDL was approved by USEPA in July 2007 and the Corralitos Creek Pathogen TMDL is in progress. Also note in Table 4.2 that stations 305PES, 305SBA, 305VIS, and 305SAF do not meet the minimum sample number of five and therefore are not comparable to either fecal coliform or *E. coli* water quality objectives.

As expressed in Table 4-2, most of the sampling sites had 10% or more of fecal coliform data exceeding 400 MPN/100ml. The shaded site ID cells in Table 4-2 indicate impairment by fecal coliform in accordance with the State Listing Policy (Section 3.4).

Table 4-3 summarizes dry season (May-Oct) and wet season (Nov-Apr) fecal coliform and *E. coli* data for each CCAMP site, including the number of samples, percent of fecal coliform samples greater than 400 MPN/100ml, fecal coliform and *E. coli* geomean values, and number of *E. coli* samples greater than 235 MPN/ml.

Table 4-3. Dry season and wet season summary of CCAMP data (1997-1998 and 2005-2006).

Waterbody	Site ID	Season	Fecal Coliform (n[1])	Fecal Coliform ≥ 400[2] No. / %	Fecal Coliform Geomean[2]	E. coli (n[1])	E. coli No. of Samples ≥ 235[2]	E. coli Geomean[2]
Pajaro R.	305THU	Dry	30	7 / 23	129	6	0	15
		Wet	29	11 / 38	440	10	4	216
	305PJP	Dry	9	0 / 0	161	6	0	55
		Wet	15	5 / 33	207	9	3	153
	305MUR	Dry	11	0 / 0	149	6	0	44
		Wet	14	5 / 36	279	9	3	121
	305CHI	Dry	17	1 / 6	155	6	0	25
		Wet	20	11 / 55	455	9	3	253
	305PAJ[3]	Dry	17	2 / 12	149	6	2	102
		Wet	20	8 / 40	436	9	3	234
	305FRA[3]	Dry	11	8 / 73	624	6	5	263
		Wet	14	7 / 50	313	9	2	114
Corralitos Cr.	305COR[4]	Dry	12	2 / 17	210	6	3	194
		Wet	15	7 / 47	490	9	4	156
	305COR2	Dry	3	2 / 67	1249	3	1	518
		Wet	8	0 / 0	85	8	0	60
Pescadero Cr.	305PES	Dry						
		Wet	1	1 / 100	900			
San Juan Cr.	305SJN[3]	Dry	6	6 / 100	1115	6	5	517
		Wet	9	4 / 44	782	9	4	305
San Benito R.	305SAN[3]	Dry	12	5 / 42	483	6	3	368
		Wet	14	9 / 64	804	8	5	572
	305TRE[3]	Dry	7	3 / 43	459	2	2	1382
		Wet	10	3 / 30	365	5	4	961
	305BRI[3]	Dry	6	2 / 33	350	6	2	197
		Wet	9	5 / 56	814	9	5	303
	305SBA	Dry						
		Wet	1	1 / 100	50000	1	1	61000
Carnadero/ Uvas Cr.	305CAN[3]	Dry	7	4 / 57	614	7	3	110
		Wet	9	2 / 22	285	9	2	152
	305UVA	Dry	4	1 / 25	315	2	0	63
		Wet	13	2 / 15	140	8	0	74

[1] Number of data.
[2] Values expressed as Most Probable Number (MPN) per 100ml.
[3] Sum of wet and dry season exceedances for USEPA-recommended *E. coli* criteria (≥ 235 MPN/100 ml) indicate impairment.
[4] Sum of wet and dry season exceedances for USEPA-recommended *E. coli* criteria (≥ 235 MPN/100 ml) indicate impairment; however impairment is being addressed via separate TMDL projects.

Table 4-3 (Cont'd.).

Waterbody	Site ID	Season	Fecal Coliform (n[1])	Fecal Coliform ≥ 400[2] No. / %	Fecal Coliform Geomean[2]	E. coli (n[1])	E. coli No. of Samples ≥ 235[2]	E. coli Geomean[2]
Llagas Cr.	305LLA[3]	Dry	17	11 / 65	765	6	4	216
		Wet	20	5 / 25	233	9	3	148
	305FUF[3]	Dry	6	4 / 67	4124	6	4	1840
		Wet	9	3 / 33	289	8	3	302
	305LUC	Dry	5	3 / 60	623			
		Wet	5	2 / 40	552			
	305HOL	Dry	4	1 / 25	438	1	0	60
		Wet	11	5 / 45	251	6	2	215
	305VIS	Dry	1	0 / 0	70			
		Wet	2	2 / 100	671			
	305MON	Dry	5	0 / 0	138			
		Wet	5	0 / 0	113			
	305OAK	Dry	5	1 / 20	134			
		Wet	5	0 / 0	61			
	305CHE	Dry	5	2 / 40	244			
		Wet	5	2 / 20	98			
Tequisquita Slough	305TES	Dry	6	6 / 100	2908			
		Wet	6	5 / 83	5931			
	305SAF	Dry						
		Wet	1	1 / 100	24000	1		20000
	305PAC	Dry	12	4 / 33	291	6	2	175
		Wet	15	4 / 27	257	9	2	142
Watsonville Slough	305HAR[4]	Dry	5	4 / 80	2089	5	5	1631
		Wet	9	5 / 56	774	9	5	490
	305STL	Dry	4	1 / 25	147	4	1	142
		Wet	9	0 / 0	70	8	0	29
	305WSA	Dry	5	3 / 60	1377	5	1	276
		Wet	7	1 / 14	130	5	3	160

1 Number of data.
2 Values expressed as Most Probable Number (MPN) per 100ml.
3 Sum of wet and dry season exceedances for USEPA-recommended *E. coli* criteria (≥ 235 MPN/100 ml) indicate impairment.
4 Sum of wet and dry season exceedances for USEPA-recommended *E. coli* criteria (≥ 235 MPN/100 ml) indicate impairment; however impairment is being addressed via separate TMDL projects.

As shown in Table 4-3, wet season values are generally higher than dry season values, with a few exceptions. Further evaluation of seasonal water quality data indicates that *E. coli* values were greatest during a March 21-23 rain event, with 15 of 21 stations recording their highest concentration for the period (not shown, see Appendix A, Attachment 1).

4.2 Water Quality Data – Central Coast Water Board

Water Board staff completed five rounds of sampling and collected samples every two weeks from November 30, 2006 to January 25, 2007. Staff collected grab samples and performed analysis for total coliform and *E. coli* using the Colilert-18 method. A total of 27 sites were initially selected for monitoring; however, three of the sites (ALL, ALD, and WIL) were dry during the period and not sampled. Many of the remaining 24 sites are the same as existing CCAMP sites because they can be easily accessed. However, a few new (non-CCAMP) sites were included to provide additional information. These additional sites are a storm drain on Pajaro River near Main Street (PJPSD), San Juan Creek above San Juan Bautista (SJB), Bird Creek near Hollister Hills (BCC), Pescadero Creek (PSB), and a storm drain near Santa Ana Creek at Fallon Road (SAFSD). The monitoring sites are listed in Table 4-4, and depicted in Figure 4-2. Water quality data from this monitoring effort is presented in the following section and contained in Appendix A, Attachment 2.

Table 4-4. Water Board Monitoring sites.

Site ID	Site Description
ALD	ALL - Alamias Creek at Dunlap Ave
ALL	ALL - Alamias Creek at Leavesley Rd
BCC	BCC - Bird Creek at Cienega Rd
BRI	BRI - San Benito River, Bridge d/s Willow Creek
CHI	CHI - Pajaro River @ Chittenden Gap
FRA	FRA - Miller's Canal @ Frazier Lake Road
FUF	FUF - Furlong (Jones) Creek @ Fraiser Lake Road
HRL	HRL - San Benito River below Hernandez Reservoir
LLA	LLA - Llagas Creek @ Bloomfield Ave
MON	MON - Llagas Creek @ Monterey Road
MUR	MUR - Pajaro River @ Murphy's Crossing
PAC	PAC - Pacheco Creek @ San Felipe Road
PAJ	PAJ - Pajaro River @ Betabel Road
PJP	PJP - Pajaro River @ Main Street
PJPSD	PJPSD - Pajaro River @ Main Street Storm Drain
PSB	PSB - Pescadero Creek tributary to San Benito
SAF	SAF - Santa Ana Creek @ Fallon Road
SAFSD	SAFSD - Santa Ana Creek @ Fallon Road Storm Drain
SAN	SAN - San Benito @ Y Road
SBA	SBA - San Benito River above unknown tributary
SJB	SJB - San Juan Creek above San Juan Bautista
SJN	SJN - San Juan Creek @ Anzar
TES	TES - Tequisquita Slough
THU	THU - Pajaro River @ Thurwachter Bridge
TRE	TRE - Tres Pinos Creek
UVA	UVA - Uvas Creek @ Bloomfield Ave
WIL	WIL - Willow Creek

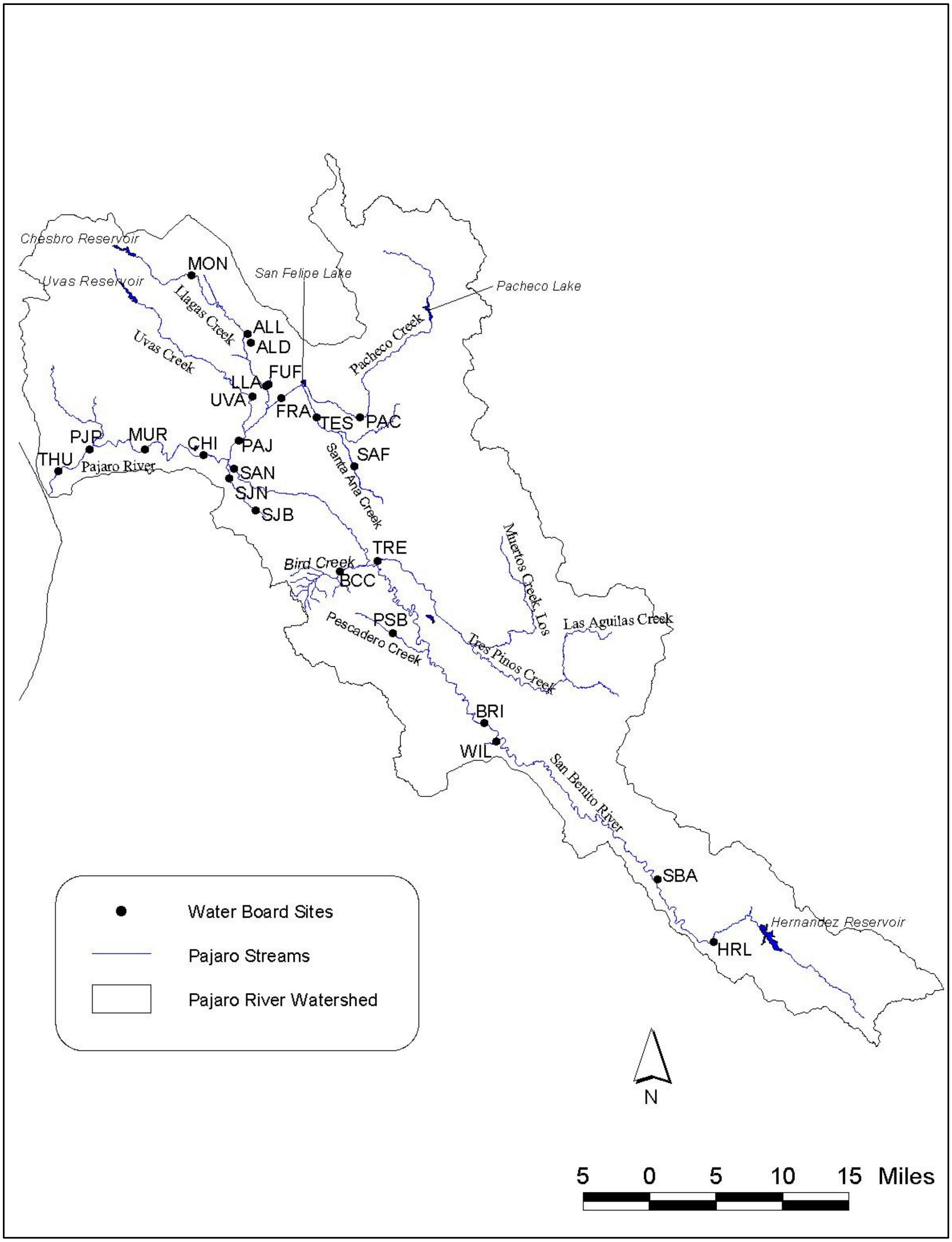

Figure 4-2. Water Board sampling sites.
Note: Storm drain monitoring locations PJPSD and SAFSD are not depicted; however, these two sites are immediately adjacent to monitoring sites PJP and SAF, respectively.

Table 4-5 summarizes the *E. coli* data for each Water Board sampling site including the number of samples, maximum values, geomean values, highest geomean values of three samples in a 30-day period, number of geomean exceedances, and number of samples exceeding 235 MPN/100ml. At the time the data were collected, it was presumed that *E. Coli* was a superior FIB to fecal coliform, and fecal coliform data were not collected during the sampling events. In accordance with the USEPA recommended water quality criteria (Section 3.5), at least three samples in a 30-day period having a geometric mean criteria of 126 MPN/100mL indicate impairment of the waterbody.

Table 4-5. Summary of Water Board data (2006 – 2007).

Site ID*	***E. coli* *No. of samples***	***E. coli* maximum[1]**	***E. coli* geomean[1]**	**E. coli highest geomean value[1] for 3 sampling events in 30-days**	***E. coli* No. of geomean exceedances for 3 sampling events in 30-days (≥ 126[1])**	***E. coli* No. samples exceeding ≥ 235[1]**
305THU	5	248	46	103	0	2
305PJP[2]	5	365	100	219	2	1
305PJPSD	1	>2419				
305MUR	5	58	26	52	0	0
305CHI	5	161	45	79	0	0
305PAJ[2]	5	285	94	163	1	1
305FRA[2]	5	248	109	144	1	1
305SJN	5	160	95	124	0	0
305SJB[2]	5	2419	182	583	3	2
305SAN[2]	5	1986	370	1009	3	3
305BCC[2]	5	547	210	272	3	2
305TRE	4	165	66.4	91	0	0
305PSB[2]	5	162	125	137	2	0
305BRI	5	199	98	120	0	0
305WIL	0 (dry)					
305SBA[2]	5	365	103	178	2	1
305HRL	5	60	41	51	0	0
305UVA[2]	5	201	157	171	3	0
305LLA[2]	5	225	155	215	3	0
305FUF[2]	5	325	149	147	1	1
305MON[2]	5	214	73	137	1	0
305TES[2]	5	579	338	403	3	4
305SAF[2]	5	1046	171	373	2	2
305SAFSD	5	980	139	515	1	2
305PAC[2]	5	410	191	194	3	2
305ALD	0 (dry)					
305ALL	0 (dry)					

* Shaded Site ID cell indicates impaired waterbody
[1] Values expressed as Most Probable Number (MPN) per 100ml.

[2] Exceedance of USEPA-recommended *E. coli* criteria (geomean of 3 samples in 30-day period ≥ 126 MPN/100 ml) indicate impairment.

Sixteen of the 23 monitoring sites exceed the USEPA-recommended *E. coli* geomean criteria of equal to or greater than 126 MPN/100ml for three samples in a 30-day period as shown in Table 4-5. For clarity, the site IDs that indicate impairment are shown as shaded cells on Table 4-5. The highest *E. coli* values were observed from samples obtained on December 12, 2006, where 11 of 23 stations recorded their highest concentration during a rain event (not shown, see Appendix A, Attachment 2).

The highest *E. coli* concentration was observed to be greater than the maximum quantification limit of 2419.6 MPN/100ml. This location was the storm drain located on the Pajaro River at Main Street (305PJPSD). The sample was obtained during a rain event on December 12, 2006 and verified with a duplicate sample.

4.3 Water Quality Data – California Food Emergency Response Team (CalFERT)

In September 2006 the U.S. Food and Drug Administration and California Department of Health Services, Food and Drug Branch jointly formed the California Food Emergency Response Team (CalFERT) to investigate the outbreak of *E. coli* O157:H7 associated with bagged spinach (CalFERT 2007). CalFERT investigators found *E. coli* O157:H7 matching the outbreak strain in wild pig feces, cattle feces, soil, and river water samples. CalFert made no definitive determination regarding the source of the E. coli spinach outbreak, but found that environmental risk factors for contamination was associated with wild pigs, and surface waters exposed to feces from cattle and wildlife. Four water samples were collected from waterbodies within the Pajaro River watershed, three from San Benito River and one from Pajaro River. Two samples collected from the San Benito River near Paicines (midway between CCAMP monitoring stations BRI and TRE in Figure 4-25) were indistinguishable from the O157:H7 outbreak strain. A water sample from San Benito River (near CCAMP station SBA) and a sample from Pajaro River (midway between CCAMP stations CHI and MUR) were positive for O157:H7; however these samples were not matched to the outbreak strain. Additional information regarding this investigation is contained in following sections.

4.4 Streamflow Data

There are six active USGS gage stations in the Pajaro River watershed. Table 4-6 presents the period of record and monthly average streamflow for these gages and Figure 4-3 shows gage locations.

Table 4-6. Summary of active USGS stations.

USGS Gage ID	**11154700**	**11156500**	**11157500**	**11158600**	**11159000**	**11159200**
Gage Location	Clear Creek near Idria, CA	San Benito River near Willow Creek School, CA	Tres Pinos Creek near Tres Pinos, CA	San Benito River at Highway 156 near Hollister, CA	Pajaro River at Chittenden, CA	Corralitos Creek at Freedom, CA
Period of Record	10/1/1993 – present day	10/1/1939 – present day	10/1/1940 – present day	10/1/1970 – present day	10/1/1939 – present day	10/1/1956 – present day
Month	**Average Monthly Flow (cfs)**					
January	6.74	33.1	39.3	72.9	437	51.30
February	12.6	72.4	66.2	174	649	62.00
March	15.1	79.4	40.3	147	474	37.80
April	8.60	43.5	25.4	42.7	253	22.00
May	6.30	22.3	7.08	16.9	53.6	5.28
June	4.25	19.9	5.26	7.65	16.8	1.13
July	2.19	14.8	4.82	5.32	8.25	0.42
August	1.30	14.4	4.45	5.11	6.40	0.19
September	1.02	11.2	3.62	4.82	6.53	0.59
October	1.01	6.58	2.78	2.91	5.56	0.81
November	1.02	5.87	4.17	6.58	31.9	5.02
December	1.91	15.4	15.6	19.4	144	16.60

Higher average streamflow typically occurs from November through May while lower average streamflow occurs from June through October. The highest flows within the Pajaro River watershed are observed at the USGS station on Pajaro River at Chittenden.

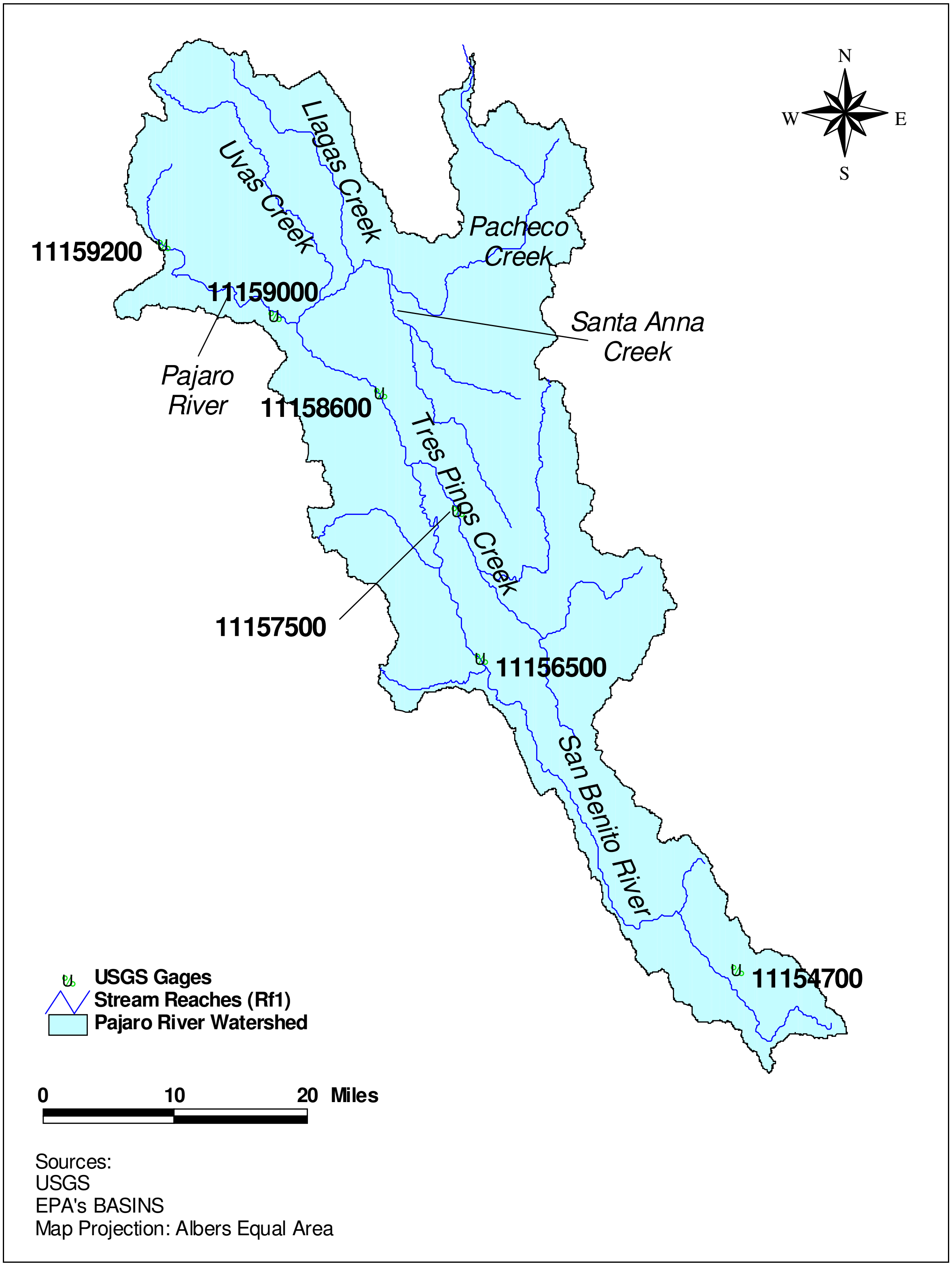

Figure 4-3. USGS gage stations in the Pajaro River watershed.

4.5 Water Quality Data Analysis and Impaired Reaches Conclusions

Staff concluded that water quality data confirm impairment of the Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough. Staff also concluded that water quality data indicate impairment of waterbodies within the Pajaro River watershed not previously included on the 303(d) list, including San Juan Creek (SJN and SJB), Carnadero/Uvas Creek (CAN and UVA), Bird Creek (BCC), Pescadero Creek (PSB), Tres Pinos Creek (TRE), Furlong (Jones) Creek (FUF), Santa Ana Creek (SAF), and Pachecho Creek (PAC). Tables 4-2, 4-3, and 4-5 in previous sections contain the data used to determine impairment and Table 4-7 describes the impaired reaches.
Abbreviations for the sampling sites and description of locations are found in Table 4-4.

Table 4-7. Impaired Reaches

Major Water Body	Tributaries	Impaired Reach Description	Previously Listed
Pajaro River		From upstream of monitoring station FRA to Monterey Bay [1]	Yes
	San Juan Creek	From upstream of monitoring station SJB to confluence with Pajaro River [1]	No
	Carnadero/Uvas Creek	From upstream of monitoring station CAN to confluence with Pajaro River [1]	No
San Benito River		From between monitoring station SBA and HRL to confluence with Pajaro River	Yes
	Bird Creek	From upstream of monitoring station BCC to confluence with San Benito River [1]	No
	Pescadero Creek	From upstream of monitoring station PSB to confluence with San Benito River [1]	No
	Tres Pinos Creek	From upstream of monitoring station TRE to confluence with San Benito River [1]	No
Llagas Creek		From upstream of monitoring station MON to confluence with Pajaro River [1]	Yes
	Furlong (Jones) Creek	From upstream of monitoring station FUF to confluence with Llagas Creek [1]	No
Tequisquita Slough		From upstream of monitoring station TES to San Felipe Lake [1]	Yes
	Santa Ana Creek	From upstream of monitoring station SAF to Tequisquita Slough[1]	No
	Pachecho Creek	From upstream of monitoring station PAC to San Felipe Lake[1]	No

[1] Upstream extent of impairment not defined due to data limitations. Impairment assumed to extend to uppermost reach of the water body.

4.6 Land Use Data

Water Board staff used spatial data to define subbasins and drainage areas, compile land use tables; represent hydrologic networks, and prepare maps. Land use activities within subbasin areas help describe the condition of the watershed and interpret the relative effects of land use activities on FIB levels. Water Board staff used USGS 30-meter Digital Elevation Models to determine subbasin boundaries within the greater Pajaro River watershed as indicated in Figure 4-4. Twenty-two (22) subbasins were delineated to highlight land use activities within drainage areas for the monitoring sites. Staff then used Farmland Mapping and Monitoring Program (FMMP) data from the California Department of Conservation, Division of Land Resource Protection to classify land use. The FMMP land use categories include prime irrigated agricultural, irrigated agricultural of state significance, orchards and vineyards, dry cropland, grazing land, urban developed land, "other" lands (e.g., forested, government-owned, rural residential), and water. Appendix A, Attachment 3 contains the FMMP land use descriptions and Table 4-8 displays land use acres and percent coverage for the 22 subwatersheds.

Grazing is the predominant land use within the Pajaro River watershed with an area around 62%, followed by the "other" land use category (e.g., forested, government-owned, rural residential) at 21% , irrigated agricultural lands (10%), urban 3%, and dry land farming 3%.

Using Water Board Monitoring data (Table 4-5), staff evaluated the potential impact of land use activities upon *E. coli* water quality conditions within the watershed. Staff concluded that a direct relationship does not exist.

For example, subbasins dominated by grazing land use areas with little agricultural use may have either relatively high or relatively low *E. coli* geomean values over the monitoring period. This is evident in a comparison between subbasins BRI_22 (San Benito River @ Willow Creek) with 85% grazing and an *E. coli* geomean of 98 MPN/100ml and PAC_9 (Pacheco Creek @ San Felipe Road) with 75% grazing and 191 MPN/100ml. In addition, subbasin TRE_2 (Tres Pinos Creek) has the largest percent area of grazing lands (91%), however the *E. coli* geomean value is relatively low at 66 MPN/100ml.

In a similar fashion, the percentage of irrigated agricultural activities land does not aide in the prediction of water quality conditions. For example, monitoring stations for subbasins TES_8 (22% agriculture) and SJB_16 (27% agriculture) have relatively high *E. coli* geomean values of 338 and 182 MPN/100 ml, respectively. While subbasins with a greater percentage of irrigated agriculture, FRA_7 (34%) and PAJ_5 (35%) had *E. coli* geomean values of 109 and 94 MPN/100 ml, respectively.

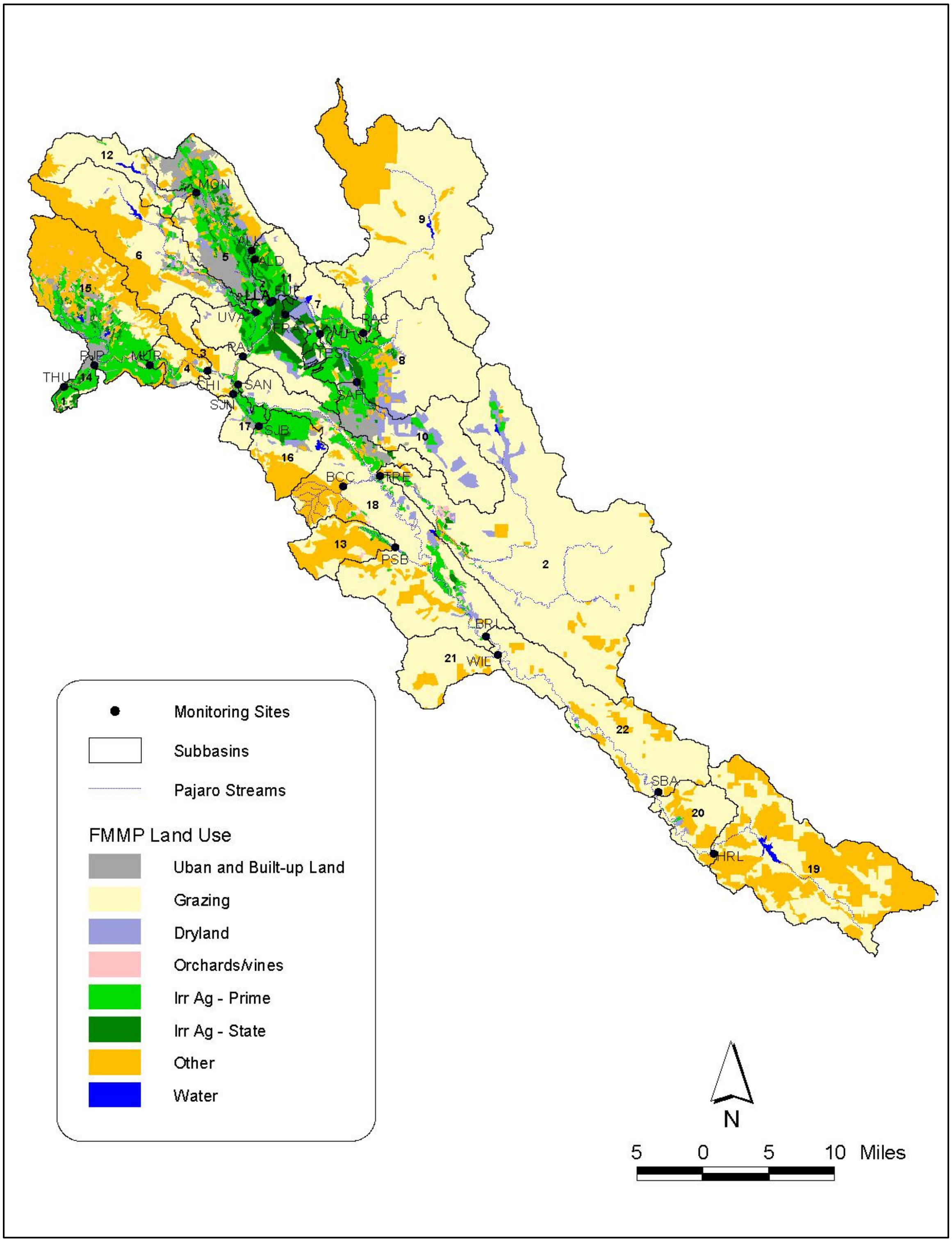

Figure 4-4. Subwatersheds, land use, and monitoring sites.

Table 4-8. Land use and subbasins within the Pajaro River watershed.

Sub-basin		Pajaro River Land Use Description								
		Dry land	Grazing	Irr Ag-Prime	Irr Ag-State	Orch Vine	Other	Urban	Water	Total
HRL_19	mi^2		48.5				63.4		1.0	112.9
	%		42.9				56.2		0.9	
SBA_20	mi^2	0.4	16.8	0.1	0.0	0.0	6.7			24.0
	%	1.6	70.0	0.5	0.1	0.1	27.8			
BRI_22	mi^2	0.3	60.0	0.1			9.7			70.0
	%	0.4	85.6	0.1			13.9			
SAN_18	mi^2	3.5	89.8	9.6	0.7	1.5	22.5	3.1	0.1	130.7
	%	2.6	68.7	7.3	0.5	1.2	17.2	2.4	0.1	
WIL_21	mi^2		23.8				3.8			27.6
	%		86.1				13.9			
PSB_13	mi^2	0.0	6.8	0.8	0.1	0.2	14.0			21.9
	%	0.2	31.0	3.4	0.3	1.1	63.9			
TRE_2	mi^2	5.8	196.7	2.7	0.4	1.2	7.6	0.3	0.2	214.9
	%	2.7	91.5	1.3	0.2	0.5	3.5	0.2	0.1	
SAF_10	mi^2	7.8	31.4	4.5	0.4	0.2	1.3	5.4		50.9
	%	15.3	61.6	8.9	0.8	0.3	2.6	10.5		
TES_8	mi^2	5.4	45.1	12.1	3.8	0.4	3.6	0.4		70.8
	%	7.7	63.7	17.1	5.4	0.5	5.1	0.6		
SJB_16	mi^2	0.8	8.5	6.2	0.5	0.0	7.7	0.8	0.3	24.8
	%	3.2	34.3	25.0	1.8	0.1	31.2	3.1	1.4	
SJN_17	mi^2	0.3	5.8	2.5	0.1		0.2	0.5		9.5
	%	3.1	61.6	26.6	1.3		2.0	5.3		
PAC_9	mi^2	0.5	110.9	2.1	0.1	0.2	32.8	0.1	0.3	146.9
	%	0.3	75.5	1.4	0.1	0.1	22.3	0.1	0.2	
FRA_7	mi^2	1.9	10.8	4.8	2.4	0.1	0.8	0.2	0.2	21.0
	%	8.9	51.2	22.6	11.4	0.5	3.6	1.0	0.8	
FUF_11	mi^2	0.7	7.3	5.6	1.9	0.3	0.4	0.4		16.5
	%	4.2	44.4	33.9	11.5	1.6	2.2	2.3		
MON_12	mi^2	0.1	20.5	0.8	0.1	0.1	3.3	1.3	0.4	26.6
	%	0.2	77.2	3.0	0.3	0.3	12.6	5.0	1.4	
PAJ_5	mi^2	4.8	32.4	23.0	12.2	0.8	8.5	17.4		99.1
	%	4.9	32.7	23.2	12.3	0.8	8.6	17.6		
UVA_6	mi^2	1.1	36.0	2.5	0.1	1.0	29.0	2.6	0.4	72.8
	%	1.6	49.5	3.4	0.2	1.4	39.8	3.6	0.5	
CHI_3	mi^2	0.0	12.6	0.7	0.0	0.0	6.0	0.4		19.7
	%	0.0	64.0	3.4	0.2	0.1	30.4	2.0		
MUR_4	mi^2	0.1	5.1	2.1	0.1	0.2	3.4	0.4	0.3	11.7
	%	1.2	43.3	18.3	0.6	1.9	28.9	3.5	2.4	
PJP_15	mi^2	0.0	6.8	18.5	2.2	4.0	36.9	5.2	0.3	73.8
	%	0.0	9.2	25.1	2.9	5.5	49.9	7.0	0.4	
THU_14	mi^2		0.2	2.2	0.3	0.1	0.3	0.8		4.0
	%		6.2	56.4	8.7	1.5	6.3	21.0		
_1	mi^2		0.5	1.3	0.8	0.1	0.2	0.1		2.9
	%		16.2	44.4	25.9	3.8	7.9	1.8		
Total	mi^2	33.4	776.1	102.0	26.1	10.4	262.0	39.4	3.3	1252.9
	%	2.7	61.9	8.1	2.1	0.8	20.9	3.1	0.3	

4.7 Relationship of Genetic Studies to Land Use in Other Watersheds

Genetic ribotyping is a microbiological source tracking method that differentiates different sources of animal *E. coli*. This tracking method identifies the animals from which *E. coli* originate and estimates relative contribution; however it does not provide the geographic locations or land uses where the animals reside or how the *E. coli* was transported from the animal to the waterbody. Staff considered ribotyping results as an estimate of possible sources and relative source contributions among all of the various sources. Ribotyping represents one of the "lines of evidence" in determining source contribution.

Water Board staff evaluated results of genetic studies conducted in other Central Coast Region watersheds to assist in characterizing sources of FIB in the Pajaro River Watershed. The discussion below includes an analysis of land use influence on FIB concentrations in two watersheds with similar land uses: the Watsonville Slough Watershed and the Morro Bay Watershed.

A study conducted in the Watsonville Slough Watershed (Hager et al, 2005) determined that all land uses were associated with exceedances of water quality objectives. Staff examined the association of dominant land use in subwatersheds of the Watsonville Sough Watershed where water quality objectives were exceeded. Staff concluded that these exceedances occurred regardless of dominant land uses (see Table 4-9 next page).

Staff found a consistent depression of the bird component of FIB with wet conditions. Data suggested that winter runoff introduced additional FIB from non-bird sources, reducing the proportion of bird FIB from 98 to 38 percent in one subwatershed of the Watsonville Slough. While the findings in Table 5 confirmed contributions from terrestrial sources, they did not definitively indicate which land use contributed which terrestrial source. Stated another way, terrestrial sources (dog, cow, human) were not well correlated with a specific land use. This pattern was also found in the Morro Bay watershed (see discussion in following paragraphs).

The data from the Watsonville Sloughs also indicated that urban land uses were commonly associated with concentrations of *E. coli* in excess of water quality objectives. Furthermore, the analysis of genetic sources relative to land uses revealed that urban uses were implicated as sources of controllable FIB from dogs and humans.

Table 4-9. Land uses surrounding sampling locations for genetic source tracking and results of genetic analysis for wet and dry seasons in Watsonville Sloughs, 2003.

Land use (% of subwatershed)		Rabbit		Human		Dog		Bird		Cow	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Struve Slough		Percent of Sample									
Urban	45%	0	0	0	3	2	21	98	38	0	38
Commercial	45%										
Agricultural	10%										
Lower Watsonville Slough											
Agricultural	85%	0	0	0	0	6	28	94	20	0	52
Undeveloped	15%										
Upper Harkins Slough											
Undeveloped	65%	0	0	1	2	47	9	52	18	0	71
Grazing	20%										
Rural Residential	10%										
Agricultural	5%										

Source: Hager, et al., 2004, and SH&G, et al., 2003.

A genetic fingerprinting study was conducted in the Morro Bay Watershed (California Polytechnic State University, 2002). Data collected from Chorro and Los Osos Creeks in the Morro Bay Watershed indicated that bovine (cow) sources contributed the majority (31 percent) of *E. coli* in Chorro Creek, a watershed with 63 percent rangeland. Bovine sources contributed similar levels of *E. coli* during both wet and dry weather sampling, as did all sources, therefore Table 4-10 (next page) does not distinguish between wet and dry sources. In Los Osos Creek, a watershed with a mixture of urban, rangeland, and agriculture, no one source exceeded 20 percent of the total. Table 4-10 describes land uses surrounding sampling locations and results of genetic analyses in Chorro and Los Osos Creeks.

Table 4-10. Land uses surrounding sampling locations for genetic source tracking and results of genetic analysis in Chorro and Los Osos Creeks, 2002.

Land use (Percent of subwatershed)		Avian	Cow	Dog	Human
Chorro Creek					
Urban	5.4%	11	31	6	13
Rangeland	62.8%				
Agricultural	6.1%				
Brushland	17.0%				
Woodland	8.7%				
Los Osos Creek					
Urban	16.9%	20	8	12	19
Rangeland	37.3%				
Agricultural	18.8%				
Brushland	3.3%				
Woodland	16.8%				

The land uses (grazing, urban, irrigated agriculture, and others) addressed in Pajaro River watershed project are similar to those in the Watsonville Slough and Morro Bay Watersheds. While it is not possible to definitively determine which sources are originating from each land use because each watershed has multiple land uses, some of the conclusions from these studies can be transferred to the watersheds addressed in this report.

4.8 Data Analysis Summary

This section provides a summary of information and conclusions presented in Section 4 *Data Analysis*.

- Staff concluded that elevated FIB are observed throughout the Pajaro River watershed.
- Staff used the Listing Policy (Section 3.4) and USEPA recommended water quality criteria (Section 3.5) to determine exceedances of water quality objectives, and scope of waterbody impairments. Water quality data was not available at the frequency necessary for a direct comparison with Basin Plan water quality objectives (e.g. five samples in a 30-day period).
- Staff concluded that eight additional water bodies are impaired (Section 4.5) including; San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek.

- Staff concluded that rain events are attributable to the highest fecal coliform and *E. coli* values.
- A storm drain discharge (sampled during a rain event) contained the highest *E. coli* value observed during Water Board monitoring (Section 4.2).
- E. coli and fecal coliform values are generally greater during the wet season.
- *E. coli* O157:H7 was detected in four water samples obtained from the Pajaro River watershed, three from San Benito River and one from Pajaro River. Two samples collected from the San Benito River near Paicines were indistinguishable from the O157:H7 outbreak strain. The *E. coli* O157:H7 outbreak resulted in three deaths and 205 illnesses related to the consumption of bagged spinach. One water sample from San Benito River (near CCAMP station SBA) and one sample from Pajaro River (midway between CCAMP stations CHI and MUR) were positive for O157:H7, however these two samples did not match the outbreak strain.
- While genetic methods are among the ways to determine relative contribution of sources of bacteria in a waterbody, Water Board staff concluded a genetic study was not warranted to proceed with TMDL development and begin implementation in the Pajaro River Watershed. Instead staff extrapolated conclusions from previous genetic studies to this study (Watsonville Slough Pathogen TMDL 2007, Morro Bay Pathogen TMDL 2003, and.Hager et al. 2004) Those conclusions included the following:
    - Specific sources (e.g. dog, human) are likely to originate from more than one land use.
    - While staff could not easily correlate sources with land use data, staff noted exceedances of water quality objectives associated with all land uses.
    - Natural sources alone can cause exceedances of water quality objectives (see Section 5.1.6 *Natural and Background Sources* for more details) .

5 SOURCE ANALYSIS

Staff based this source analysis on water quality, land use, and genetic data used for other TMDL projects as presented in Section 4.7. Staff also considered the following information:

- field observations,
- wastewater spill reports,
- permitted facilities within the watershed,
- monitoring efforts to isolate specific causes of high FIB loads,
- relationships between seasonal conditions, land use, and FIB levels,
- relationships between land use and FIB concentrations, and
- relationships between land use and genetic sources.

Staff also obtained information from representatives of the San Benito County Environment Health Agency, Santa Cruz, Monterey, San Benito and Santa Clara Farm Bureaus, county Resource Conservation Districts, and from individuals who attended the CEQA Scoping meeting that was held June 20, 2007, in Gilroy, California.

5.1 Source Categories and Source Organisms of Fecal Indicator Bacteria (FIB)

This section contains a discussion of FIB sources and the modes by which various sources may reach surface waters.

5.1.1 Waste Discharges Subject to Regulation by the Central Coast Water Board

In this section staff presents potential FIB sources subject to regulation by the Central Coast Water Board.

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

Urban runoff as a potential contributor to water quality problems is well established. In 1986, USEPA published the "Results of the Nationwide Urban Runoff Program." The study demonstrated high levels of indicator bacteria in urban runoff. The National Stormwater Quality Database contains 8,062 rain events from 104 cities throughout the United States, and again validating the ubiquitous nature of high levels of indicator bacteria measured in urban land use runoff. It is widely acknowledged that urbanization increases the variety and amount of pollutants carried into streams, rivers, and lakes; pollutants which include viruses and bacteria from pet waste, failing septic systems, and other sources including natural wildlife sources (USEAP Fact Sheet, 2003).

Staff concludes that the sources in the following subsections were likely in storm drain discharges (to municipally owned and operated storm sewer systems) to surface water bodies in the Pajaro River watershed. Storm drains can be a conduit for FIB to reach surface waterbodies. During storms, rainwater can come in contact with animal or human waste and carry FIB to surface waters through a storm drain. Genetic ribotyping studies in the Central Coast region (see Section 4.7) indicate that urbanized watersheds contribute pet waste, bird waste, and human waste to fecal coliform loads to waterbodies (i.e., Struve Slough, Los Osos Creek, see Section 4.7)

FIB deposited by pets and wildlife (e.g., birds and rodents) can enter storm drains through contact with stormwater during the wet season or dry weather flows originating from excessive landscape irrigation, car washing, or other types of wash water.

Staff concludes storm drain discharges transfer FIB to surface waterbodies. Water Board staff collected a water sample from a storm drain that discharges into Pajaro River at Main Street (PJPSD) and five samples from a storm drain that discharges into Santa Ana Creek (SAFSD). The Pajaro River storm drain sample was obtained during a rain event and yielded the highest *E. coli* value observed during Water Board monitoring (>2,420 MPN/100ml). Storm water samples from the Santa Ana Creek station also contained high *E. coli* with densities up to 980 MPN/100ml.

Staff concludes these sources are present in storm drain discharge from urban lands in the Pajaro River watershed based on ribotyping studies (Section 4.7). The Implementation Plan (Section 12) recommends methods to minimize these sources.

5.1.1.2 Pet Waste

As previously stated, it has been widely acknowledged by USEPA at the national level, and validated by genetic ribotyping studies in the Central Coast Region, that domestic pet waste contributes to fecal coliform loading in urbanized subwatersheds. Stormwater data at the National, State, Regional, and local levels routinely indicate high levels of fecal coliform concentrations in urban storm drain outfalls. Consequently, staff concluded pet wastes reached waterbodies of the Pajaro River watershed via storm drain discharges during wet seasons. Staff also considered that during dry seasons pet waste reached storm drains if it was deposited on sidewalks, parking lots or other similar surfaces. These wastes could be transported via overland flow to surface waters from stormwater, car wash water, excess irrigation, or similar water sources. Staff observed pet waste in urban areas of the Pajaro River watershed and concluded it was likely that bacteria indicators from this source reached surface water. Census Bureau data for domestic pets, available via the American Veterinary Medical Assoc (AMVA, 2007) for example, indicates that there are approximately 9,373 cats and 6,849 dogs in the City of Gilroy. Cats and dogs produce 5.0 E+9 cfu/day of fecal coliforms (USEPA, 2001). Or an aggregate total of 8.1 E+13 cfu/day. If even less than one per cent of that load was discharged to a small urban stream, it could represent a substantial daily load, or annual load. For instance, if only one half of one percent of all domestic fecal coliforms from pet waste in Gilroy got into the storm drain system, that would be a stream load of around 4 E+11 cfu/day, which would represent a substantial degradation of the assimilative capacity of a stream on the hydrologic scale of Llagas Creek (see Appendix A, Attachment 4 of the amended Project Report). It is therefore presumed, that improperly managed pet waste could potentially degrade the assimilative capacity of an urban water body to a significant degree.

The Implementation Plan (Section 12) recommends methods to minimize this source.

5.1.1.3 Controllable Wildlife Waste

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. Since anthropogenic activities can influence the behavior of wildlife, waste from wildlife under these circumstances can be controlled by modifying the anthropogenic activities that influence the wildlife behavior. For example, human activities such as littering attract wildlife. Wildlife forages through litter and may defecate in the same place that the litter is found, such as a city sidewalk or road shoulder. Landscaping runoff, wash water, or stormwater runoff may cause the feces or FIB from the feces to enter surface waters. Furthermore, in other watersheds, such as the Morro Bay watershed, microbial source tracking data suggests that rodents and other wildlife contribute FIB to surface waters in areas of urban land use (California Polytechnic State University, 2002). Littering and other activities that attract wildlife, in addition to transport mechanisms such as wash water and landscaping runoff, are controllable human activities, and controlling these activities will result in the control of wildlife waste. Staff acknowledges that there is uncertainty regarding the magnitude of the fractional bacteria load contributed by controllable wildlife waste. The Implementation Plan (Section 12) recommends methods to minimize waste from controllable wildlife.

5.1.1.4 Trash Receptacle Leachate

During rain events, rainwater can enter trash receptacles (private residential trash cans and larger commercial dumpsters) and discharge leachate. This can occur when receptacles are uncovered and/or containers leak. Although staff has not seen leachate drainage from trash receptacles in areas that drain to MS4s in this watershed, it is widely acknowledged that maintaining trash receptacles in a sanitary condition prevents leachate from entering storm drain systems and minimizes the potential for the attraction of rodents, birds and wildlife (see for example, *Assessment of Sources of Bacterial Contamination at Santa Cruz Beaches,* County of Santa Cruz Health Services Agency March, 2006). The Santa Cruz County report identifies proper maintenance of trash receptacles as a management practice to reduce bacteria loads. Receptacles may contain animal waste because wildlife and domestic animals leave waste while scavenging through uncovered receptacles. Property owners also discard yard waste from pets or waste from cat boxes into trash receptacles. People also use trash receptacles to discard diapers. FIB contained in these sources may reach storm drains and surface waters in the wet season. During dry seasons, FIB may reach surface waters when trash-holding areas are hosed off or washed. Wash water may reach storm water drains and surface waters.

The Cities of Gilroy, Morgan Hill, Hollister, Watsonville, and Pajaro and the Counties of Santa Clara, San Benito, Santa Cruz, and Monterey are municipalities with residential and commercial land uses. These municipalities provide trash collection services to residences and commercial properties within the Pajaro River watershed. Since these properties produce trash, there is potential for trash containers on these properties to leak, crack, or be knocked over, discharging FIB to sidewalks, parking lots, or other impervious surfaces, ultimately to enter the stormwater system. The Implementation Plan (Section 12) recommends methods to reduce FIB contributions in the creeks from trash receptacle leachate.

5.1.1.5 Human Waste Discharges

Human waste discharges can reach surface waters via storm drains. For example, human discharges can occur when homeless people do not have access to restroom facilities. Staff observed homeless persons and encampments along the Pajaro River and concluded that homeless persons are a source of fecal coliform. Water Board staff observed human waste on the south bank of the Pajaro River at Main Street Bridge monitoring site. Staff also observed a bed mattress, blankets, and sleeping pads suggesting that people spent the night at this location.

Homeless persons and human waste was observed at the Pajaro River at Main Street Bridge monitoring station (monitoring site PJP). While fecal coliform geomean values did not exceed Basin Plan REC-1 objectives at this monitoring site, Water Board staff concluded that it was highly likely that their waste reached surface waters. In addition to human waste, staff suspects that homeless encampments generate wastes from other sources, such as rodent waste, pet waste, and bird waste. Staff concluded that actions to reduce fecal coliform associated with homeless persons in Pajaro River watershed are necessary. Actions are included in the Implementation Plan.

5.1.2 Domestic Animal Discharges in Areas That Do Not Drain to MS4s

Based on visual observation, staff concluded that domestic animals (cattle, horses, goats, sheep, pigs, dogs, cats) likely contributed FIB to surface waters within the Pajaro River watershed. Staff categorized domestic animal discharges into types that are described below.

5.1.2.1 Domestic Animals (Cattle)

FIB sources from open spaces that are grazed, in part, originate from cattle feces entering the water body. Staff observed cattle within the San Benito River and cattle grazing adjacent to San Benito River, Pajaro River, Tequisquita Slough, and most tributary streams (e.g. Pachecho Creek, Tres Pinos Creek, San Juan Creek, and Uvas Creek). *E. coli* values up to 61,000 MPN/100 ml were recorded at monitoring station 305SBA, where staff observed cattle in San Benito River (Figure 5-1). Staff acknowledges the possibility that FIB levels at monitoring site 305SBA may be from natural sources, such as wild pig or other wildlife, however staff noted the presence of cattle in the river during most monitoring events. In addition, the California Food Emergency Response Team (CalFERT) investigation identified *E. coli* O157:H7 in the San Benito River and Pajaro River, with San Benito River water samples that were indistinguishable from the spinach outbreak strain (see Section 1.5 of Appendix A and CalFERT, 2007). *E. coli* O157:H7 associated with the outbreak strain was also found in cattle feces within the San Benito River watershed. The presence of *E. coli* O157:H7 indicates that generic *E. coli* are also present.

Staff concluded that cattle grazing lands are a source contributing to exceedances of water quality objectives. Actions to control these sources are included in Section 12 Implementation Plan.

Staff acknowledges the work done by California Cattleman's Association, the Central Coast Rangeland Coalition, Santa Clara and San Benito County Farm Bureau, Resource Conservation Districts, Natural Resource Conservation Districts, University of California Cooperative Extension, and rangeland managers within the Pajaro River watershed. These entities have provided and attended educational courses, provided research and funding assistance to rangeland managers, and have implemented rangeland management practices to improve water quality.

Figure 5-1. Cattle within San Benito River upstream of monitoring station 305SBA. (Water Board staff photograph, Nov. 6, 2006)

5.1.2.2 Domestic Animals (Farm Animal Operations)

Staff observed many farm animal operations within the Pajaro River watershed. These operations (commonly referred to as "hobby farming" or "hobby ranching") are located in rural residential areas where farm animals and livestock such as horses, cattle, chickens, goats, dogs, cats, and other farm animals are housed. These animals may contribute FIB if manure is not properly managed (e.g., retained on site) or if farm animals have access to waterways. Staff observed farm animals in rural areas that are adjacent to impaired reaches and tributary streams throughout most non-urban portions the Pajaro River watershed. *E. coli* values up to 130,000 MPN/100 ml were recorded at monitoring station 305SJN, where staff observed cattle and horses on rural residential properties next to San Juan Creek.

Staff concluded that farm animals are a source contributing to exceedance of water quality objectives. Actions to control these sources are included in Section 12.

Staff acknowledges the work done by Santa Cruz County Resource Conservation District, Ecology Action, and the Santa Cruz Horsemen's Association within the Santa Cruz county portion of the Pajaro River watershed. This work has provided education and management practices aimed to improve runoff and manure management at farm animal/livestock operations throughout Santa Cruz County. Ecology Action has obtained grant funding to extend this program to Santa Clara and San Benito counties in an effort to improve management practices on properties with farm animals in these portions of the watershed.

Figure 5-2. East Little Llagas Creek in rural residential pastures west of Llagas Avenue. (Fall Creek Engineering, Inc., 2004).

5.1.3 Spills and Leaks from Sanitary Sewer Collection and Treatment Systems

There are several regulated entities within the Pajaro River watershed that collect and treat domestic wastewater. Collection system sewage spills can occur when roots, grease buildup, hair, or other debris block sewer lines. Wastewater can leak from cracks within collection system lines or from faulty connections. Rainfall and groundwater infiltration into lines with these conditions may contribute to sewer system overflow (or spills) during the wet season. Infiltration can result in a greater amount of flow than the line and connected pump stations were designed to handle. The entry of rainwater into the system through illicit openings (inflow) can produce the same result. When sewer lines are blocked or leaking, sewage may run onto the street, into gutters, and into storm drains or surface water. Conversely, sewage seepage potential exists in dry seasons when sewage leaks from underground lines. Domestic wastewater treatment facilities may also discharge to surface waters when equipment (valves, pumps, etc.) fails, during power failures, when containment facilities are breached, or when backup systems fail.

Sanitary sewer collection and treatment systems within the Pajaro River watershed are maintained by the following agencies and regulated by the Water Board via waste discharge requirements (WDRs) and, in some cases, National Pollutant Discharge Elimination System (NPDES) permits:

1. Hollister Domestic Wastewater Treatment Facility (WDR Order 87-47). Collection, treatment, and pond system for the city of Hollister.
2. Sunnyslope County Water District, Ridgemark Estates Subdivision, Wastewater Treatment Plant (WDR Order R3-2004-0065). Collection, treatment, and pond system for Ridgemark Estates Subdivision.
3. Tres Pinos County Water District (WDR Order 99-101). Collection treatment and pond system for the community of Tres Pinos.
4. San Juan Bautista Wastewater Treatment Facility (WDR Order R3-2003-0087, NPDES CA0047902). Collection, treatment, and pond system for the community of San Juan Bautista. Pond water is further treated via ultra violet radiation prior to discharge to a drainage channel. The drainage channel flows approximately 2-miles north before joining San Juan Creek and the Pajaro River.
5. South County Regional Wastewater Authority (SCRWA), Cities of Gilroy and Morgan Hill, (WDR Order R3-2004-0099, NPDES CA0049964). Collection, treatment, and pond system for the cities of Gilroy and Morgan Hill. The SCRWA facility is permitted for future discharge to Pajaro River, however no discharges have occurred to date.
6. City of Watsonville Wastewater Treatment Facility (WDR Order R3-2003-0040, NPDES CA0048216). Collection and treatment system for the City of Watsonville. Treated wastewater is discharged to the Pacific Ocean. The City of Watsonville treatment facility also receives wastewater from three sanitation districts. The Salsipuedes Sanitation District and the Freedom County Sanitation District are located within the Corralitos/Salsipuedes watershed and the Pajaro County Sanitation District is located immediately south of the City of Watsonville and Pajaro River. Collection system waste discharges for the three sanitation districts are regulated by the Water Board (WDR Order R3-2003-0041)

Domestic wastewater in all other areas of the Pajaro River watershed is treated with onsite wastewater disposal systems.

Regulated dischargers are required to report sewage spills to the Central Coast Water Board. Along with other information, the volume of the spill and whether the spill reached surface waters is reported. If a spill occurs, spilled material is typically contained and disinfected as soon as possible.

Staff obtained a history of spill information and municipal waste violations for these facilities from the California Integrated Water Quality System (CIWQS) in April 2007 (Appendix B). Based on the information available at the time of this report, staff concluded that incidental spills may have affected water quality in the Pajaro River watershed. The problem was not chronic, but episodic and infrequent. Where spills occurred, the response was typically immediate, minimizing further degradation to water quality.

Staff concluded that spills and leaks from sanitary sewer collection and treatment may contribute to fecal coliform levels within the Pajaro River watershed; however regulatory mechanisms are in place to address this potential source. Water Board staff concluded it was likely that FIB from this source contributed to the impairment in surface waters of the Pajaro River Creek watershed. The Implementation Plan recommends methods to minimize FIB from this source.

5.1.4 Private Sewer Laterals to Sanitary Sewer Collection and Treatment Systems

Staff determined it was likely private lateral leaks and spills contributed FIB to surface waters within the Pajaro River watershed. Staff researched spill reports contained in the CIWQS database (Appendix B). Based on the information available, staff concluded that incidental spills may have affected water quality in the Pajaro River watershed. The problem was not chronic, but episodic and infrequent. Where spills occurred, the response was typically immediate, minimizing further degradation to water quality.

Staff concluded that FIB from this source contributed to the impairment of surface waters in the Pajaro River Creek watershed. The Implementation Plan recommends methods to minimize this source.

5.1.5 Other Sources Considered

5.1.5.1 <u>Onsite Wastewater Disposal System Discharges</u>

Septic systems, also known as Onsite Sewage Disposal Systems (OSDSs), are potential sources of FIB to surface waters. Typically during dry periods, sewage from failing OSDSs will not reach surface waters unless a failure occurs very close to a creek or a tributary. During the wet season while the ground is saturated with water it is possible for FIB to enter surface water through ditches, roadways, creeks, or via groundwater seepage.

Health Departments of the counties of Santa Clara, San Benito, Santa Cruz, and Monterey regulate the issuance of new permits for septic systems and are responsible for investigating failing systems. However, these municipalities typically do not have the resources to investigate existing systems unless the existing system is suspected of failing or the property owner has made application for new development.

Staff interviewed a professional who installs and repairs septic systems (Brad Miller, Wastewater Solutions, September 2006, personal communication). Staff found that septic system failures are uncommon in the Pajaro River watershed. Mr. Miller estimated drain fields fail in about 1 in 80 cases. Mr. Miller has observed septic water in backyard ponds where systems have failed, but on only a few occasions several years ago.

Staff also interviewed county health department representatives. The San Benito county representative mentioned that there are no known septic tank problems in the county with the exception of the community of Aromas. The community of Aromas is located along the Pajaro River (upstream of monitoring stations MUR and downstream of station CHI) and within the counties of San Benito, Santa Cruz, and Monterey. The San Benito representative mentioned that failures are due to high residential density on small lots and "tight soils". Contrastingly, the Monterey County representative mentioned that septic systems are not a problem in the Monterey county portion of Aromas because sandy soils provide efficient percolation. The variable soil conditions in Aromas are most likely due to the unique geologic formations created within the nearby San Andreas Fault zone.

Staff evaluated water quality data from CCAMP and Water Board monitoring stations CHI and MUR. Staff concluded that geomean fecal coliform and *E. coli* data was not elevated at monitoring station MUR (downstream of Aromas). In fact, fecal coliform and *E. coli* data from monitoring station CHI (upstream of Aromas) was greater of the two. Staff concluded that OSDSs in Aromas did not contribute to water quality impairment.

In addition, Monterey, Santa Clara, and Santa Cruz health department representative were not aware of any potential problem areas within the Pajaro River watershed.

Several other lines of evidence support the aforementioned information. These include depth to groundwater, groundwater quality data, and the estimated amount and geographic density of OSDS in the watershed. See Appendix A, Attachment 4 for more detail pertaining to these analyses.

In general, failing septic systems may be a common source of fecal coliform loading to surface waters where the water table is relatively shallow and has a greater chance of intersecting the septic drain field. Often, this may occur in coastal watersheds and watersheds with shallow groundwater. As a result, septic tanks may contribute excessive loads during moderate to high-flow events as the water table rises and meets the septic drain fields. If the recharge path to nearby surface water bodies is relatively short, baseflow of groundwater may reach the surface water before bacterial die-off.

Staff evaluated groundwater data from the California Department of Water Resources website to investigate the possibility of shallow groundwater in the project area. Records from six randomly selected wells in the Gilroy, Hollister, and San Juan Bautista areas indicate that the depths to groundwater below ground surface range between 35 to 126 feet, with an collective average depth of 89 feet below surface. Broadly, this indicates relatively deep groundwater in the watershed that does not intersect septic drainfields. In addition, USGS flow data and a cursory review of the scientific literature indicate that the major surface water bodies in the Pajaro Watershed are losing streams. Losing streams generally lose water due to percolation into the subsurface, and consequently do not receive any significant baseflow from groundwater. Staff concluded that no credible evidence exists that contaminated baseflow from potentially failing OSDS are impairing surface waters in the watershed. This does not preclude the possibility of OSDS impacts to groundwater, which are however beyond the scope of this project.

In addition, staff evaluated reports on groundwater quality in the Pajaro watershed for the presence of elevated levels of nitrates. Elevated levels of nitrates in groundwater could potentially indicate the presence of failing septic systems. As previously mentioned, the community of Aromas, California is an unsewered community. The 2007 Annual Water Quality Report for the Aromas Water District reported an average level of 2.3 ppm of nitrate in city wells with a range of ND to 8 ppm, well below established maximum contaminant levels and public health goals. These relatively low levels of nitrate concentrations do not support the potential of a significant problem with failing OSDS. The data are also supportive of the information provided by County officials and private contractors; namely that there is no systematic evidence of failing OSDS impairing surface water quality in the Pajaro watershed.

The California Department of Water Resources California Water Plan Update 2005 also contains regional information on nitrate contamination in Central Coast watersheds. The Water Plan Update 2005 did not report any regional problems with nitrate contamination in the Pajaro watershed. However, the report did note that nitrate contamination is a problem in the nearby Elkhorn Slough, a coastal wetland located between the Pajaro and Salinas rivers. Failing OSDS are reportedly a suspected source of nitrate impairment in Elkhorn Slough. Referring back to the previous discussion on groundwater depths, the potential for nitrate contamination from failing OSDS in Elkhorn Slough may potentially be a function of shallow groundwater and contaminated baseflow into Elkhorn Slough. For comparative purposes, staff investigated groundwater depths in areas proximal to Elkhorn Slough from a public access database maintained by Gregg Drilling, Inc. (gregdrilling.com). Seven wells in the Moss Landing area, and one well in Castroville reported depths to groundwater of between 12 and 21 feet below surface. This indicates shallow groundwater in the Elkhorn Slough area and the potential for nitrate contaminated baseflow reaching surface waterbodies. Note that this contrasts with the relatively deep groundwater and no significant baseflow to surface waterbodies in the Pajaro watershed. Collectively, the groundwater depth and nitrate data for groundwater in the Pajaro watershed indicate that OSDS are not a source of fecal coliform loading to surface waterbodies in the watershed.

Finally, staff estimated the amount and density of septic systems in the Pajaro watershed to investigate if there was any positive correlation between the density (number per square mile) of OSDS, and elevated fecal coliform concentrations. The U.S. Census Bureau maintains a database of survey data which reports the type of sewage disposal systems households have (U.S. Census Bureau Decennial Housing Census).. Using the census data staff subdivided the Pajaro watershed into six census regions which roughly corresponded to the subwatershed scale. Consequently, the estimated densities of OSDS throughout the watershed ranged from 0.4 per square mile in the upper San Benito River watershed, to 33.4 per square mile in the lower Pajaro River watershed. The data did not qualitatively suggest a positive correlation between OSDS density and elevated fecal coliform water quality data. In fact, in areas with the highest OSDS densities the geomean concentrations of fecal coliform tended to be lower, whereas in areas of low OSDS densities, fecal coliform concentrations trended towards higher geomean values (see Appendix A Attachment 4)

Collectively, the aforementioned data do not support the potential for failing OSDS to be a source of impairment to surface water bodies, and staff concluded that OSDSs are not a source of fecal coliform surface water impairment in the Pajaro River watershed.

5.1.5.2 Livestock (Dairies)

Staff reviewed existing permits for dairy operations and interviewed other Water Board staff to determine if smaller, unpermitted dairy operations are within the Pajaro River watershed. One permitted dairy (Furtado Dairy) and two non-permitted dairies (Acquistapace Dairy and 3D Dairy) were identified. The Furtado Dairy, located near Alamias Creek (a tributary to Llagas Creek), has a history of discharge violations and criminal penalties have been pursued by the Santa Clara County District Attorney. The most significant discharge occurred on May 12, 2005, where approximately 240,000 gallons of dairy processed wastewater (manure & wastewater) entered Alamias Creek. This wastewater was observed in approximately 4.5 mile reach of creek channel. The Furtado Dairy has since gone out of business and the Water Board approved the rescission of Waste Discharge Requirements, Order No. R3-2006-0016, on December 7, 2007.

Staff performed inspections of Acquistapace Dairy and 3D dairy. Acquistapace Dairy is located adjacent to Arroyo Dos Picachos (a tributary to Tequisquita Slough) and staff observed that the dairy operation was well-maintained and did not discharge or threaten to discharge dairy waste or wastewater to Arroyo Dos Picachos. The 3D Dairy is immediately adjacent to Tequisquita Slough and staff identified a discharge of dairy wastewater to Tequisquita Slough via a drainage ditch. Water Board staff informed 3D dairy operators of the discharge and during the spring and summer of 2007 staff worked with 3D dairy operators to eliminate the discharge. The owners of 3D Dairy installed an appropriately-sized impoundment on their property and diverted dairy wastewater to the impoundment for containment.

During staff inspections of 3D Dairy, staff observed cattle grazing on an adjacent grazing property. Staff also observed an artesian spring in the immediate vicinity of the cattle. The spring flows into Tequisquita Slough and staff concluded that cattle waste may be transported to the slough via overland flow.

Staff concluded that dairy cattle operations within the Pajaro River watershed are no longer sources of fecal coliform. Staff concluded that grazing cattle are a source of fecal coliform in Tequisquita Slough and has included an Implementation Plan to control FIB from Domestic Animals.

5.1.5.3 Irrigated agriculture

Water Board staff considered possible contributions from irrigated agricultural lands because all of the impaired waterbodies are within these fertile productive growing areas. Staff concluded that contributions from irrigated agriculture were insignificant because most agricultural operations use inorganic fertilizers (based on conversations with various agricultural associated organizations and individuals listed at the beginning of Section 5, *Source Analysis*).

To validate the fertilizer usage information provided by the organizations and individuals noted above, staff evaluated 2002 agricultural census data from the U.S. Department of Agriculture, National Agricultural Statistics Service (NASS) database (www.nass.usda.gov). The census data is available at the County-level. Since the overwhelming majority of the Pajaro watershed is within San Benito County, it is assumed that the agricultural census data for San Benito County is broadly representative of irrigated agriculture throughout the watershed.

The NASS census data indicates that there were 326 farms with irrigated cropland in San Benito County and that only 3.4% of those farms applied manure. The overwhelming majority of farms with irrigated cropland used inorganic chemical fertilizers, lime, or soil conditioners. For comparative purposes, staff evaluated NASS census data for manure application rates at the California state level, and also for Nebraska, which is reported to be the second-ranked state in terms of amount of irrigated acreage. In California at the state level, 13.4% of all irrigated farms reported manure applications; whereas in Nebraska 48.4% of irrigated farms reported manure applications. Note that these ratios compare with the aforementioned 3.4% manure application rate in San Benito County.

In addition, the Resource Conservation District of Monterey County reports that raw manure application in the Central Coast region has been largely phased out (Monterey County RCD, 2006). Further, on February 4, 2009 the 2007 National

Agricultural Statistics Service (NASS) Census of Agriculture was published online. To validate the information provided in the 2006 Resource Conservation District Report noted above, staff evaluated the newer 2007 NASS agricultural census data. The 2007 agricultural census reported that San Benito County has 30,372 acres of irrigated cropland. Of these, 372 acres received manure application. This amounts to 1.2% of all cropland in the County receiving manure applications. Although NASS doesn't report the exact nature or type of manure application, it was assumed that most, or at least some fraction of the 372 acres receiving manure application were with treated or composted manure rather than raw manure. Consequently, based on the RCD 2006 reporting and the 2007 NASS census data, staff concluded that raw or untreated manure application was relatively negligible and inconsequential in the Pajaro watershed.

Staff determined the presence of organic agricultural operations within the watershed and these operations frequently use organic compost that is derived from chicken manure. The chicken manure is composted and processed into chicken pellets that are applied to crops as organic fertilizer. The CalFERT investigation audited a chicken pellet manufacturer that supplied organic compost for a farm in Paicines located adjacent to the San Benito River. During the audit of the firm's records, there were no positive pathogen test results observed by CalFERT investigators. Additionally, August 2006 testing of finished products were negative for *E. Coli* O157:H7. (CalFERT, 2007). In contrast, CalFERT investigators collected environmental samples in and around the Paicines farm, including cattle feces, wild pig feces, other animal feces, soil, and water some of which matched the *E. Coli* O157:H7 outbreak strain as determined by pulsed field gel electrophoresis (PFGE) analysis. Consequently, staff concluded that there was no credible evidence that manure application on irrigated cropland are contributing to fecal coliform impairment of surface water in the watershed.

Staff also considered FIB loading from farm workers in irrigated agricultural operations. Staff noted porta-potties located in proximity to field workers throughout the Pajaro River watershed during five field investigations conducted between November 2006 and January 2007. Staff investigated the condition of one porta-potty and found it to be clean and well-maintained (December 28, 2006). Additionally, CalFERT investigators conducted a field inspection and audit of a farm in Paicines, and reported that onsite portable toilets appeared to be properly maintained (CalFERT, 2007). The owner of the farm indicated that toilets were serviced twice a week. Thus staff concluded FIB loading from field workers was insignificant.

Growers in the project area are highly aware of food safety issues; their livelihood depends on providing a crop that is safe for consumers. As such, growers practice methods that minimize the potential of crop contamination (based on conversations with county Farm Bureau representatives).

In summary, based on the negligible amounts of manure application in the watershed, the audit of composted chicken manure, and the operational practices pertaining to field workers, staff concluded that irrigated agricultural operations are not a controllable source contributing to exceedance of water quality objectives.

5.1.6 Natural Sources - Waste Discharges Not Subject to Regulation by the Central Coast Water Board

Staff concluded that natural sources, such as birds and other wildlife, contributed to FIB loading in the Pajaro River watershed. Staff observed an abundance of wildlife within the watershed, particularly within large open space areas that provide vegetation for cattle grazing and in forested areas. Staff observed coyote, bobcat, opossum, skunk, raccoon, rabbit, ground squirrels, deer, wild pig, wild turkey, and several avian species within the grazing and forested portions of the watershed. This conclusion is also based on the fact that grazing lands comprise approximately 62 percent of the Pajaro River watershed and forested lands (a subset of the "other" land use category) comprise up to 21 percent of the watershed area (see Table 4-8 for land use categories and areas).

Microbial source tracking conducted in both Watsonville Slough and Morro Bay watersheds identified birds as a substantial source (Section 4.7). The Morro Bay watershed study also identified sources attributable to other wildlife such as deer fox, rabbit opossum, raccoon and rodents (Cal Poly, 2002).

In addition, an investigation by the California Food Emergency Response Team was conducted to identify the source of an *E. coli* O157:H7 outbreak associated with bagged spinach (CalFERT, 2007). CalFERT investigators used pulsed field gel electrophoresis (PFGE) to identify the *E. coli* O157:H7 pattern and determine if this pattern was consistent with the outbreak strain of *E. coli* O157:H7. PFGE is a method for separating large DNA molecules, which may be used for genotyping or genetic fingerprinting. CalFERT investigators found that the PFGE patterns of some samples were indistinguishable from the *E. coli* O157:H7 outbreak strain found in the bagged spinach. As noted previously, the PFGE pattern was identified in San Benito River water, cattle feces, wild pig feces, and soil on the ranch. Land on the ranch was primarily utilized for cattle grazing with a small amount of land used for crop production. Investigators observed evidence of wild pig in and around the cattle pastures as well as in the row crop areas of the ranch. Investigators established that numerous wild pigs thrived alongside grazing cattle in the riparian habitat of the ranch (see Appendix A, Section 1.6).

In addition, surviving fecal coliforms deposited in sediments and organic material at some time in the past and that are not attributable to a recent pollution event, could be swept up into the water column due to a resuspension event or by gradual erosion of microbial biofilms present in the stream bed. This may constitute a naturalized source of fecal coliform stream loads. The scope and extent of this source, and the potential for regrowth of microbial indicators deposited in sediment or organic matter in the watershed is largely unknown at present. Staff considers the fecal coliforms resulting from regrowth and multiplication from controllable sources to be a naturalized source. Staff does consider these fecal coliforms controllable, insofar as the parent coliforms are controllable sources.

Based on the above information, staff concluded that natural sources contributed to elevated levels of fecal coliform in each of the listed water bodies.

The Central Coast Water Board has authority to regulate waste discharges. The Water Board does not have authority to regulate natural sources of waste discharges, unless the natural waste entering surface waters is caused by human activities.

Therefore, staff distinguished “natural sources” from “controllable” wildlife sources. Controllable sources were those caused or influenced by human activity, including naturalized sources. Staff discussed controllable wildlife sources above Section 5.1.1.3 and included measures to minimize their contribution to FIB loading in the Implementation Plan in Section 12.

5.2 Source Analysis Conclusions

Staff concluded natural sources (bird and other wildlife) contributed FIB to the Pajaro River watershed based on field observations and the aforementioned CalFERT reports (see above Section 5.1.6). Evidence regarding natural sources has lead staff to conclude that the contribution may have been significant. Staff estimated most of the natural sources were not controllable.

Staff estimated the relative order of controllable FIB sources for the Pajaro River watershed, beginning with the largest source first. The relative order is a staff estimate only. Staff noted that there are uncertainties associated with such estimates. For example, staff cannot be certain of the magnitude and location of spills and leaks from sanitary sewer collection and treatment systems or from private laterals.

Staff estimated the relative order of controllable sources as follows: (1) storm drain discharges to municipally owned and operated storm sewer systems required to be covered by an NPDES permit (MS4s); (2) domestic animal discharges that do not discharge to MS4s; (3) spills and leaks from Sanitary Sewer Collection and Treatment Systems; and (4) private sewer laterals connected to municipal sanitary sewer collection systems based on the information in Sections 4 and 5 of this report. As stated previously, staff used water quality data, discharger data and reports, flow estimates, land use data, ribotyping results from studies conducted in the Central Coast region, field reconnaissance work, and conversations with County staff and stakeholders to complete the source analysis conclusions. The rationale for the relative order of FIB sources is described below.

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

Staff estimated storm drain discharges were the largest controllable source of FIB based on water quality monitoring results from stations PJPSD and SAPSD. Storm drain discharges can contain controllable bird, wildlife, and rodent waste; pet waste; dumpster leachate; human waste from private sewer laterals and homeless encampments.

2. Domestic Animal Discharges in Areas That Do Not Drain to MS4s

Staff estimated that domestic animal discharges in areas that do not drain to MS4s are the second largest contributor of fecal coliform. Staff estimated domestic livestock discharges contributed less than storm drain discharges based on water quality monitoring results. Domestic animals include cattle within grazing lands and farm animals such as horses, cattle, chickens, goats, dogs, and cats within rural residential areas of the watershed. Grazing land use area is approximately 776 square miles (62% of the Pajaro River watershed) and rural residential land use is up to 262 square miles (21% of the watershed). It is difficult to provide a better estimate of rural residential areas because this land use is a portion of the “other” land use category which also contains private lands, forested land, and government-owned lands (see Section 4.6 for land use areas and Appendix A, Attachment 3 for land use descriptions).

3. Spills and Leaks from Sanitary Sewer Collection and Treatment Systems

As indicated in Section 5.1.3, staff concluded that spills and leaks from collection systems contributed fecal coliform to surface waters in the watershed. However, it was difficult for staff to distinguish the extent and severity of this source. Although contributions from sanitary sewer collection and treatment systems have been documented in spill and violation reports (see Appendix B), staff concluded leaks from the sanitary system were intermittent and often indirect when compared to other sources, and also the reactions to the spills from the responsible parties were generally timely and reasonable.

4. Private Sewer Laterals

Staff determined private sewer lateral leaks contribute similar levels of fecal coliform as the sanitary sewer collection and treatment systems throughout the watershed. This is documented in the spill reports (see Appendix B) which also include spills from private sewer laterals. However, staff assumed there was less sewer line devoted to laterals than to the sewer main lines, and the volume of wastewater through each lateral was lower than the volume of wastewater flowing through a sewer main line.

FIB levels throughout the Pajaro River watershed were elevated and varied by season, and a variety of land uses drained to each of the listed water bodies. Despite CCAMP and Water Board sampling efforts, the outcomes did not definitively specify relative sources of FIB from each land use, but rather confirmed that FIB was originating from each of the land uses. As such, staff considered numerous activities associated with all land uses as potential sources.

6 CRITICAL CONDITIONS AND SEASONAL VARIATION

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

6.1 Critical Conditions and Uncertainties

The critical conditions occur when environmental factors are such that water quality objectives are not exceeded, but almost, and the frequency of this occurrence is acceptable. This situation is critical because if water quality is degraded slightly, the result will be exceedance of the water quality objective. If a critical condition is present, the implementation plan of the TMDL should be developed to account for the condition.

Staff concluded that critical conditions are not present in the impaired water bodies.

Staff concluded there are several uncertainties with FIB. Stream flows may serve to either increase or dilute FIB concentrations. Stagnant pools may be areas where FIB concentrations increase due to evaporation or wildlife use. Conversely, increased stream flows may dilute FIB concentrations.

Staff determined that another uncertainty was the limited information available to develop relative contributions. In other words, staff concluded that both controllable and non-controllable sources were contributing FIB input into the waterbodies. However, staff was uncertain about the load that each of these sources was contributing.

6.2 Seasonal Variations

Staff analyzed FIB data for the Pajaro River watershed and found that maximum levels of fecal coliform and *E. coli* were generally observed during the wet season. However, geomean values for fecal coliform and *E. coli* varied between seasons and monitoring stations. Therefore, staff did not adjust load allocations and numeric targets to account for critical conditions.

6.3 Conclusion

Although waters within the Pajaro River watershed were impaired, staff concluded there were no critical condition considerations. Therefore, staff did not adjust load allocations and numeric targets to account for critical conditions. The numeric targets provided in Section 7 apply to both wet and dry weather.

7 NUMERIC TARGET

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 TMDLs for Pajaro River Watershed, including, San Benito River, Llagas Creek, Tequisquita Slough, San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek was:

> *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.*

Natural non-controllable sources are a contributor of FIB in the Pajaro River watershed. Some uncertainty exists whether the non-controllable fraction of FIB alone is 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[1] and Scott's Creeks[2] are largely undeveloped coastal streams with lagoons. 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 the Pajaro River Watershed. Staff acknowledges that Pajaro River, San Benito River, Llagas Creek, and Tequisquita Slough are influenced by urban sources of FIB, whereas Waddell

[1] Waddell Creek is located in the Redwood Belt of the Santa Cruz Mountains. The California Big Basin State Park occupies approximately 85% of the Waddell Creek watershed. The lower watershed is comprised of developed open space with a ranger/nature station at the bottom. A limited amount of farming occurs in the lower Waddell Valley.

[2] Scott's Creek is also located in the Santa Cruz Mountains. The watershed is very rural with a small number of humans in residence. Low intensity timber harvesting, row-crop farming, and cattle ranching are practiced in a sustainable fashion.

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.

8 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 TMDL will result in attaining the numeric targets. For these TMDLs, staff determined this link is established because the numeric target concentrations are the same as the TMDLs, expressed as a concentration. Staff identified sources of FIB that caused elevated concentrations of fecal coliform in receiving water bodies. Therefore, staff concluded reductions in FIB loading from these sources should cause a reduction in the measured fecal coliform concentrations. The numeric targets are protective of the recreational beneficial use. Hence, staff concluded the TMDLs define appropriate water quality.

9 TMDLS CALCULATION 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 fecal coliform, it is appropriate for TMDLs to be based on concentration. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measures [40 CFR §130.2(I)]. Concentration based TMDLs make more sense in this situation because the public health risks associated with recreating in contaminated waters scales with organism concentration, and fecal coliform is not readily controlled on a mass basis. Therefore, staff established concentration-based TMDLs for fecal coliform in Pajaro River Watershed, including, San Benito River, Llagas Creek, Tequisquita Slough, San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek.

Staff proposes the TMDLs as the same set of concentrations as staff proposed in the numeric targets section. The TMDLs for the_Pajaro River, San Benito River, Llagas Creek, Tequisquita Slough, San Juan Creek, Carnadero/Uvas Creek, Bird Creek, Pescadero Creek, Tres Pinos Creek, Furlong (Jones) Creek, Santa Ana Creek, and Pachecho Creek are concentration based TMDLs applicable to each day of all seasons and are equal to the following:

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.

9.1 Proposed Wasteload and Load Allocations

Staff determined that the load allocation for all non-natural (controllable) sources will be equal to the TMDLs. These sources shall not discharge or release a load of fecal coliform that will increase the load above the loading capacity of the water body (Table 9-1). All responsible parties for sources of fecal coliform to the Pajaro River watershed will be accountable to attain these allocations. The parties responsible for the allocations to non-natural (controllable) sources are not responsible for the allocation to natural (uncontrollable) sources. Responsible parties that must comply with the Human Fecal Material Discharge Prohibition are assigned a waste load allocation of zero; no fecal coliform bacteria load originating from human sources of fecal material is allowed.

Table 9-1 Allocations

WASTE LOAD ALLOCATIONS		**Receiving Water Fecal Coliform (MPN/100mL)**
Waterbody	**Responsible Party** [NPDES and/or WDR number] **(Source)**	
Pajaro River[1] San Benito River[2] Llagas Creek[3] Tequisquita Slough[4]	Santa Cruz, Santa Clara, and Monterey Counties. Cities of Hollister, Morgan Hill, Gilroy, and Watsonville [NPDES No. CAS000004] (Storm Drain Discharges To MS4s Required to be covered by an NPDES Permit)	Allocation 1
Pajaro River[1] San Benito River[2] Llagas Creek[3] Tequisquita Slough[4]	City of Hollister [WDR 87-47] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) City of Watsonville [WDR Order R3-2003-0040, NPDES No. CA0048216] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) Cities of Gilroy and Morgan Hill via South County Regional Wastewater Authority (SCRWA) [WDR Order R3-2004-0099, NPDES No. CA0049964] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) San Juan Bautista Wastewater Treatment Facility [WDR Order R3-2003-0087, NPDES No. CA0047902] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) Sunnyslope County Water District [WDR Order R3-2004-0065] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) Tres Pinos County Water District [WDR Order 99-101] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks) Pajaro County Sanitation District [WDR Order R3-2003-0041] (Sanitary Sewer Collection and Treatment Systems Spills and Leaks)	Allocation 2
Pajaro River[1] San Benito River[2] Llagas Creek[3] Tequisquita Slough[4]	Owners of Private Sewer Laterals (Private laterals connected to municipal Sanitary Sewer Collection and Treatment Systems)	Allocation 2
LOAD ALLOCATIONS		**Receiving Water Fecal Coliform (MPN/100mL)[1]**
Waterbody	**Responsible Party (Source)**	
Pajaro River[1] San Benito River[2] Llagas Creek[3] Tequisquita Slough[4]	Owners/operators of land used for/containing domestic animals (Domestic Animal Discharges)	Allocation 1

Pajaro River[1] San Benito River[2] Llagas Creek[3] Tequisquita Slough[4]	Natural Sources	Allocation 1
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 200/100mL, nor shall more than ten percent of total samples during any 30-day period exceed 400/100 mL. Allocation 2: Allocation of zero; no loading is allowed from this source.		

[1] The entire reach of the Pajaro River from the Pacific Ocean to San Felipe Lake outflow via the Miller's Canal drain. Including the entire San Juan Creek tributary from the uppermost reach of the waterbody to the confluence with Pajaro River, and Carnadero/Uvas Creek tributary from Hollister Road crossing to the confluence with Pajaro River.

[2] San Benito River from confluence with Pajaro River to three miles above Old Hernandez Road at Arizona Crossing. Including Bird Creek tributary from the uppermost reach of the waterbody to the confluence with San Benito River, the Pescadero Creek tributary from the uppermost reach of the waterbody to the confluence with San Benito River, and Tres Pinos Creek tributary from the uppermost reach of the waterbody to the confluence with San Benito River.

[3] Llagas Creek from_confluence with Pajaro River to Oak Glen Avenue. Including Furlong (Jones) Creek tributary from the uppermost reach of the waterbody to confluence with Llagas Creek.

[4] Tequisquita Slough from confluence with San Felipe Lake to the uppermost reach of the waterbody. Including Santa Ana Creek tributary from the uppermost reach of the waterbody to the confluence with Tequisquita Slough and Pechecho Creek tributary from the uppermost reach of the waterbody to San Felipe Lake.

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

<u>The TMDLs are considered achieved when the allocations assigned to all individual responsible parties are met, or when the numeric targets are consistently met.</u>

Should all control measures be in place, fecal coliform concentrations remain high, and the TMDL not be met, staff may investigate or require investigations (e.g., genetic studies to isolate sources or other appropriate monitoring) to determine if the high level of fecal coliform is due to uncontrollable sources or other controllable sources not previously identified. Responsible parties may demonstrate that controllable sources of fecal coliform are not contributing to exceedance of water quality objectives in receiving waters. If this is the case, staff may consider re-evaluating the 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 may be based on evidence that natural, or background sources alone are the cause of exceedances of a TMDL.

10 MARGIN OF SAFETY

The 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 has been established implicitly through the use of protective numeric targets, which are the water quality objectives for the Pajaro River watershed's beneficial uses.

The fecal coliform TMDLs for the Pajaro River watershed are the Basin Plan water quality objective for fecal coliform for water contact recreation. The Basin 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 water quality objective, if achieved, these allocations will by definition contribute to achieving the water quality objectives in the receiving water. Thus, in these TMDLs there is no uncertainty that controlling the load from controlled sources will positively affect water quality by reducing the FIB contribution.

However, in certain locations there is a possibility that non-controllable natural sources, will themselves occur at levels exceeding water quality objectives. And while it is controllable water quality conditions ("actions or circumstances resulting from man's activities" (Basin Plan, p. III-2)) that must conform to water quality objectives, receiving water quality will contain discharge from both controllable and natural sources.

The ability to differentiate between controllable and natural sources is the chief uncertainty in these TMDLs. Reporting and monitoring will indicate whether the allocations from controllable sources are met, thereby minimizing any uncertainty about the impacts of loads on the water quality.

11 PUBLIC PARTICIPATION

The primary goals of stakeholder involvement in the Pajaro River Watershed are to learn about existing implementation efforts and available information (e.g. water quality data), to communicate TMDL project status to agency staff and individuals, to coordinate additional data collection, to gain support for the potential implementation strategies, and to develop additional monitoring activities.

The primary framework for stakeholder involvement to date has been email and phone correspondence, staff participation in existing group meetings (e.g. a farm water quality short-course), and focused meetings to request specific information (e.g. water quality data) or to answer specific questions (e.g. regarding implementation approaches).

Staff conducted a California Environmental Quality Act (CEQA) stakeholder scoping meeting on June 20, 2007 which presented the Phase 4 Preliminary Project Report. Staff incorporated public comments from the scoping meeting into this report where appropriate. Staff also scoped issues pursuant to the California Environmental Quality Act at this meeting. Staff prepared environmental documents indicating any potential environmental impacts and considered alternative allocations schemes and implementation strategies prior to soliciting formal public comments on these TMDLs and implementation plans.

Staff held an informational project status update meeting with stakeholders in October 2008.

This Final Project Report and other related Basin Plan Amendment Documents were posted for a formal 45-day public review and comment period. Staff incorporated public comments received during this time into the final documents.

12 IMPLEMENTATION PLAN

Implementation actions and monitoring requirements rely on existing and proposed regulatory mechanisms. The Implementation Plan incorporates requirements that currently exist pursuant to an existing regulatory mechanism (e.g. permit or prohibition). The Water Board's Executive Officer is authorized to take the proposed steps to insure implementation of appropriate actions to reduce fecal coliform loading according to the requirements that currently exist. Proposed actions include the adoption of two prohibitions, which are new requirements that must be approved by the Central Coast Water Board, State Water Resources Control Board, and California's Office of Administrative Law. The two prohibitions are: 1) the Domestic Animal Waste Discharge Prohibition, and 2) Human Fecal Material Discharge Prohibition. Staff is recommending a prohibition on these types of waste as the appropriate administrative authority to address these sources of waste discharge consistent with the State Water Resources Control Board's Nonpoint Source Pollution Control policy.

12.1 Implementation Actions

Staff discusses the proposed actions necessary for the Pajaro River watershed surface waters to attain fecal coliform water quality standards in this section. The actions are presented with the sources of fecal coliform to the Pajaro River watershed.

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

The Central Coast Water Board will address fecal indicator bacteria (e.g. fecal coliform and/or other indicators of pathogens; FIB) discharged from the Counties of Santa Cruz, Santa Clara, and Monterey, and the Cities of Hollister, Gilroy, Morgan Hill, and Watsonville municipal separate storm sewer systems (MS4 entities) 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 Plans in their SWMPs.

The Central Coast Water Board will require the Wasteload Allocation Attainment Plans to describe the actions that will be taken by the MS4 entities to attain the wasteload allocations. The expected principal components of the Wasteload Allocation Attainment Plans are outlined below.

1. A detailed description of a strategy that will be used to guide BMP selection, assessment, and implementation, to ensure that BMPs implemented will be effective at abating pollutant sources, reducing pollutant discharges, and achieving TMDL wasteload allocations.
2. Identification of sources of the impairment within the municipality's jurisdiction, including specific information on various source locations and their magnitude within the jurisdiction.
3. Prioritization of sources within the jurisdiction, based on suspected contribution to the impairment, ability to control the source, and other pertinent factors.
4. Identification of BMPs that will address the sources of impairing pollutants and reduce the discharge of impairing pollutants.
5. Prioritization of BMPs, based on suspected effectiveness at abating sources and reducing impairing pollutant discharges, as well as other pertinent factors.
6. Identification of BMPs to be implemented, including an implementation schedule. For each BMP, milestones to be used for tracking implementation should be identified, as well as any measurable goals to be used to assess implementation efforts. Expected BMP implementation for the future implementation years should be included to the extent possible, with the understanding that future BMP implementation plans may change as new information is obtained.
7. An analysis exhibiting the connection between BMP implementation and TMDL wasteload allocation attainment, based on the expected wasteload reductions attributable to the BMPs to be implemented.
8. A detailed description of a monitoring program to be implemented to assess discharge and receiving water quality and BMP effectiveness, including a schedule for implementation of the monitoring program. At a minimum, the water quality monitoring program should be consistent with any monitoring program information included in the TMDL documentation.
9. A reporting program that includes evaluation as to whether current best management practices are progressing toward achieving the wasteload allocations by thirteen years after the TMDLs are approved by OAL.
10. A detailed description of how BMP and plan effectiveness will be assessed. The description should incorporate the assessment methods described in the California Stormwater Quality Association's *Municipal Stormwater Program Effectiveness Assessment Guide*.
11. A detailed description of how the plan will be modified to improve upon BMPs determined to be ineffective during the effectiveness assessment.
12. A detailed description of information to be included in annual reports.

13. A detailed description of how the municipality will collaborate with other agencies, stakeholders, and the public to develop and implement the Wasteload Allocation Attainment Plan.
14. Any other items identified by the TMDL Project Report or Resolution.

The Central Coast Water Board will require the Wasteload Allocation Attainment Plans 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 an MS4 that is enrolled under the General Permit at the time of Wasteload Allocation Attainment Plan submittal, the Wasteload Allocation Attainment Plan must be incorporated into the SWMP when the Wasteload Allocation Attainment Plan is submitted. For an MS4 entity that is not enrolled under the General Permit at the time of the Wasteload Allocation Plan submittal, the Wasteload Allocation Attainment Plan must be incorporated into the SWMPs when the SWMP is 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 municipal storm water discharges.

Recommended Stormwater Pollution Prevention Measures

Staff developed the following general recommendations as measures the MS4 entities can implement to address discharges of runoff that may collect accumulated FIB while traveling to storm drains and creeks.

1. Eliminate over watering and runoff of irrigation water into the street;
2. Wash cars at carwashes or wash them at locations that will not run into the street;
3. Discharge wash water from carpet cleaning, mop buckets, floor mat washing, etc. to the sanitary sewer;
4. Clean up spills with mops or absorbent material rather than washing spills into a gutter or storm drain inlet;
5. Provide education regarding preventing discharges to storm drains;
6. Maintain a street sweeping program;
7. Regularly clean storm drains to remove silt and organic material accumulations, particularly before the first storm of the season.

Additional recommendations that staff developed for specific FIB sources:

Pet Wastes

Staff recommends development of a pet waste ordinance, if one does not already exist. Active, rather than passive, enforcement of the ordinance should also be conducted. For example, known problem areas can be targeted for enforcement. In addition, pet waste, including waste from cats, on a pet owner's property or residence may also be at risk of entering waterbodies (e.g. backyards abutting waterways, or dog defecation directly in waterbody) if not disposed of properly. Therefore, the MS4 entities should undertake additional measures to educate residents and homeowners whose properties abut riparian areas and waterbodies regarding the vulnerability of these areas to pollution from domesticated dog, cat, and other pet waste.

Dumpster Leachate and Controllable Bird, Rodent, and Other Wildlife Waste

Staff proposes the MS4 entities include management practices that specifically address dumpsters/receptacles serving restaurants or other facilities within the MS4 entities' jurisdiction to eliminate discharge leachate. Additionally, the County and City should consider ways to eliminate other controllable sources from rodents, birds, or other wildlife. For example, they should require that dumpsters always be covered and be replaced when leaks occur. Feeding of birds and wildlife should also be discouraged to prevent concentration of bird and wildlife waste.

Private Laterals

The MS4 entities should evaluate the contributions of FIB from private laterals and develop appropriate measures to reduce FIB loading from private laterals.

Public Education

The MS4 entities should identify how they will educate the public, what best management practices they will use to educate the public, and goals for the public education and outreach program. The MS4 entities should specifically target education to landowners regarding management measures to minimize leaks from private laterals, onsite wastewater systems and homeless encampment discharges.

New Development

The MS4 entities should develop and implement low impact development principles and practices for new and redevelopment to minimize and prevent addition of new FIB sources.

The recommendations listed above are meant to serve as examples of the types of BMPs that are expected to be necessary to achieve the wasteload allocations for these TMDLs. The listed items are not comprehensive; staff expects implementation of additional BMPs to be needed.

12.1.2 Domestic Animal Waste Discharges Outside Scope of MS4s

The *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* 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. These include waste discharge requirements (WDR), waivers of WDR, and prohibitions. The Central Coast Water Board will use the Domestic Animal Waste Discharge Prohibition to address sources of fecal material from domestic animals.

Owners and/or operators of lands containing domestic animals in the Pajaro River 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 toward 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).

12.1.3 Sanitary Sewer Collection and Treatment Systems Spills and Leaks

Entities with jurisdiction over sewer collection systems in the Pajaro River Watershed must comply with the Human Fecal Material Discharge Prohibition; compliance with the Human Fecal Material Discharge Prohibition implies compliance with their load allocation for this TMDL.

To comply with the Human Fecal Material Discharge Prohibition, the Hollister Domestic Wastewater Treatment Facility (WDR Order 87-47), Sunnyslope County Water District, Ridgemark Estates Subdivision, Wastewater Treatment Plant (WDR Order R3-2004-0065), Tres Pinos County Water District (WDR Order 99-101), San Juan Bautista Wastewater Treatment Facility (WDR Order R3-2003-0087, NPDES CA0047902), South County Regional Wastewater Authority (SCRWA), Cities of Gilroy and Morgan Hill, (WDR Order R3-2004-0099, NPDES CA0049964), City of Watsonville Wastewater Treatment Facility (WDR Order R3-2003-0040, NPDES CA0048216), and Pajaro County Sanitation District (WDR Order R3-2003-0041) (herein referred to as sanitary collection system jurisdictions) must continue to implement their Collection System Management Plans, as required by their Waste Discharge Requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permits.

In addition, the sanitary collection system jurisdictions identified above and in Table IX-M-1 are required to improve maintenance of their sewage collection systems, 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 Pajaro River Watershed.

To this end, within six months following adoption of this TMDL by the Office of Administrative Law, the Executive Officer will issue a letter pursuant to Section 13267 of the CWC requiring: 1) submittal within one-year, a technical report that describes how and when the jurisdictions of the collection systems 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 the Human Fecal Material Discharge Prohibition, and 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 sanitary collection system jurisdiction is in compliance with the Human Fecal Material Discharge Prohibition.

12.1.4 Private Laterals to the Sanitary Sewer Collection and Treatment Systems

The following sanitary sewer collection and treatment systems have authority to require private lateral upgrades:

1. Hollister Domestic Wastewater Treatment Facility (WDR Order 87-47)
2. Sunnyslope County Water District, Ridgemark Estates Subdivision, Wastewater Treatment Plant (WDR Order R3-2004-0065).
3. Tres Pinos County Water District (WDR Order 99-101)
4. San Juan Bautista Wastewater Treatment Facility (WDR Order R3-2003-0087, NPDES CA0047902)
5. South County Regional Wastewater Authority (SCRWA), Cities of Gilroy and Morgan Hill, (WDR Order R3-2004-0099, NPDES CA0049964)
6. City of Watsonville Wastewater Treatment Facility (WDR Order R3-2003-0040, NPDES CA0048216)
7. Pajaro County Sanitation District (WDR Order R3-2003-0041)

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.

Within three years of approval of these TMDLs by the Office of Administrative Law, the Executive Officer will notify owners and/or operators of private laterals to sanitary sewer collection systems (owners/operators of private laterals) of the requirement to comply with the Human Fecal Material Discharge Prohibition. In his notification, the Executive Officer will also describe the owner's/operator's of private laterals options for demonstrating compliance with the Human Fecal Material Discharge Prohibition; pursuant to California Water Code section 13267 and within six months of the notification by the Executive officer, owners/operators of private laterals 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 private lateral is and will continue to be in compliance with the Human Fecal Material Discharge Prohibition; clear evidence could be certification by a sanitary collection system jurisdiction that owner/operator of private lateral is in compliance with the Human Fecal Material Discharge Prohibition, or
2) A schedule for compliance with the Human Fecal Material Discharge Prohibition. The compliance schedule must include a monitoring and reporting program and milestone dates demonstrating progress towards compliance with the Human Fecal Material Discharge Prohibition, with the ultimate milestone being compliance with the Human Fecal Material Discharge Prohibition no later than three years from the date of the Executive Officer's notification to the owner/operator requiring compliance,

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)), or
4) Clear evidence of current or scheduled compliance with the Human Fecal Material Discharge Prohibition (as described in number-1 and number-2 above, respectively) through the submittal of the required information by a sanitary collection system jurisdiction, acting as the voluntary agents of owners/operators of private laterals. Note that an owner/operator of a private lateral cannot demonstrate compliance with the Human Fecal Material Discharge Prohibition through this option if: 1) a sanitary collection system jurisdiction is not their voluntary agent, or 2) if the owner/operator of the private lateral does not choose the sanitary collection system jurisdiction as their agent, or, 3) the Executive Officer or Water Board does not approve the evidence submitted by the sanitary collection system jurisdictions on behalf of the owners/operators of private laterals.

12.2 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.

The Central Coast Water Board may conclude that ongoing implementation efforts are insufficient to ultimately achieve the allocations and numeric target. If the Central Coast Water Board makes this determination, responsible parties must improve and increase their reporting, monitoring, and/or implementation efforts, as necessary, for their allocations and the numeric target to be achieved. The Central Coast Water Board may conclude, at the time of review, that implementation efforts are expected to result in achieving the allocations and numeric target. In that case, responsible parties must continue to implement existing and anticipated reporting, monitoring, and implementation efforts.

Responsible parties will continue monitoring 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 pathogen indicator organisms.

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

12.3 Timeline and Milestones

The compliance schedule for achieving the allocations and numeric target required under these TMDLs is 13 years after the date of approval by the California Office of Administrative Law). This estimation is in part based on the amount of time necessary to identify responsible parties under the Domesticated Animal Waste Discharge Prohibition and Human Waste Discharge 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.

12.4 Economic Considerations

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; 3) TMDL inspections/monitoring; and 4) reporting costs.

Anticipating costs with any accuracy is challenging for staff 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 Stormwater) or are actions anticipated regardless of TMDL adoption. Therefore assigning all of these costs to TMDL implementation would be inaccurate.

12.4.1 Cost Estimate Storm Drain Discharges

The State Water Resources Control Board adopted an NPDES General Permit for stormwater discharge. The General Permit requires the MS4 Entities identified in Section 12.1.1 above to develop and implement a Stormwater Management Plan (SWMP). As of the date of writing this report, the counties of Santa Cruz and Santa Clara, as well as the cities of Gilroy and Morgan Hill are not yet enrolled in the General Permit and thus, do not yet have an approved SWMP. Monterey County and the cities of Morgan Hill and Hollister currently have permit coverage and approved SWMPs.

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

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

The University of Southern 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 to $46. 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 to $130 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 Pajaro River watershed, staff calculated an average annual cost from the range of costs for recently approved Phase II SWMPs in Region 3 ($21 in Seaside to $130 in the City of Monterey). Staff calculated an average annual cost of $77 per household. Staff used this cost per household to estimate the cost per year of SWMP implementation in the Pajaro River watershed, based on the populations of Gilroy, Morgan Hill, Hollister, Watsonville, and Pajaro.

<u>Pajaro River watershed</u> (http://www.city-data.com/, accessed Feb 14, 2008) :

Gilroy - 12,167 (households)
Morgan Hill – 11,110 (households)
Hollister – 9,954 (households)
Watsonville – 11,771 (households)
Pajaro – 749 (households)

45,751 (households) x $77 (cost per household per year) = $3,522,827 (total cost per year)

The MS4 Entities are required to develop and implement SWMPs for this watershed independently of the Basin Plan amendment. Since this is an existing requirement under Phase II of the stormwater program, no additional cost is estimated for implementing the existing SWMP. Some additional implementation measures or management programs may be needed for FIB 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:

<u>Pajaro River watershed</u>: $3,522,827 (total cost per year) x 1.02 (percent minimum increase) = $3,593,283 (total cost per year with 2 percent increase)

$3,522,827 (total cost per year) x 1.15 (percent maximum increase) = $4,051,251 (total cost per year with 15 percent increase)

Inspections/Monitoring: Central Coast Water Board staff is proposing that MS4 Entities monitor storm drains. The purpose of the monitoring is to determine the effectiveness of management measures.

Central Coast Water Board staff estimated monitoring will cost the County approximately $5,600 per year. According to John Ricker of County of Santa Cruz Environmental Health Services, the cost of sampling is $40 for sample collection and field analysis plus $20 for each bacterial per 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 6 sample sites will be analyzed per year. Therefore, staff estimated the total water sampling cost per year at approximately $3,600 ($60/sample x 10 samples x 6 sites). Water Board staff also assumed County staff resources will cost $200 per sampling day. Therefore total sampling costs per year including staff resources would cost approximately $5,600 ($3,600 + ($200/sampling day x 10 sampling days/year)). Based on this information, staff estimates the cost of $5,600 for the five MS4 Entities will total $28,000.

Reporting: The MS4 Entities are required to report independent of the TMDL under Phase II of the municipal stormwater program. Therefore, no costs have been estimated for reporting.

12.4.2 Cost Estimate Private Sewer Lateral Upgrade

Implementation: According to Santa Cruz County, Health Services Agency (March 2006), the cost to repair a leaking private lateral is estimated to be $5,000.

Inspections/Monitoring: According to Santa Cruz County, Health Services Agency (March 2006), the cost to test for leaking private laterals is approximately $1,000.

Reporting: All responsible parties will 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.

12.4.3 Cost Estimate for Sanitary Sewer Collection and Treatment Systems Spills and Leaks

Implementation: All sanitary sewer activities specified in the Basin Plan amendment are currently required under the existing Central Coast Water Board permits and requirements. No new costs are anticipated as a result of these TMDLs.

Inspections/Monitoring: These costs are currently required by Central Coast Water Board permits.

Reporting: These costs are currently required by Central Coast Water Board permits.

12.4.4 Cost Estimate Domestic Animal Discharges

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

Implementation: Staff concluded there are a variety of methods owners of domestic animals 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 USEPA, 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 boarded 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 (at 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 stormwater 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 Aptos Creek watershed was approximately $4000. (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 for frequent periodic property inspections to assess and prevent 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 Central Coast Water Board. This report is required every three years.

Example Annual Costs: On-site management practices in rangelands domestic farm animal operations, tabulated below:

Practices	Cost	Practices	Cost
	(Maximum, unless otherwise noted)		**(Maximum, unless otherwise noted)**
Access Road (repair)	$5/ft.	Pond (repair)	$10,000 ea.
Attend Training Sessions	Usually <$40 (transportation/registration fess)**	Range Seeding:	
Brush Mgt.	$10/ac.	Native species	$250/ac.
Channel Vegetation	$600/ac.	Introduced species	$100/ac.
Clearing and Snagging	$10/ft.	Riparian Buffer Strip	$600/ac.
Conservation Tillage	$20/ac.	Roads*	
Cover/Green Manure Crop:		Culverts and Water Bars	$150/mile
Native species	$250/ac.	Road Repairs	$1,500/mile
Introduced species	$100/ac.	Spring Development	$1,000/ea.
Critical Area Planting	$1,000/ac.	Streambank Protection:	
Fence (upland)	$2/ft.	mechanical	$100/ft.
Fence (riparian)	$2/ft.	Vegetative	$12.50/ft.
Fence, Electric (upland)	$1.25/ft.	Tank	$2,500 ea.
Fence, Electric (riparian)	$1.25/ft.	Tree Planting w/ irrigation	$600/ac.
Grade Stabilizer	$20,000 ea.	Tree Planting w/o irrigation	$300/ac.
Grassed Waterways	$20/ft.	Trough (w/ concrete pad)	$1,000 ea.
Grazing Management:		Trough (w/o concrete pad)	$800/ea.
Hardened Stream Crossings	$2,000 to $6,000**	Trough (small wildlife)	$500/ea.
Prescribed Grazing	$6.95/ac. (median)**	Upland Wildlife Habitat Mgt.	$400/ac.
Provide Shade away from riparian area	$500/accommodate 5-6 cows**(moveable shading structures)	Vegetative Buffer Strip:	
Remote waterers in pastures	$4,500 to $8,200 to install (could be <$1,000 if water piped from existing well)**	Native Species	$200/ac.
Rotational Grazing	$30 to $70/acre	Introduced Species.	$75/ac.
Streamside livestock exclusion	(see fence est.) Funding may be available through local conservation office**	Wildlife Watering Facility	$4,000/ea.
Pipeline	$1.25/ft.		

Source: NRCS Templeton Service Center Environmental Quality Improvement Program Practices Information (as reported in Watsonville Slough Pathogen TMDL Project Report, 2005)
* Estimate provided by Cal Poly for Chumash Creek Watershed road improvements.
** U.S. Dept. of Agriculture and South Dakota State Univ., 2008. Reicks et al., "Better Management Practices for Improved Profitability and Water Quality" : SDSU publication FS994

13 MONITORING PLAN

13.1 Introduction

The Monitoring Plan outlines the monitoring sites, frequency of monitoring, and parties responsible for monitoring. This Monitoring Plan recommends sites and frequency, etc. and requires parties to propose monitoring acceptable to the Executive Officer of the Central Coast Water Board based on the recommendations. The monitoring for TMDL compliance and evaluation is the minimum staff concluded is necessary. If a change in these requirements is warranted after the TMDL is approved, the Executive Officer and/or the Central Water Board will require such changes.

13.2 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, if appropriate, to the monitoring plan outlined below.

Water Board staff recommends monthly fecal coliform monitoring in receiving waters at the following locations:

1. Pajaro River (305THU, 305PJP, 305MUR, 305CHI, 305PAJ, 305FRA, 305UVA)
2. San Benito River (305SAN, 305SJN, 305SJB, 305TRE, 305BRI, 305SBA, 305BCC, 305PSB)
3. Llagas Creek (305LLA, 305MON, 305FUF)
4. Tequisquita Slough (305TES, 305SAF, 305PAC)

In addition to the receiving water locations, staff also proposes fecal coliform monitoring in storm water runoff from Pajaro (Monterey County), and the cities of Hollister, Morgan Hill, Gilroy, and Watsonville at the following locations:

1. Storm drain at Pajaro River and Main Street in Pajaro (PJPSD)
2. Storm drain at Santa Ana Creek at Fallon Road in the city of Hollister (305SAFSD)
3. Storm drains from the cities of Morgan Hill, Gilroy, Hollister, Watsonville, and Pajaro (MS4 Entities). Staff will coordinate with MS4 Entities to determine the appropriate number and locations of sampling sites to characterize the severity and extent of fecal coliform concentrations in urban runoff.

Samples should be taken during three storm events and during two dry season flows (when present).

13.3 Reporting

The parties responsible for implementation and monitoring will incorporate the results of monitoring efforts in reports filed pursuant to their NPDES permit, 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 the TMDL implementation progress, the Executive Officer of 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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APPENDIX A
ATTACHMENT 1

CCAMP DATA

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305BRI	01/24/05	230	160										
305BRI	02/22/05	300	540										
305BRI	03/23/05	90000	2000										
305BRI	04/19/05	500	170										
305BRI	5/17/05	300	310										
305BRI	6/14/05	170	180										
305BRI	7/19/05	300	190										
305BRI	8/17/05	500	270										
305BRI	9/13/05	300	98										
305BRI	10/12/05	800	210										
305BRI	11/9/05	1100	190										
305BRI	12/6/05	800	440										
305BRI	1/10/06	300	280										
305BRI	2/21/06	240	32										
305BRI	3/14/06	800	990										
305BRI				05_06_D	6	800	300	350	6	310	200	197	
305BRI				05_06_W	9	90000	500	814	9	2000	280	303	
305BRI				05_06	15	90000	300	581	15	2000	210	255	
305BRI				ALL_D	6	310	200	350	6	310	200	197	
305BRI				ALL_W	9	90000	500	814	9	2000	280	303	
305BRI				ALL	15	90000	300	581	15	2000	210	255	7
305CAN	1/25/05	300	190										
305CAN	2/23/05	170	170										
305CAN	3/24/05	1700	1300										
305CAN	4/20/05	300	170										
305CAN	5/18/05	500	41										
305CAN	5/19/05	230	52										
305CAN	6/15/05	2200	100										
305CAN	7/20/05	240	400										
305CAN	8/18/05	800	310										
305CAN	9/15/05	230	31										
305CAN	10/13/05	2400	240										
305CAN	11/10/05	240	24										
305CAN	12/7/05	110	63										
305CAN	1/11/06	240	120										
305CAN	2/23/06	50	38										
305CAN	3/15/06	900	880										
305CAN				05_06_D	7	2400	500	596	7	400	100	110	
305CAN				05_06_W	9	1700	240	269	9	1300	170	152	
305CAN				05_06	16	2400	270	381	16	1300	145	132	
305CAN				ALL_D	7	2400	500	596	7	400	100	110	
305CAN				ALL_W	9	1700	240	269	9	1300	170	152	
305CAN				ALL	16	2400	270	381	16	1300	145	132	5
305CHE	2/10/98	900											
305CHE	3/5/98	130											
305CHE	6/12/98	300											
305CHE	7/20/98	1700											
305CHE	8/11/98	2400											
305CHE	9/10/98	50											
305CHE	10/15/98	14											
305CHE	11/4/98	23											
305CHE	12/2/98	110											
305CHE	1/7/99	30											
305CHE				97_98_D	5	2400	300	244					
305CHE				97_98_W	5	900	110	98					
305CHE				97_98	10	2400	120	154					
305CHE				ALL_D	5	2400	300	244					
305CHE				ALL_W	5	900	110	98					
305CHE				ALL	10	2400	120	154					
305CHI	12/18/97	500											
305CHI	1/19/98	3000											
305CHI	2/10/98	1600											
305CHI	2/19/98	3000											
305CHI	3/5/98	110											

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305CHI	3/12/98	500											
305CHI	5/27/98	900											
305CHI	6/12/98	280											
305CHI	6/30/98	80											
305CHI	7/20/98	240											
305CHI	7/31/98	170											
305CHI	8/11/98	140											
305CHI	9/3/98	300											
305CHI	9/10/98	80											
305CHI	9/30/98	240											
305CHI	10/15/98	170											
305CHI	10/21/98	170											
305CHI	11/4/98	170											
305CHI	11/10/98	300											
305CHI	12/2/98	500											
305CHI	12/16/98	170											
305CHI	1/7/99	130											
305CHI	1/24/05	50	41										
305CHI	2/22/05	500	340										
305CHI	3/23/05	90000	13000										
305CHI	4/19/05	50	110										
305CHI	5/17/05	50	10										
305CHI	6/14/05	130	86										
305CHI	7/19/05	30	20										
305CHI	8/17/05	80	10										
305CHI	9/13/05	240	31										
305CHI	10/12/05	80	41										
305CHI	11/9/05	110	41										
305CHI	12/6/05	50	120										
305CHI	1/10/06	700	190										
305CHI	2/21/06	500	52										
305CHI	3/14/06	3000	4400										
305CHI				97_98_D	11	900	170	199					
305CHI				97_98_W	11	3000	500	466					
305CHI				97_98	22	3000	240	304					
305CHI				05_06_D	6	240	80	82	6	86	26	25	
305CHI				05_06_W	9	90000	500	442	9	13000	120	253	
305CHI				05_06	15	90000	110	225	15	13000	52	100	
305CHI				ALL_D	17	900	170	155	6	86	26	25	
305CHI				ALL_W	20	90000	500	455	9	13000	120	253	
305CHI				ALL	37	90000	170	269	15	13000	52	100	3
305COR	12/18/97	5000											
305COR	1/19/98	900											
305COR	2/19/98	3000											
305COR	3/12/98	80											
305COR	5/27/98	80											
305COR	6/30/98	70											
305COR	7/31/98	300											
305COR	9/3/98	240											
305COR	9/30/98	2400											
305COR	10/21/98	110											
305COR	11/10/98	70											
305COR	12/16/98	70											
305COR	1/24/05	2400	10										
305COR	2/22/05	300	380										
305COR	3/23/05	2400	730										
305COR	4/19/05	30	41										
305COR	5/17/05	80	31										
305COR	6/14/05	220	120										
305COR	7/19/05	240	480										
305COR	8/17/05	300	360										
305COR	9/13/05	500	360										
305COR	10/12/05	110	230										
305COR	11/9/05	300	320										

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305COR	12/6/05	500	210										
305COR	1/10/06	2300	130										
305COR	2/21/06	80	35										
305COR	3/14/06	3000	1600										
305COR				97_98_D	6	2400	175	218					
305COR				97_98_W	6	5000	490	417					
305COR				97_98	12	5000	175	301					
305COR				05_06_D	6	500	230	203	6	480	295	194	
305COR				05_06_W	9	3000	500	546	9	1600	210	156	
305COR				05_06	15	3000	300	367	15	1600	230	170	
305COR				ALL_D	12	2400	230	210	6	480	295	194	
305COR				ALL_W	15	5000	500	490	9	1600	210	156	
305COR				ALL	27	5000	300	336	15	1600	230	170	7
305COR2	1/24/05	30	41										
305COR2	2/22/05	80	41										
305COR2	3/23/05	240	140										
305COR2	4/21/05	30	31										
305COR2	5/19/05	30000	13000										
305COR2	6/16/05	500	170										
305COR2	7/21/05	130	63										
305COR2	12/8/05	80	110										
305COR2	1/12/06	50	41										
305COR2	2/23/06	130	90										
305COR2	3/16/06	300	54										
305COR2				05_06_D	3	30000	500	1249	3	13000	170	518	
305COR2				05_06_W	8	300	80	85	8	140	48	60	
305COR2				05_06	11	30000	130	177	11	13000	63	108	
305COR2				ALL_D	3	30000	500	1249	3	13000	170	518	
305COR2				ALL_W	8	300	48	85	8	140	48	60	
305COR2				ALL	11	30000	130	177	11	13000	63	108	1
305FRA	2/10/98	1110											
305FRA	3/5/98	800											
305FRA	6/12/98	500											
305FRA	7/20/98	900											
305FRA	8/11/98	1100											
305FRA	9/10/98	900											
305FRA	10/15/98	900											
305FRA	11/4/98	500											
305FRA	12/2/98	500											
305FRA	1/7/99	170											
305FRA	1/25/05	30	52										
305FRA	2/23/05	50	86										
305FRA	3/24/05	24000	3000										
305FRA	4/20/05	50	35										
305FRA	5/18/05	300	250										
305FRA	6/15/05	800	280										
305FRA	7/20/05	1300	970										
305FRA	8/18/05	500	300										
305FRA	9/15/05	300	260										
305FRA	10/13/05	300	63										
305FRA	11/10/05	300	74										
305FRA	12/7/05	130	74										
305FRA	1/11/06	800	220										
305FRA	2/22/06	50	10										
305FRA	3/15/06	800	570										
305FRA				97_98_D	5	1100	900	833					
305FRA				97_98_W	5	1110	500	519					
305FRA				97_98	10	1110	850	658					
305FRA				05_06_D	6	1300	400	491	6	970	270	263	
305FRA				05_06_W	9	24000	130	236	9	3000	74	114	
305FRA				05_06	15	24000	300	316	15	3000	220	159	
305FRA				ALL_D	11	1300	800	624	6	970	270	263	
305FRA				ALL_W	14	24000	400	313	9	3000	74	114	
305FRA				ALL	25	24000	500	424	15	3000	220	159	7

APPENDIX A, ATTACHMENT 1 CCAMP DATA

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305FUF	1/25/05	80	-50										
305FUF	2/23/05	40	100										
305FUF	3/24/05	5000	9800										
305FUF	4/20/05	300	120										
305FUF	5/18/05	230	52										
305FUF	6/15/05	11000	9800										
305FUF	7/20/05	240	230										
305FUF	8/18/05	3000	400										
305FUF	9/15/05	30000	12000										
305FUF	10/13/05	90000	69000										
305FUF	11/10/05	900	510										
305FUF	12/7/05	80	160										
305FUF	1/11/06	220	85										
305FUF	2/22/06	80	35										
305FUF	3/15/06	2300	2400										
305FUF				05_06_D	6	90000	7000	4124	6	69000	5100	1840	
305FUF				05_06_W	9	5000	220	289	8	9800	140	302	
305FUF				05_06	15	90000	300	837	14	69000	315	655	
305FUF				ALL_D	6	90000	7000	4124	6	69000	5100	1840	
305FUF				ALL_W	9	5000	220	289	8	9800	140	302	
305FUF				ALL	15	90000	300	837	14	69000	315	655	7
305HAR	1/24/05	110	10										
305HAR	2/22/05	130	180										
305HAR	3/23/05	11000	6900										
305HAR	4/21/05	30	52										
305HAR	5/19/05	2300	680										
305HAR	6/16/05	3000	550										
305HAR	7/21/05	300	1200										
305HAR	8/18/05	2400	3100										
305HAR	10/13/05	8000	8300										
305HAR	11/9/05	5000	6400										
305HAR	12/8/05	5000	5400										
305HAR	1/12/06	500	310										
305HAR	2/23/06	1300	130										
305HAR	3/16/06	1300	1800										
305HAR				05_06_D	5	8000	2400	2089	5	8300	1200	1631	
305HAR				05_06_W	9	11000	1300	774	9	6900	310	490	
305HAR				05_06	14	11000	1800	1103	14	8300	940	753	
305HAR				ALL_D	5	8000	2400	2089	5	8300	1200	1631	
305HAR				ALL_W	9	11000	1300	774	9	6900	310	490	
305HAR				ALL	14	11000	1800	1103	14	8300	940	753	10
305HOL	2/10/98	300											
305HOL	3/5/98	900											
305HOL	6/12/98	110											
305HOL	7/20/98	16000											
305HOL	10/15/98	300											
305HOL	11/4/98	170											
305HOL	12/2/98	500											
305HOL	1/7/99	50											
305HOL	2/23/05	220	220										
305HOL	3/24/05	2400	1800										
305HOL	4/20/05	50	160										
305HOL	5/18/05	70	60										
305HOL	1/11/06	800	140										
305HOL	2/22/06	13	12										
305HOL	3/15/06	800	930										
305HOL				97_98_D	3	16000	300	808					
305HOL				97_98_W	5	900	300	258					
305HOL				97_98	8	16000	300	396					
305HOL				05_06_D	1	70	70	70	1	60	60	60	
305HOL				05_06_W	6	2400	510	246	6	1800	190	215	
305HOL				05_06	7	2400	220	205	7	1800	160	179	
305HOL				ALL_D	4	16000	205	438	1	60	60	60	
305HOL				ALL_W	11	2400	300	251	6	1800	190	215	
305HOL				ALL	15	16000	300	291	7	1800	160	179	2

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305LLA	12/18/97	130											
305LLA	1/19/98	3000											
305LLA	2/10/98	240											
305LLA	2/19/98	500											
305LLA	3/5/98	50											
305LLA	3/12/98	80											
305LLA	5/27/98	900											
305LLA	6/12/98	1600											
305LLA	6/30/98	170											
305LLA	7/20/98	5000											
305LLA	7/31/98	900											
305LLA	8/11/98	400											
305LLA	9/3/98	900											
305LLA	9/10/98	300											
305LLA	9/30/98	1600											
305LLA	10/15/98	900											
305LLA	10/21/98	900											
305LLA	11/4/98	130											
305LLA	11/10/98	110											
305LLA	12/2/98	500											
305LLA	12/16/98	130											
305LLA	1/7/99	170											
305LLA	1/25/05	80	110										
305LLA	2/23/05	300	280										
305LLA	3/24/05	2400	630										
305LLA	4/20/05	130	30										
305LLA	5/18/05	300	67										
305LLA	6/15/05	3000	170										
305LLA	7/20/05	300	280										
305LLA	8/18/05	500	270										
305LLA	9/15/05	230	290										
305LLA	10/13/05	2200	410										
305LLA	11/10/05	300	22										
305LLA	12/7/05	170	220										
305LLA	1/11/06	140	140										
305LLA	2/22/06	130	93										
305LLA	3/15/06	1100	930										
305LLA													
305LLA				97_98_D	11	5000	900	844					
305LLA				97_98_W	11	3000	130	207					
305LLA				97_98	22	5000	450	418					
305LLA				05_06_D	6	3000	400	639	6	410	275	216	
305LLA				05_06_W	9	2400	170	270	9	930	140	148	
305LLA				05_06	15	3000	300	381	15	930	220	172	
305LLA				ALL_D	17	5000	900	765	6	410	275	216	
305LLA				ALL_W	20	3000	155	233	9	930	140	148	
305LLA				ALL	37	5000	300	403	15	930	220	172	7
305LUC	2/10/98	300											
305LUC	3/5/98	170											
305LUC	6/12/98	130											
305LUC	7/20/98	1600											
305LUC	8/11/98	500											
305LUC	9/10/98	3000											
305LUC	10/15/98	300											
305LUC	11/4/98	300											
305LUC	12/2/98	2400											
305LUC	1/7/99	1400											
305LUC				97_98_D	5	3000	500	623					
305LUC				97_98_W	5	2400	300	552					
305LUC				97_98	10	3000	400	586					
305LUC				ALL_D	5	3000	500	623					
305LUC				ALL_W	5	2400	300	552					
305LUC				ALL	10	3000	400	586					
305MON	2/10/98	300											
305MON	3/5/98	300											

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305MON	6/12/98	80											
305MON	7/20/98	240											
305MON	8/11/98	110											
305MON	9/10/98	300											
305MON	10/15/98	80											
305MON	11/4/98	40											
305MON	12/2/98	300											
305MON	1/7/99	17											
305MON				97_98_D	5	300	110	138					
305MON				97_98_W	5	300	300	113					
305MON				97_98	10	300	175	125					
305MON				ALL_D	5	300	110	138					
305MON				ALL_W	5	300	300	113					
305MON				ALL	10	300	175	125					
305MUR	2/10/98	16000											
305MUR	3/5/98	50											
305MUR	6/12/98	300											
305MUR	7/20/98	300											
305MUR	8/11/98	170											
305MUR	9/10/98	80											
305MUR	10/15/98	300											
305MUR	11/4/98	300											
305MUR	12/2/98	900											
305MUR	1/7/99	30											
305MUR	1/24/05	50	10										
305MUR	2/22/05	500	500										
305MUR	3/23/05	50000	4600										
305MUR	4/19/05	170	52										
305MUR	5/17/05	30	52										
305MUR	6/14/05	80	69										
305MUR	7/19/05	130	10										
305MUR	8/17/05	130	41										
305MUR	9/13/05	240	74										
305MUR	10/12/05	230	63										
305MUR	11/9/05	80	63										
305MUR	12/6/05	50	63										
305MUR	1/10/06	80	160										
305MUR	2/21/06	80	28										
305MUR	3/14/06	500	270										
305MUR				97_98_D	5	300	300	206					
305MUR				97_98_W	5	16000	300	365					
305MUR				97_98	10	16000	300	274					
305MUR				05_06_D	6	240	130	114	6	74	58	44	
305MUR				05_06_W	9	50000	80	241	9	4600	63	121	
305MUR				05_06	15	50000	130	179	15	4600	63	81	
305MUR				ALL_D	11	300	170	149	6	74	58	44	
305MUR				ALL_W	14	50000	125	279	9	4600	63	121	
305MUR				ALL	25	50000	170	212	15	4600	63	81	3
305OAK	2/10/98	240											
305OAK	3/5/98	300											
305OAK	6/12/98	30											
305OAK	7/20/98	500											
305OAK	8/11/98	70											
305OAK	9/10/98	220											
305OAK	10/15/98	188											
305OAK	11/4/98	27											
305OAK	12/2/98	220											
305OAK	1/7/99	2											
305OAK				97_98_D	5	500	188	134					
305OAK				97_98_W	5	300	220	61					
305OAK				97_98	10	500	204	91					
305OAK				ALL_D	5	500	188	134					
305OAK				ALL_W	5	300	220	61					
305OAK				ALL	10	500	204	91					

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305PAC	12/18/97	300											
305PAC	1/19/98	400											
305PAC	2/19/98	900											
305PAC	3/12/98	80											
305PAC	5/27/98	30											
305PAC	6/30/98	50											
305PAC	7/31/98	330											
305PAC	9/3/98	1400											
305PAC	9/30/98	170											
305PAC	10/21/98	300											
305PAC	11/10/98	500											
305PAC	12/16/98	70											
305PAC	1/25/05	170	74										
305PAC	2/23/05	80	190										
305PAC	3/24/05	800	1200										
305PAC	4/20/05	500	84										
305PAC	5/18/05	240	210										
305PAC	6/15/05	900	88										
305PAC	7/20/05	240	240										
305PAC	8/18/05	500	280										
305PAC	9/15/05	500	210										
305PAC	10/13/05	800	110										
305PAC	11/10/05	240	26										
305PAC	12/7/05	500	260										
305PAC	1/11/06	110	110										
305PAC	2/22/06	130	98										
305PAC	3/15/06	500	230										
305PAC				97_98_D	6	1400	235	181					
305PAC				97_98_W	6	900	350	259					
305PAC				97_98	12	1400	300	217					
305PAC				05_06_D	6	900	500	467	6	280	210	175	
305PAC				05_06_W	9	800	240	256	9	1200	110	142	
305PAC				05_06	15	900	500	325	15	1200	190	154	
305PAC				ALL_D	12	1400	315	291	6	280	210	175	
305PAC				ALL_W	15	900	300	257	9	1200	110	142	
305PAC				ALL	27	1400	300	272	15	1200	190	154	4
305PAJ	12/18/97	2400											
305PAJ	1/19/98	16000											
305PAJ	2/10/98	16000											
305PAJ	2/19/98	1600											
305PAJ	3/5/98	130											
305PAJ	3/12/98	130											
305PAJ	5/27/98	130											
305PAJ	6/12/98	50											
305PAJ	6/30/98	30											
305PAJ	7/20/98	300											
305PAJ	7/31/98	110											
305PAJ	8/11/98	170											
305PAJ	9/3/98	170											
305PAJ	9/10/98	500											
305PAJ	9/30/98	130											
305PAJ	10/15/98	80											
305PAJ	10/21/98	300											
305PAJ	11/4/98	240											
305PAJ	11/10/98	110											
305PAJ	12/2/98	5000											
305PAJ	12/16/98	130											
305PAJ	1/7/99	80											
305PAJ	1/25/05	30	52										
305PAJ	2/23/05	230	160										
305PAJ	3/24/05	2400	2900										
305PAJ	4/20/05	80	110										
305PAJ	5/18/05	230	31										
305PAJ	6/15/05	300	84										

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305PAJ	7/20/05	80	41										
305PAJ	8/18/05	130	410										
305PAJ	9/15/05	80	300										
305PAJ	10/13/05	500	86										
305PAJ	11/10/05	130	130										
305PAJ	12/7/05	2400	860										
305PAJ	1/11/06	170	150										
305PAJ	2/23/06	30	58										
305PAJ	3/15/06	1300	820										
305PAJ				97_98_D	11	500	130	136					
305PAJ				97_98_W	11	16000	240	709					
305PAJ				97_98	22	16000	150	310					
305PAJ				05_06_D	6	500	180	175	6	410	85	102	
305PAJ				05_06_W	9	2400	170	241	9	2900	150	234	
305PAJ				05_06	15	2400	170	212	15	2900	130	168	
305PAJ				ALL_D	17	500	130	149	6	410	85	102	
305PAJ				ALL_W	20	16000	200	436	9	2900	150	234	
305PAJ				ALL	37	16000	170	266	15	2900	130	168	5
305PES	12/18/97	900											
305PES				97_98_D	N/A								
305PES				97_98_W	1	900	900	900					
305PES				97_98	1								
305PES				ALL_D	N/A								
305PES				ALL_W	1	900	900	900					
305PES				ALL	1								
305PJP	12/11/02	110											
305PJP	2/10/03	110											
305PJP	3/11/03	50											
305PJP	3/1/04	700											
305PJP	3/29/04	130											
305PJP	5/17/04	230											
305PJP	6/21/04	130											
305PJP	8/3/04	170											
305PJP	12/9/04	1300											
305PJP	1/24/05	240	52										
305PJP	2/22/05	500	490										
305PJP	3/23/05	9000	11000										
305PJP	4/19/05	40	20										
305PJP	5/17/05	50	31										
305PJP	6/14/05	130	20										
305PJP	7/19/05	240	63										
305PJP	8/17/05	170	63										
305PJP	9/13/05	220	150										
305PJP	10/12/05	240	74										
305PJP	11/9/05	80	52										
305PJP	12/6/05	50	120										
305PJP	1/10/06	80	41										
305PJP	2/21/06	50	25										
305PJP	3/14/06	1100	1300										
305PJP				02_04_D	3	230	170	172					
305PJP				02_04_W	6	1300	120	204					
305PJP				02_04	9	1300	130	193					
305PJP				05_06_D	6	240	195	155	6	150	63	55	
305PJP				05_06_W	9	9000	80	209	9	11000	52	153	
305PJP				05_06	15	9000	170	186	15	11000	63	102	
305PJP				ALL_D	9	240	170	161	6	150	63	55	
305PJP				ALL_W	15	9000	110	207	9	11000	52	153	
305PJP				ALL	24	9000	150	188	15	11000	63	102	3
305SAF	3/24/05	24000	20000										
305SAF				05_06_D	N/A	N/A	N/A	N/A	N/A		N/A	N/A	
305SAF				05_06_W	1	24000	24000	24000	1	20000	20000	20000	
305SAF				05_06	1	24000	24000	24000	1	20000	20000	20000	
305SAF				ALL_D	N/A	N/A	N/A	N/A	N/A		N/A	N/A	
305SAF				ALL_W	1	24000	24000	24000	1	20000	20000	20000	

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305SAF				ALL	1	24000	24000	24000	1	20000	20000	20000	1
305SAN	12/18/97	240											
305SAN	1/19/98	11000											
305SAN	2/19/98	900											
305SAN	3/12/98	9000											
305SAN	5/27/98	600											
305SAN	6/30/98	170											
305SAN	7/31/98	130											
305SAN	9/3/98	300											
305SAN	9/30/98	300											
305SAN	10/21/98	170											
305SAN	11/10/98	500											
305SAN	12/16/98	80											
305SAN	1/24/05	1300	860										
305SAN	2/22/05	130	910										
305SAN	3/23/05	50000	61000										
305SAN	4/19/05	230	450										
305SAN	5/17/05	220	160										
305SAN	6/14/05	800	400										
305SAN	7/19/05	5000	1900										
305SAN	8/17/05	2300	2500										
305SAN	9/13/05	130	160										
305SAN	10/12/05	3000	51										
305SAN	11/9/05	50	31										
305SAN	12/6/05	900	200										
305SAN	2/21/06	900	210										
305SAN	3/14/06	700	410										
305SAN				97_98_D	6	600	235	242					
305SAN				97_98_W	6	11000	700	974					
305SAN				97_98	12	11000	300	486					
305SAN				05_06_D	6	5000	1550	961	6	2500	280	368	
305SAN				05_06_W	8	50000	800	696	8	61000	430	572	
305SAN				05_06	14	50000	850	799	14	61000	405	473	
305SAN				ALL_D	12	5000	300	483	6	2500	280	368	
305SAN				ALL_W	14	50000	800	804	8	61000	430	572	
305SAN				ALL	26	50000	550	635	14	61000	405	473	8
305SBA	3/23/05	50000	61000										
305SBA				05_06_D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
305SBA				05_06_W	1	50000	50000	50000	1	61000	61000	61000	
305SBA				05_06	1	50000	50000	50000	1	61000	61000	61000	
305SBA				ALL_D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
305SBA				ALL_W	1	50000	50000	50000	1	61000	61000	61000	
305SBA				ALL	1	50000	50000	50000	1	61000	61000	61000	1
305SJN	1/25/05	240	100										
305SJN	2/22/05	400	180										
305SJN	3/23/05	160001	130000										
305SJN	4/19/05	50	84										
305SJN	5/17/05	500	300										
305SJN	6/14/05	5000	3900										
305SJN	7/19/05	500	780										
305SJN	8/17/05	1100	440										
305SJN	9/13/05	500	170										
305SJN	10/12/05	2800	280										
305SJN	11/9/05	800	520										
305SJN	12/6/05	500	250										
305SJN	1/10/06	340	41										
305SJN	2/21/06	210	17										
305SJN	3/14/06	5000	1300										
305SJN				05_06_D	6	5000	800	1115	6	3900	370	517	
305SJN				05_06_W	9	160001	400	782	9	130000	180	305	
305SJN				05_06	15	160001	500	902	15	130000	280	377	
305SJN				ALL_D	6	5000	800	1115	6	3900	370	517	
305SJN				ALL_W	9	160001	400	782	9	130000	180	305	
305SJN				ALL	15	160001	500	902	15	130000	280	377	9

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305STL	1/24/05	240	-5										
305STL	2/22/05	240	31										
305STL	3/23/05	330	63										
305STL	4/21/05	2	10										
305STL	6/16/05	170	63										
305STL	7/21/05	23	190										
305STL	8/17/05	170	140										
305STL	10/12/05	700	240										
305STL	11/9/05	130	130										
305STL	12/8/05	40	52										
305STL	1/12/06	80	10										
305STL	2/23/06	50	41										
305STL	3/16/06	50	10										
305STL				05_06_D	4	700	170	147	4	240	165	142	
305STL				05_06_W	9	330	80	70	8	130	36	29	
305STL				05_06	13	700	130	88	12	240	58	50	
305STL				ALL_D	4	700	170	147	4	240	165	142	
305STL				ALL_W	9	330	80	70	8	130	36	29	
305STL				ALL	13	700	130	88	12	240	58	50	1
305TES	12/18/97	240											
305TES	1/19/98	24000											
305TES	2/19/98	7000											
305TES	3/12/98	24000											
305TES	5/27/98	2400											
305TES	6/30/98	1600											
305TES	7/31/98	700											
305TES	9/3/98	5000											
305TES	9/30/98	5000											
305TES	10/21/98	9000											
305TES	11/10/98	9000											
305TES	12/16/98	5000											
305TES				97_98_D	6	9000	3700	2908					
305TES				97_98_W	6	24000	8000	5931					
305TES				97_98	12	24000	5000	4153					
305TES				ALL_D	6	9000	3700	2908					
305TES				ALL_W	6	24000	8000	5931					
305TES				ALL	12	24000	5000	4153					
305THU	12/18/97	9000											
305THU	1/19/98	5000											
305THU	2/10/98	4000											
305THU	2/19/98	3000											
305THU	3/5/98	240											
305THU	3/12/98	240											
305THU	5/27/98	130											
305THU	6/12/98	280											
305THU	6/30/98	220											
305THU	7/20/98	500											
305THU	7/31/98	300											
305THU	8/11/98	240											
305THU	9/3/98	500											
305THU	9/10/98	130											
305THU	9/30/98	14											
305THU	10/15/98	900											
305THU	10/21/98	80											
305THU	11/4/98	50											
305THU	11/10/98	80											
305THU	12/2/98	2400											
305THU	12/16/98	30											
305THU	1/7/99	34											
305THU	4/26/01	1400											
305THU	5/31/01	24000											
305THU	6/28/01	920											
305THU	7/25/01	3500											
305THU	8/30/01	230											

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305THU	9/18/01	79											
305THU	10/16/01	240											
305THU	11/13/01	54000											
305THU	12/20/01	1600											
305THU	1/21/02	1300											
305THU	3/18/02	130											
305THU	4/15/02	130											
305THU	5/13/02	1300											
305THU	7/17/02	110											
305THU	8/14/02	13											
305THU	9/11/02	4											
305THU	10/9/02	-1											
305THU	11/12/02	230											
305THU	6/21/04	240											
305THU	8/3/04	230											
305THU	10/5/04	240											
305THU	11/2/04	130											
305THU	1/24/05	130	31										
305THU	2/22/05	300	460										
305THU	3/23/05	7000	7500										
305THU	4/19/05	50	150										
305THU	5/17/05	240	120										
305THU	6/14/05	30	51										
305THU	7/19/05	30	20										
305THU	8/17/05	2	11										
305THU	9/13/05	4	1										
305THU	10/12/05	2	10										
305THU	11/9/05	30	20										
305THU	12/6/05	260	54										
305THU	1/10/06	240	120										
305THU	2/21/06	110	30										
305THU	3/14/06	300	1500										
305THU	4/5/06	2300	2400										
305THU				97_98_D	11	900	240	199					
305THU				97_98_W	11	9000	240	479					
305THU				97_98	22	9000	240	308					
305THU				01_04_D	13	24000	240	266					
305THU				01_04_W	8	54000	765	729					
305THU				01_04	21	54000	240	390					
305THU				05_06_D	6	240	17	12	6	120	16	15	
305THU				05_06_W	10	7000	250	268	10	7500	135	216	
305THU				05_06	16	7000	120	84	16	7500	53	80	
305THU				ALL_D	30	24000	230	129	6	120	16	15	
305THU				ALL_W	29	54000	240	440	10	7500	135	216	
305THU				ALL	59	54000	240	236	16	7500	53	80	4
305TRE	12/19/97	23											
305TRE	2/19/98	300											
305TRE	3/12/98	280											
305TRE	5/27/98	30											
305TRE	6/30/98	300											
305TRE	7/31/98	1100											
305TRE	9/30/98	170											
305TRE	10/21/98	300											
305TRE	11/10/98	280											
305TRE	12/16/98	80											
305TRE	2/22/05	800	590										
305TRE	3/23/05	160000	160000										
305TRE	4/19/05	50	62										
305TRE	8/17/05	5000	910										
305TRE	9/13/05	1700	2100										
305TRE	1/10/06	300	500										
305TRE	3/14/06	500	280										
305TRE				97_98_D	5	1100	7	219					
305TRE				97_98_W	5	300	280	134					

Site Tag	Date	FColi	Ecoli	Period	Fcoli Count	Fcoli Max	Fcoli Median	Fcoli Geomean	Ecoli Count	Ecoli Max	Ecoli Median	Ecoli Geomean	Ecoli Count >235
305TRE				97_98	10	1100	280	171					
305TRE				05_06_D	2	5000	3350	2915	2	2100	1505	1382	
305TRE				05_06_W	5	160000	500	992	5	160000	500	961	
305TRE				05_06	7	160000	800	1350	7	160000	590	1066	
305TRE				ALL_D	7	5000	300	459	2	2100	1505	1382	
305TRE				ALL_W	10	160000	290	365	5	160000	500	961	
305TRE				ALL	17	160000	300	401	7	160000	590	1066	6
305UVA	12/18/97	130											
305UVA	1/19/98	1100											
305UVA	2/19/98	1600											
305UVA	3/12/98	13											
305UVA	5/27/98	130											
305UVA	6/30/98	110											
305UVA	12/16/98	300											
305UVA	1/25/05	50	52										
305UVA	2/23/05	50	130										
305UVA	3/24/05	300	170										
305UVA	4/20/05	240	52										
305UVA	5/18/05	230	98										
305UVA	6/15/05	3000	41										
305UVA	12/7/05	30	31										
305UVA	1/11/06	110	86										
305UVA	2/22/06	50	49										
305UVA	3/15/06	300	120										
305UVA				97_98_D	2	130	120	120					
305UVA				97_98_W	5	1600	300	246					
305UVA				97_98	7	1600	130	200					
305UVA				05_06_D	2	3000	1615	831	2	98	70	63	
305UVA				05_06_W	8	300	80	99	8	170	69	74	
305UVA				05_06	10	3000	170	151	10	170	69	72	
305UVA				ALL_D	4	3000	180	315	2	98	70	63	
305UVA				ALL_W	13	1600	130	140	8	170	69	74	
305UVA				ALL	17	3000	130	169	10	170	69	72	0
305VIS	2/10/98	900											
305VIS	3/5/98	500											
305VIS	6/12/98	70											
305VIS				97_98_D	1	70	70	70					
305VIS				97_98_W	2	900	700	671					
305VIS				97_98	3	900	500	316					
305VIS				ALL_D	1	70	70	70					
305VIS				ALL_W	2	900	700	671					
305VIS				ALL	3	900	500	316					
305WSA	1/24/05	70	-50										
305WSA	4/21/05	30	100										
305WSA	5/19/05	1300	200										
305WSA	6/16/05	240	97										
305WSA	7/21/05	240	10										
305WSA	8/18/05	30000	41000										
305WSA	10/13/05	2200	200										
305WSA	11/9/05	300	410										
305WSA	12/8/05	800	-50										
305WSA	1/12/06	240	260										
305WSA	2/23/06	30	41										
305WSA	3/16/06	170	240										
305WSA				05_06_D	5	30000	1300	1377	5	41000	200	276	
305WSA				05_06_W	7	800	170	130	5	410	240	160	
305WSA				05_06	12	30000	240	347	10	41000	200	210	
305WSA				ALL_D	5	30000	1300	1377	5	41000	200	276	
305WSA				ALL_W	7	800	170	130	5	410	240	160	
305WSA				ALL	12	30000	240	347	10	41000	200	210	4

APPENDIX A
ATTACHMENT 2

WATER BOARD MONITORING DATA

SiteID	Date	Time	QA/QC	Total Coliform	*E. coli*	Total coliform median	E. coli median	Total coliform geomean	E. coli geomean	No. Days between 3 sampling events	Geomean for 3 sampling events in 30-days	No. of Geomean exceedances for 3 sampling events in 30-days	No. samples exceeding 235 MPN ecoli
305ALD	11/30/06	10:40		Dry	Dry								
305ALD	12/12/06	11:35		Dry	Dry								
305ALD	12/28/06	11:07		Dry	Dry					28			
305ALD	1/11/07	10:45		Dry	Dry					30			
305ALD	1/25/07	10:32		Dry	Dry					28			
305ALL	11/30/06	10:35		Dry	Dry								
305ALL	12/12/06	11:42		Dry	Dry								
305ALL	12/28/06	11:02		Dry	Dry					28			
305ALL	1/11/07	10:43		Dry	Dry					30			
305ALL	1/25/07	10:30		Dry	Dry					28			
305BCC	11/30/06	11:50		547.7	145.5								
305BCC	12/12/06	13:58		1119.9	139.6								
305BCC	12/28/06	13:15		1986.3	547.5					28	223.2		
305BCC	1/11/07	12:40		365.4	74.9					30	178.9		
305BCC	1/25/07	12:21		727	488.4	727	145.5	798.0	209.8	28	271.6	3	2
305BRI	11/30/06	10:59		218.7	127.4								
305BRI	12/12/06	14:33		2419.6	198.9								
305BRI	12/28/06	14:00		142.1	68.3					28	120.1		
305BRI	1/11/07	13:21		131.4	33.6					30	77.0		
305BRI	1/25/07	12:56		204.6	155.3	204.6	127.4	289.2	98.0	28	70.9	0	0
305BRI2	12/28/06	14:00	FD	137.6	69.7								
305CHI	11/30/06	13:45		2419.6	17.1								
305CHI	12/12/06	9:30		2419.6	161.6								
305CHI	12/28/06	9:08		2419.6	142.1					28	73.2		
305CHI	1/11/07	9:11		2419.6	21.6					30	79.2		
305CHI	1/25/07	8:50		2419.6	21.3	2419.6	21.6	2419.6	44.8	28	40.3	0	0
305CHI2	1/11/07	9:11	FD	2419.6	27.5								
305FRA	11/30/06	11:20		1046.2	248.1								
305FRA	12/12/06	12:25		1732.9	116.2								
305FRA	12/28/06	11:48		1986.3	104.3					28	144.3		
305FRA	1/11/07	11:15		2419.6	93.2					30	104.1		
305FRA	1/25/07	11:06		1553.1	55.6	1732.9	104.3	1683.7	109.3	28	81.5	1	1
305FRA2	11/30/06	11:20	FD	980.4	275.5								
305FUF	11/30/06	11:30		2419.6	325.5								
305FUF	12/12/06	11:55		2419.6	155.3								
305FUF	12/28/06	11:19		2419.6	63.1					28	147.2		
305FUF	1/11/07	10:55		2419.6	122.3					30	106.2		
305FUF	1/25/07	10:42		1413.6	187.2	2419.6	155.3	2173.0	148.8	28	113.0	1	1
305FUF2	11/30/06	11:30	FS	2419.6	206.4								
305HRL	11/30/06	9:45		95.9	60.2								
305HRL	12/12/06	15:42		198.9	58.3								
305HRL	12/28/06	15:03		62.7	37.3					28	50.8		
305HRL	1/11/07	14:25		63.1	23.1					30	36.9		
305HRL	1/25/07	13:54		88.4	39.3	88.4	39.3	92.2	41.2	28	32.4	0	0
305HRL2	1/11/07	14:25	FD	56.3	17.3								

SiteID	Date	Time	QA/QC	Total Coliform	*E. coli*	Total coliform median	E. coli median	Total coliform geomean	E. coli geomean	No. Days between 3 sampling events	Geomean for 3 sampling events in 30-days	No. of Geomean exceedances for 3 sampling events in 30-days	No. samples exceeding 235 MPN ecoli
305LLA	11/30/06	11:40		Dry	Dry								
305LLA	12/12/06	12:05		2419.6	225.4								
305LLA	12/28/06	11:27		2419.6	204.6					28	214.7		
305LLA	1/11/07	11:00		2419.6	102.2					30	167.7		
305LLA	1/25/07	10:49		2419.6	123.6	2419.6	164.1	2419.6	155.4	28	137.2	3	0
305LLA2	12/12/06	12:05	FD	2419.6	285.1								
305MON	11/30/06	10:30		1553.1	140.1								
305MON	12/12/06	11:08		2419.6	214.2								
305MON	12/28/06	10:41		1732.9	86.5					28	137.4		
305MON	1/11/07	10:28		1986.3	34.5					30	86.1		
305MON	1/25/07	10:10		2419.6	23.3	1986.3	86.5	1991.1	73.1	28	41.1	1	0
305MUR	11/30/06	14:10		1119.9	10.9								
305MUR	12/12/06	9:12		2419.6	167								
305MUR	12/28/06	8:49		2419.6	58.3					28	47.3		
305MUR	1/11/07	8:56		2419.6	14.8					30	52.4		
305MUR	1/25/07	8:35		2419.6	7.4	2419.6	14.8	2074.1	25.9	28	18.6	0	0
305MUR2	1/25/07	8:35	FD	2419.6	11								
305PAC	11/30/06	11:00		579.4	83.6								
305PAC	12/12/06	12:45		2419.6	410.6								
305PAC	12/28/06	12:11		1732.9	117.8					28	159.3		
305PAC	1/11/07	11:37		920.8	150					30	193.6		
305PAC	1/25/07	11:25		1413.6	416	1413.6	150	1258.9	190.7	28	194.4	3	2
305PAC2	1/11/07	11:37	FD	2419.6	248.9								
305PAJ	11/30/06	13:25		2419.6	39.3								
305PAJ	12/12/06	10:42		2419.6	154.1								
305PAJ	12/28/06	10:11		2419.6	285.1					28	120.0		
305PAJ	1/11/07	10:02		2419.6	98.8					30	163.1		
305PAJ	1/25/07	9:42		2419.6	42.6	2419.6	98.8	2419.6	93.8	28	106.3	1	1
305PAJ2	1/11/07	10:02	FD	2419.6	73.8								
305PJP	11/30/06	14:20		1203.3	35								
305PJP	12/12/06	8:40		2419.6	365.4								
305PJP	12/28/06	8:32		2419.6	201.4					28	137.1		
305PJP	1/11/07	8:38		2419.6	142.1					30	218.7		
305PJP	1/25/07	8:18		2419.6	27.5	2419.6	142.1	2104.1	100.1	28	92.3	2	1
305PJPSD	12/12/06	8:46		2419.6	2419.6								
305PJPSD	12/28/06	8:32		Dry	Dry								
305PJPSD	1/11/07	8:38		Dry	Dry								
305PJPSD	1/25/07	8:18		Dry	Dry								
305PJPSD2	12/12/06	8:46	FD	2419.6	2419.6								
305PSB	11/30/06	11:25		2419.6	161.6								
305PSB	12/12/06	14:13		2419.6	146.7								
305PSB	12/28/06	13:34		2419.6	107.6					28	136.6		
305PSB	1/11/07	12:57		2419.6	133.3					30	128.1		
305PSB	1/25/07	12:35		2419.6	90.6	2419.6	133.3	2419.6	125.2	28	109.1	2	0
305PSB2	11/30/06	11:25	FD	2419.6	185								

SiteID	Date	Time	QA/QC	Total Coliform	*E. coli*	Total coliform median	E. coli median	Total coliform geomean	E. coli geomean	No. Days between 3 sampling events	Geomean for 3 sampling events in 30-days	No. of Geomean exceedances for 3 sampling events in 30-days	No. samples exceeding 235 MPN ecoli
305SAF	11/30/06	12:48		2419.6	387.3								
305SAF	12/12/06	13:07		2419.6	1046.2								
305SAF	12/28/06	12:24		2419.6	128.1					28	373.0		
305SAF	1/11/07	11:54		1986.3	25.6					30	150.8		
305SAF	1/25/07	11:39		2419.6	111.2	2419.6	128.1	2326.0	171.4	28	71.4	2	2
305SAFSD	11/30/06	12:50		2419.6	920.8								
305SAFSD	12/12/06	13:01		2419.6	980.4								
305SAFSD	12/28/06	12:28		2419.6	151.5					28	515.2		
305SAFSD	1/11/07	11:59		2419.6	6.3					30	97.8		
305SAFSD	1/25/07	11:42		2419.6	59.8	2419.6	151.5	2419.6	138.8	28	38.5	1	2
305SAN	11/30/06	14:10		2419.6	365.4								
305SAN	12/12/06	9:54		2419.6	1986.3								
305SAN	12/28/06	9:38		2419.6	1413.6					28	1008.6		
305SAN	1/11/07	9:31		1986.3	165.8					30	775.0		
305SAN	1/25/07	9:08		866.4	40.8	2419.6	365.4	1894.1	370.1	28	212.3	3	3
305SAN2	12/28/06	9:38	FD	2419.6	1299.7								
305SBA	11/30/06	10:20		148.3	32.3								
305SBA	12/12/06	15:06		178.5	64.4								
305SBA	12/28/06	14:34		517.2	148.3					28	67.6		
305SBA	1/11/07	13:52		648.8	365.4					30	151.7		
305SBA	1/25/07	13:24		325.5	105	325.5	105	310.6	103.4	28	178.5	2	1
305SJB	11/30/06	13:39		2419.6	10.9								
305SJB	12/12/06	10:22		2419.6	2419.6								
305SJB	12/28/06	9:55		2419.6	365.4					28	212.8		
305SJB	1/11/07	9:44		2419.6	224.7					30	583.5		
305SJB	1/25/07	9:24		2419.6	93.3	2419.6	224.7	2419.6	182.4	28	197.1	3	2
305SJB2	1/25/07	9:25	FD	2419.6	93.2								
305SJN	11/30/06	13:57		2419.6	108.1								
305SJN	12/12/06	9:47		2419.6	111.2								
305SJN	12/28/06	9:28		2419.6	160.7					28	124.5		
305SJN	1/11/07	9:24		2419.6	83.6					30	114.3		
305SJN	1/25/07	9:02		2419.6	48	2419.6	108.1	2419.6	95.0	28	86.4	0	0
305TES	11/30/06	11:15		2419.6	579.4								
305TES	12/12/06	12:33		2419.6	116.9								
305TES	12/28/06	11:58		2419.6	461.1					28	314.9		
305TES	1/11/07	11:24		2419.6	488.4					30	297.5		
305TES	1/25/07	11:16		2419.6	290.9	2419.6	461.1	2419.6	338.4	28	403.1	3	4
305TES2	1/25/07	11:16	FD	2419.6	613.1								
305THU	11/30/06	14:40		488.4	9.6								
305THU	12/12/06	8:18		2419.6	238.2								
305THU	12/28/06	8:18		2419.6	248.1					28	82.8		
305THU	1/11/07	8:20		2419.6	18.5					30	103.0		
305THU	1/25/07	8:01		2419.6	20.1	2419.6	20.1	1756.9	46.2	28	45.2	0	2
305TRE	11/30/06	12:18		Dry	Dry								
305TRE	12/12/06	13:30		2419.6	165.8								
305TRE	12/28/06	12:50		2419.6	124.6					28	143.7		
305TRE	1/11/07	12:19		2419.6	36.4					30	90.9		
305TRE	1/25/07	12:00		2419.6	25.9	2419.6	80.5	2419.6	66.4	28	49.0	1	0
305TRE2	12/12/06	13:30	FS	2419.6	128.1								

SiteID	Date	Time	QA/QC	Total Coliform	*E. coli*	Total coliform median	E. coli median	Total coliform geomean	E. coli geomean	No. Days between 3 sampling events	Geomean for 3 sampling events in 30-days	No. of Geomean exceedances for 3 sampling events in 30-days	No. samples exceeding 235 MPN ecoli
305UVA	11/30/06	11:50		2419.6	115.3								
305UVA	12/12/06	12:13		2419.6	163.8								
305UVA	12/28/06	11:38		2419.6	201.4					28	156.1		
305UVA	1/11/07	11:07		2419.6	135.4					30	164.7		
305UVA	1/25/07	10:56		2419.6	185	2419.6	163.8	2419.6	157.0	28	171.5	3	0
305UVA2	12/28/06	11:38	FD	2419.6	143.9								
305WIL	11/30/06	10:50		Dry	Dry								
305WIL	12/12/06	14:40		Dry	Dry								
305WIL	12/28/06	14:08		Dry	Dry								
305WIL	1/11/07	13:27		Dry	Dry								
305WIL	1/25/07	13:02		Dry	Dry								
BATCH BLANK	11/30/06	17:14		1	1								

APPENDIX A
ATTACHMENT 3

LAND USE DATA

California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program (FMMP), 2005

Prime Farmland (P)
Irrigated land with the best combination of physical and chemical features able to sustain long term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date

Farmland of Statewide Importance (S)
Irrigated land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of agricultural crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date

Unique Farmland (U)
Lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

Farmland of Local Importance (L)
Land cultivated as dry cropland. Usual crops are wheat, barley, oats, safflower, and grain hay. The Board of Supervisors determined that there will be no Farmland of Local Importance for Monterey County. In Santa Cruz County, soils used for Christmas tree farms and nurseries, and that do not meet the definition for Prime, Statewide, or Unique.

Grazing Land (G)
Land on which the existing vegetation is suited to the grazing of livestock. This category is used only in California and was developed in cooperation with the California Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities. The minimum mapping unit for Grazing Land is 40 acres.

Urban and Built-Up Land (D)
Urban and Built-Up land is occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. Common examples include residential, industrial, commercial, institutional facilities, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, and water control structures.

Other Land (X)
Land which does not meet the criteria of any other category. Typical uses include low density rural development, heavily forested land, mined land, or government land with restrictions on use.

Water (W)
Water areas with an extent of at least 40 acres.

APPENDIX A
ATTACHMENT 4

SCREENING ANALYSIS OF BASELINE CONDITIONS AND LOAD ASSESSMENT FOR A RURAL RANGELAND SUBWATERSHED, AND AN URBAN SUBWATERSHED

Baseline Environmental Conditions and Existing Loads Analysis for a Rural Rangeland Subwatershed, and an Urban Subwatershed in the Pajaro River Watershed Project Area

Natural non-controllable sources are a contributor of FIB in the Pajaro River watershed. Some uncertainty exists whether the non-controllable fraction of FIB alone is causing receiving water concentration of FIB to exceed the numeric target. The ability to differentiate between controllable and natural sources is an uncertainty in these TMDLs. This phenomenon represents an uncertainty that staff has attempted to address through an empirical analysis of land use data, sources of fecal coliform bacteria (humans, wildlife, livestock), hydrologic data, livestock and wildlife inventory data. The technical approaches outlined in this analysis are used similarly in many State and USEPA-approved TMDL programs (e.g., see Virginia TMDL program, Minnesota TMDL program). Two subwatersheds were assessed in this technical attachment; one representative of a rural agricultural-rangeland drainage, the other representative of an urban subwatershed.

1) **San Benito River Subwatershed BRI 22**

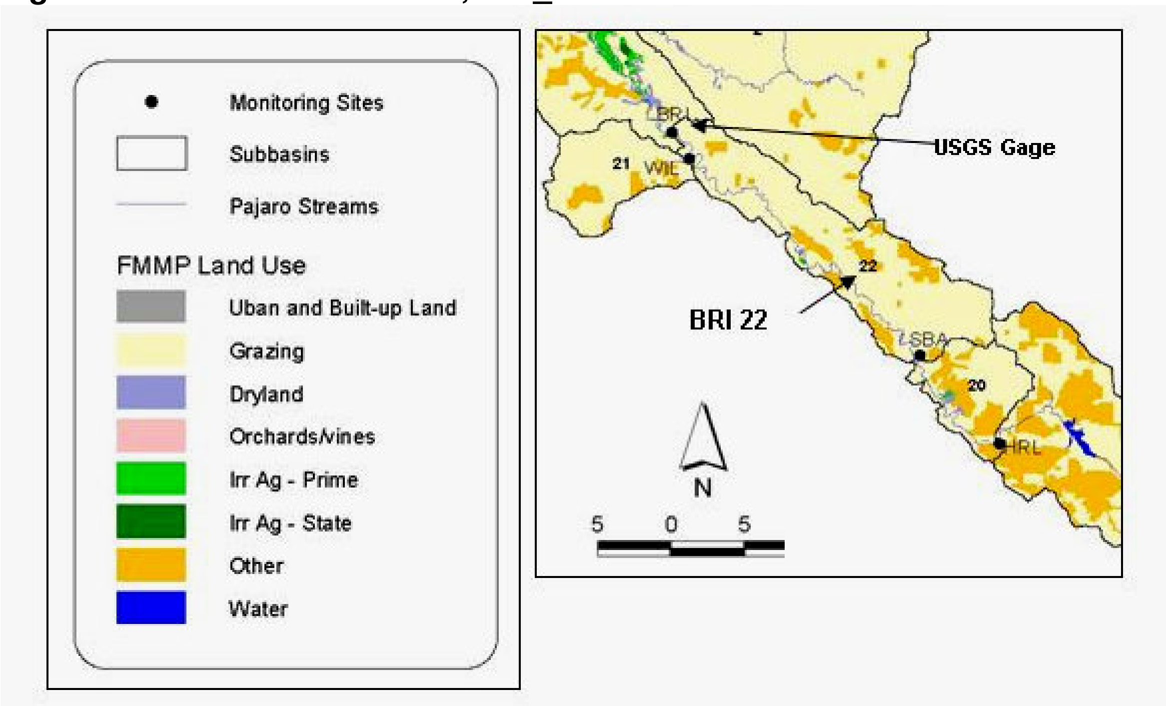
The first step in estimating the proportional loads of controllable sources and non-controllable sources is to establish an estimate of baseline conditions. Baseline conditions represent existing non-point source loading conditions and permitted point source discharge conditions. The baseline conditions allow for an evaluation of current in-stream water quality under existing loads, and to ultimately attribute the relative proportion of loading from all sources, in conjunction with land use data, and other empirical estimates. This may result in a screening-level assessment of the nature, scope, and magnitude of the various non-point sources and point sources within the watershed. Ideally, the estimates will provide an evaluation of the expected magnitude of exceedances and the proportional loads from controllable and non-controllabe sources (i.e., natural background) over a range of hydrologic and environmental conditions, including dry seasons, wet seasons, and average periods.

Data required to assess baseline conditions and the proportional load contributions at the subwatershed scale include:

- Hydrologic flow data
- Land use data
- Inventories of livestock and wildlife in the watershed.
- Estimates of the scope and magnitude of fecal coliform production and deposition from various agricultural, human, and natural sources
- Fecal coliform loading rates to water bodies attributable to various land uses types

Fecal coliform data collected near USGS gage 11152650 on the San Benito River at Willow Creek were used to establish baseline conditions for subwatershed BRI_22 (see Project Report, Figure 4-4, also shown below in Figure A.4-1). The watershed is at a scale (around 45,000 acres) at which it is presumed that the USGS stream gage located at the lower end of the watershed, and loads from monitoring data near at that location, are broadly representative of baseline conditions throughout the subwatershed. In contrast, it would not be appropriate to extrapolate observed bacteria loads from a monitoring site located at the lower end of a geographically large watershed, throughout the upstream reaches of that watershed. For example, bacteria flowing from the upper reaches of a large watershed may have little impact on the waterbody downstream, and on loads measured at a downstream gage, due to die off.

Figure A.4-1: San Benito River, BRI_22 Subwatershed



For subwatershed BRI_22, the relative contribution of various sources to the baseline conditions were estimated from empirical estimates of land use, livestock, human, and wildlife data used in conjunction with the Bacteria Source Load Calculator (BSLC) spreadsheet. The BSLC was developed by the Center for TMDL and Watershed Studies at Virginia Tech University as a software tool designed to simplify the time-consuming work involved in determining bacterial loadings. BSLC characterizes how bacterial loads are spatially and temporally distributed in the watershed from user input. BSLC processes source data to calculate fecal coliform loads deposited to land, and loads to stream resulting from direct in-stream deposition. Estimated stream loads resulting from fecal coliform deposited on land as calculated in BSLC can then be estimated by using reasonable loading and runoff parameters found in the scientific literature.

2) Land Use

Land use in the BRI_22 subwatershed is found in Table 4-8, Section 4-6 of this project report. Land uses are summarized and distributed between three land use categories shown below in Table A.4-1.

Table A.4-1: BRI_22 Subwatershed Land Use:

Land use	Acres
Forest	6208
Cropland	64
Pasture-Rangeland	38400

3) Fecal Coliform Sources

There are no permitted point sources discharging fecal coliform in the San Benito River BRI_22 subwatershed. Table A.4-2 summarizes the major sources of fecal coliform in the BRI_22 subwatershed. It is important to recognize there is uncertainty in these numbers. Livestock numbers are taken from the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service

Census database. This database tabulates the number of livestock reported in San Benito County. The most recent online version of the database is from 2002. For purposes of this estimate, it was assumed that livestock are evenly distributed throughout all rangeland in the county. To obtain an average animal geographic density, the number of livestock were obtained from the USDA Agricultural Census database, and divided by the amount of rangeland in San Benito County. The amount of acreage of rangeland in the watershed was obtained from the land use data in this Project Report. Land use data was also cross-validated with the amount of rangeland reported in the San Benito County General Plan, Table 1*: Unincorporated Land Use Breakdown*. The number of people in the watershed was estimated from block group data in the U.S. Census Bureau 2000 Decennial Census.

Wildlife populations are estimated from habitat and animal population densities available from California Department of Fish and Game and other sources shown in Table A.4-3. Using these numbers, a habitat density (animal units/square mile or animal units/acre) were derived, and it was assumed that the distribution of animals was spread evenly across all suitable habitat. It is important to note that the possible load contribution potential from the regrowth and resuspension of bacteria in stream bottom sediments is largely unknown currently. This is a potential naturalized source that is not quantified in this analysis.

Table A.4-2: Inventory of Fecal Coliform Producers in San Benito River BRI_22 Subwatershed

Category	Sub-Category	Estimated Animal Units or Individuals	Source of Estimate	Fecal Coliform produced per Individual/day (cfu)[G]
Livestock	Cattle	2295	USDA Census of Agriculture, 2002[A]	3.3 E+10
	Sheep	252	USDA Census of Agriculture, 2002[A]	1.2 E+10
	Hogs	43	USDA Census of Agriculture, 2002[A]	1.1 E+10
Human		72	US Census Bureau, 2000[B]	2.0 E+09
Wildlife	Deer	427	California Dept. Fish and Game[C]	3.5 E+08
	Feral Pig	119	Calif. Dept. Fish and Game[D]	1.1 E+10
	Coyotes	58	Gese et al. (1989); Babb et al. (1989)	5.0 E+09
	Raccoons	489	Calif. Dept. Fish and Game[D]	5.0 E+07
	Wild Turkey	581	Calif. Dept. Fish and Game[E]	9.3 E+07
	Pheasant	1645	Calif. Dept Water Resources-IEP[F]	Assume equal to turkey
	Other wildlife	It was not possible to obtain reliable estimates of numbers for other wildlife. To attempt to account for the fecal coliform bacteria that would be produced by other wildlife, an equivalency to all deer in the watershed was assumed.		Assume equivalency to all deer in watershed.

<u>Population Inventory and Habitat Sources</u>

A: USDA, National Agricultural Statistics Service http://www.nass.usda.gov/Census/Create_Census_US_CNTY.jsp

B: US Census Bureau website - http://factfinder.census.gov

C: California Dept. of Fish and Game - http://www.dfg.ca.gov/wildlife/hunting/deer/docs/habitatassessment/part4.pdf

D: California Dept. of Fish and Game - Game http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.aspx

E: California Dept. of Fish and Game - http://www.dfg.ca.gov/wildlife/hunting/uplandgame/docs/turkplan_04.pdf

F: Interpreted from Cal. DWR Interagency Ecological Program - http://www.iep.ca.gov/suisun_eco_workgroup/workplan/report/wildlife/pheasant.html

G. Literature references, see Section 7, BSLC references

Table A.4-3: Assumptions Used in Deriving Wildlife Population Densities Estimates

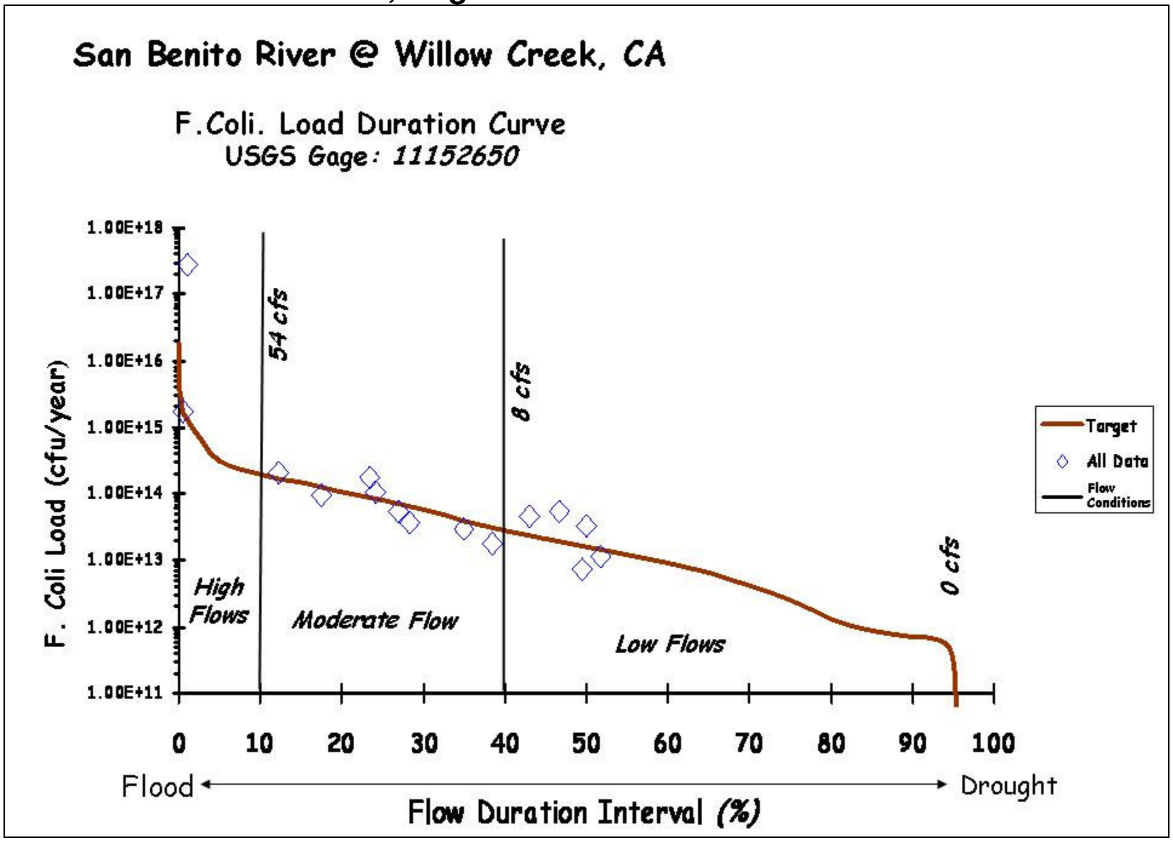
Wildlife Type	Reported Population Density Ranges (animals/mi^2)*	Average Density (animals/mi^2)	Estimated Population Density (#/per acre)	Habitat*	BSLC Landuse Categories Used for Habitat Density Estimates
Deer	4.4 to 7.8	6.1	0.010	Entire subwatershed	Forest, Rangeland, Cropland
Feral pig	1.3 to 2.1	1.7	0.003	Entire subwatershed	Forest, Rangeland, Cropland
Coyote	0.75 to 0.91	0.83	0.001	Entire subwatershed	Forest, Rangeland, Cropland
Raccoon	6 to 52	29 sq/mi (.045/acre) in prime riparian habitat	0.045	Closely associated with permanent water. Assumed habitat is 0.5 mile buffer around permanent water (San Benito River) within subwatershed boundaries to obtain a watershed-wide population density estimate.	Forest, Rangeland, Cropland
Turkey	7 to 9.6	8.3	0.013	Entire watershed excluding cropland (trees/shrubs required for roosting habitat)	Forest, Rangeland
Pheasant	-	23.5	0.037	Entire watershed	Forest, Rangeland, Cropland

*From literature/technical sources identified in Table A.4-2

4) Flow Data and Assimilative Capacity of San Benito River at USGS Gage 11152650

To assist in determining potential sources of fecal coliform *to* the San Benito River in subwatershed BRI_22, a load duration curve analysis (see Cleland, 2002) was developed for USGS gage 111565000 on the San Benito River at Willow Creek. A load duration curve considers how flow conditions relate to a variety of pollutant sources (point and nonpoint sources). It is a method of water quality analysis and display that shows the assimilative or allowable loading capacity, across the entire spectrum of flow conditions. The allowable load plotted as a curve on the graph, is calculated simply as the water quality objective (400 MPN/100mL) multiplied by the flow taking into account unit conversion factors. Monitoring data, plotted as observed loads, which plot above the curve represent exceedances of the allowable load. It is important to note that the fecal coliform loads along the vertical axis are plotted on a logarithmic scale.

Figure A.4-2: Load Duration Curve, Gage 11152650



The load duration curve indicates that exceedances of the fecal coliform water quality objective are observed during wet and dry weather events. Note that data points above the curve on the left side of the figure are indicative of fecal coliform exceedances during wet weather conditions (higher flows) and data points above the curve to the right side indicate fecal coliform exceedances during dry weather conditions (lower flows). These low flow exceedances indicate that sources of fecal coliform are most likely not related to precipitation events (i.e., runoff). Given the low density of human population in the watershed, the lack of permitted point sources of fecal coliform, the absence of sanitary sewer collection systems, and the low density of septic systems, the most likely source of fecal coliform exceedences during dry weather is via in-stream deposition from wildlife and livestock.

5) <u>Reference Watersheds</u>

Ultimately, it is useful to compare the estimated baseline conditions of an agricultural subwatershed, with a nearby reference subwatershed that drains relatively undeveloped rural lands and which has similar climatic conditions. Fecal coliform data has not been collected in any of the undeveloped tributary headwaters within the Pajaro watershed project area. Data of this nature could conceivably be used for comparison with the fecal coliform data that is available in the lower lying areas, and to urban and agricultural valley floor stream reaches. Waddell and Scott's Creeks in Santa Cruz County were identified in Section 7 of the Project Report as reference streams which drain relatively undeveloped watersheds. Neither Waddel or Scott's creeks are impaired by fecal coliform loads, and consequently staff concluded that natural background conditions in the Pajaro Watershed were unlikely to be a major cause of sustained exceendences of water quality objectives for fecal coliform. Stakeholders and interested parties have noted that climatologically, Waddel Creek and Scott's creek may not be appropriate reference streams for comparison to streams in many parts of the Pajaro

River Watershed project area. Climatologically, Waddell and Scott's creek are located in the Redwood belt of Santa Cruz County, and receive substantially more rainfall in comparison to many Pajaro Watershed streams.

To further test the conclusions staff made in the project report with respect to the Waddell and Scott's Creeks reference streams, staff evaluated fecal coliform data from the Arroyo Seco River. The Arroyo Seco River is a tributary to the Salinas River having a confluence with the Salinas River approximately one mile upstream of the City of Gonzales. The headwaters of the Arroyo Seco contain minimally impacted areas that closely reflect natural bacteria densities in headwaters areas in the area. The upper watershed is within public lands of the U.S. Forest service that are largely undeveloped.

The Arroyo Seco River is an inland surface stream located south of the Pajaro River Watershed project area, approximately 30 miles south-southwest of the San Benito River at Willow Creek. Climatic and precipitation conditions in the Arroyo Seco watershed are relatively similar to the inland streams of the Pajaro River watershed project area. Precipitation in the Arroyo Seco watershed ranges from an annual average of 11 inches of rain per year in the lower watershed – i.e., valley floor (NWS station 048338 at King City), to 24 inches per year in the headwater areas at the Paloma weather station (NWS station 048338). This compares reasonably well to the average annual rainfall of 12 inches per year at the lower San Benito River at Willow Creek (Weather Station 047721), to 16 inches of rainfall per year in the San Benito River headwater reaches (Hernandez 2 NWS station 043925).

Table A.4-4 shows the data from the Arroyo Seco River monitoring site titled ARR-GOR. Note that the concentration of *E. coli* at this monitoring site were well below the USEPA recommended criteria of 126 MPN/100mL.

Table A.4-4: E. Coli Data from Arroyo Seco River upper watershed

Site ARR-GOR	*E. coli* MPN/100mL	USEAP WQ Criteria (MPN/100mL)
04/18/06	**15**	126
05/15/06	**11**	126
8/22/06	**5**	126
I10/10/06	**5**	126

It is important to note that these headwater areas in the Arroyo Seco watershed are likely not representative of valley floor, agricultural and urban watersheds of the Pajaro River watershed. However, they may provide insight on the bacteria load conditions within headwaters of Pajaro River watershed streams.

Two CCAMP monitoring stations on the lower Arroyo Seco River (valley floor) represent water quality conditions of the river as it drains from the undeveloped uplands, and through agricultural lands on the valley floor (Table A.4-5). Land use analysis indicates that lands associated with these sites are characterized largely by cultivated cropland, with minor amounts of pasture and grassland (Figure A.4-3). Therefore, the water quality at this site is predominantly representative of cropland drainage, and waters drained from the largely undeveloped uplands.

Table A.4-5: Fecal Coliform Data from Arroyo Seco River, lower watershed (valley floor)

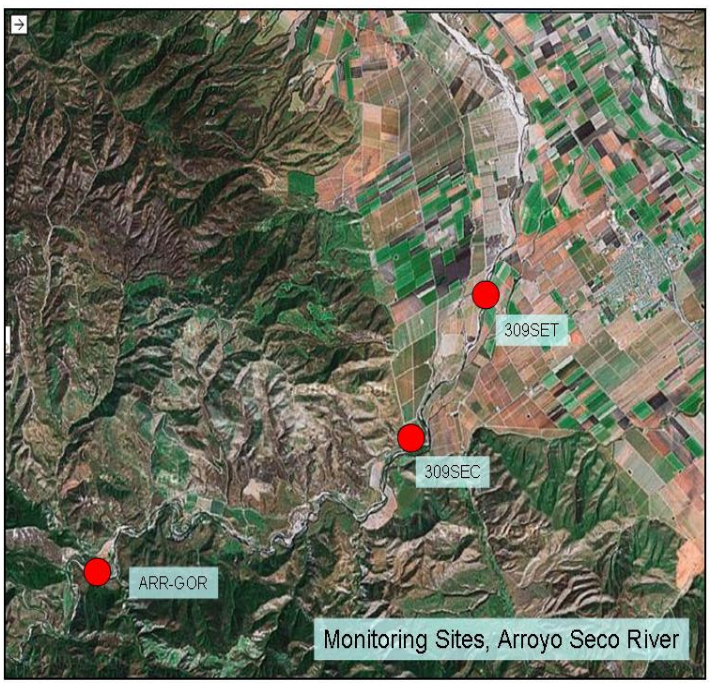
Monitoring Site	# of Samples	Range of Samples (MPN/100mL)	Geomean of Samples (MPN/100mL)	*Fecal Coliform* WQ Criteria (MPN/100mL)	# of samples exceeding WQ criteria	Status*
309SEC (Elm St.)	20	2 - 1700	**53**	**400**	3 of 20	Not impaired
309SET (Thorne Rd.)	15	2 - 800	**37**	**400**	2 of 15	Not impaired

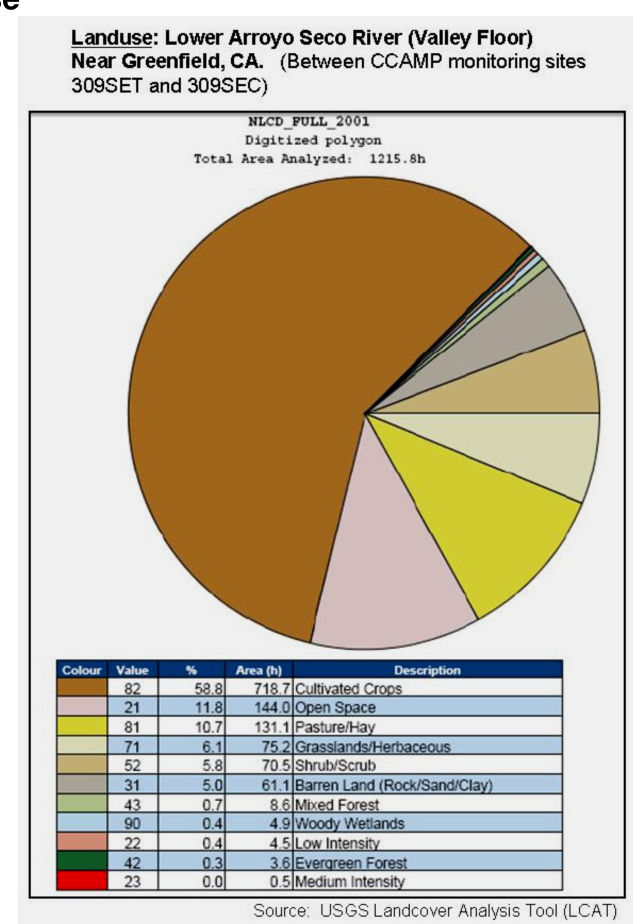
* Reference: State Water Resources Control Board, 303(d) Listing Policy, 2004, Table 3.2

Fecal coliform data for the two valley floor sites, 309SET and 309SEC have relatively low concentrations, with geomeans ranging from 35 MPN/100mL to 53MPN/100 mL. Collectively, monitoring sites ARR-GOR, 309SEC and 309SET suggest that this segment of the Arroyo Seco represents a central coast inland valley floor stream dominated by drainage from predominantly undeveloped upland forest and grassland areas and some irrigated cropland valley floor drainage.

Collectively, Arroyo Seco data appear to indicate that fecal coliform sources may not contribute to sustained and frequent exceedences of fecal coliform water quality objectives in valley floor streams that drain largely undeveloped areas and minor amounts of cultivated cropland. Staff acknowledges that the Arroyo Seco may be not representative of all streams in the Pajaro Watershed project area. Wildlife probably can and do periodically cause exceedances of water quality objectives, either through in-stream defecation, or from runoff of fecal matter from land.

Figure A.4-3: Arroyo Seco River (lower) Land Use





6) BRI_22 Source Load Assessment

For subwatershed BRI_22, the relative contribution of various sources to the baseline conditions were estimated from empirical land use, livestock, human, wildlife, data used in conjunction with the Bacteria Source Load Calculator (BSLC) spreadsheet. BSLC characterizes how bacterial loads are spatially and temporally distributed in the watershed from user input, and processes source data to calculate fecal coliform loads to land, and loads to stream from direct in-stream deposition. Estimated stream loads resulting from fecal coliform fraction deposited on land as calculated in BSLC can then be estimated by using reasonable loading and runoff parameters found in the scientific literature.

The BSLC spreadsheet calculations and input parameters are included in Section 7 of this Attachment. Summary results of the BSLC simulation and the estimated loads from non-point sources are tabulated in Tables A.4-6 through A.4-9. It is important to note that these tables carry no regulatory consequences; they are provided for screening and informational purposes only.

Table A.4-6: Subwatershed BRI_22 NPS Annual Loads from In-stream Defecation

Source	FC Direct Deposit Load to Stream (x 10^8 cfu/year)	Percent of total load to stream from direct (in-stream) nonpoint sources
Cattle in Streams	**1,935,766**	96%
Other Livestock in Streams	**0**	0%
Wildlife in Streams	**80,474**	4%
Straight Pipes	**0**	0%
Total	**2,016,240**	100%

BSLC itself does not simulate die-off once bacteria reach the land surface. However, attenuation of bacteria prior to runoff into streams was incorporated by comparing the fecal coliform totals deposited on land, to the concentrations of fecal coliform in runoff leaving various land uses reported in the literature. This is identified as the delivery potential of fecal coliform in Table A.4-7. Current stream load proportions from land runoff were estimated by multiplying the wet season fecal coliform loads deposited to land (Dec. through May) from the BSLC spreadsheets (Section 6 of this Attachment), by the delivery potential (% - the fractional amount of land load washed into streams) estimated in Table A.4-7. It is assumed that little if any dry season (June through Nov.) overland flow reaches waterbodies from fecal deposits on land in the subwatershed.

Table A.4-7:: BRI_22 NPS Annual Loads from Land Runoff

Land Use	Total FC Produced (x 10^8 cfu/year)	% of FC Available for Potential Runoff [4]	Literature Reported FC Load Potential (loads from land runoff) [1, 2, 3]	Source for FC Load Potential [1, 2]	Est. Delivery Potential: % of FC delivered to streams (cfu/year) [5]	Estimated FC Load To Stream (cfu/year)
Cropland	10,147	100%	4.86 E+08 cfu/acre-year	Horner, 1992	2.85% wet season, 0% dry season	**1.55E+10**
Pasture	391,383,075	100%	1.94 E+09 cfu/acre-year	Horner, 1992	0.20% wet season, 0% dry season	**3.53E+13**
Forest	1,064,662	100%	4.86 E+08 cfu/acre-year	Horner, 1992	2.65% wet season; 0% dry season	**1.51E+12**
Residential (septic only)	18,744	10%	10% of the FC available for potential runoff ;and 2% of septics are proximal enough to surface water to contribute to stream loading	Cal SWRCB OSDS Draft EIR; Chico State Univ. (2003)	0.2% wet season; 0% dry season	**1.87E+09**
Total	**392,522,679**					**3.68E+13**

Sources/Assumptions:

1) Horner (1992) as reported in Shaver et al., 2007, Fundamentals of Urban Runoff Management, 2nd edition. Study reported a range of fecal coliform loading potential (minimum, median, maximum) from various landuses in the Pacific Northwest. Since San Benito county is a relatively arid climate, the low end (minimum) estimates of runoff concentration for forest and pasture/rangeland from Shaver (2007) were used for the BRI_22 subwatershed,. It was assumed loading (runoff) from cropland was similar to forest. This is consistent with USEPA's Protocol for Developing Pathogen TMDLs (2001), Table 5-2, in which literature values for fecal coliform concentrations in runoff from cropland, and background runoff concentrations are within similar ranges, and both are up to an order of magnitude lower than FC concentrations in the grazed rangeland runoff. It is also assumed for BIR_22 that the loading from land (runoff) using the values of Shaver (2007) occurs only in the wet season (Dec. through May, as calculated in the BSLC spreadsheet)

2) California SWRCB AB885 Draft EIR, for Septic Tanks. Section A20 Used information from Table 2-4 to estimate the proximity of OSDS to surface waters. Estimated that 2% of septics were close enough to surface water (<600 feet) to potentially contribute to loading.

3) Chico State University (2003), Status Report: Onsite Wastewater Treatment Systems in California. Used septic tank repair rates for San Benito county to estimate septic tank failure rate. Estimated 2% annual failure rate for use in BSLC spreadsheet tool load calculation.

4) Assumed 10% of FC discharged to land from failing septics is available for potential discharge into waterbodies. (effluent surfacing, etc).

5) Derivation of % residential FC discharged to stream: 10% OSDS FC available for potential runoff X 2% of OSDS proximal to waterbody = 0.2% FC wet season loads discharged to stream (note: septic failure rate is accounted for in BSLC spreadsheet load calculation.) Derivation of % forest/rangeland/cropland FC discharged to stream: i.e., For forest = [Annual Load cfu/year-acre (from Shaver, 2007) X acres of forest in BRI-22] / FC deposited on BRI_22 Forest (cfu/year, from BSLC calculation) X 100 = Estimated percent of FC deposited on forest and subsequently delivered to stream in BRI_22 (rainy season).

Table A.4-8: Estimated Total Annual and Seasonal FC Loads to BRI_22 Watershed

BRI_22 Annual FC Load		% of Annual Load	Seasonal FC Load (Dec. - May)		% of Wet Load	Seasonal FC Load (June- Nov.)		% of Dry Load
Cropland	1.55E+10	0%	Cropland	1.55E+10	0%	Cropland	0	0%
Pasture	3.53E+13	15%	Pasture	3.53E+13	41%	Pasture	0	0%
Forest	1.51E+12	1%	Forest	1.51E+12	2%	Forest	0	0%
Residential	1.87E+09	0%	Residential	1.87E+09	0%	Residential	0	0%
Cattle in Streams	1.94E+14	81%	Cattle in Streams	4.513E+13	52%	Cattle in Streams	1.48E+14	97%
Wildlife in Streams	8.05E+12	3%	Wildlife in Streams	4.288E+12	5%	Wildlife in Streams	4.31E+12	3%
Total	**2.38E+14**							

Table A.4-9: Assimilative Capacity and Fecal Coliform Load: BRI 22 Subwatershed

Stream Mean Assimilative Capacity		**Estimated Annual Source Load Contribution (cfu/year)**						
San Benito River Annual Mean Flow (cfs)*	Assimilative Capacity (cfu/year)**	Cropland	Pasture	Forest	Residential	Cattle in Streams	Wildlife in Streams	**Total Est. Annual NPS Load**
30	**1.07 E+14**	1.55E+10	3.53E+13	1.51E+12	1.87E+09	1.94E+14	8.05E+12	**2.38E+14**

* @ USGS Gage 111565000

** @ FC water quality criteria of 400 mpn/mL

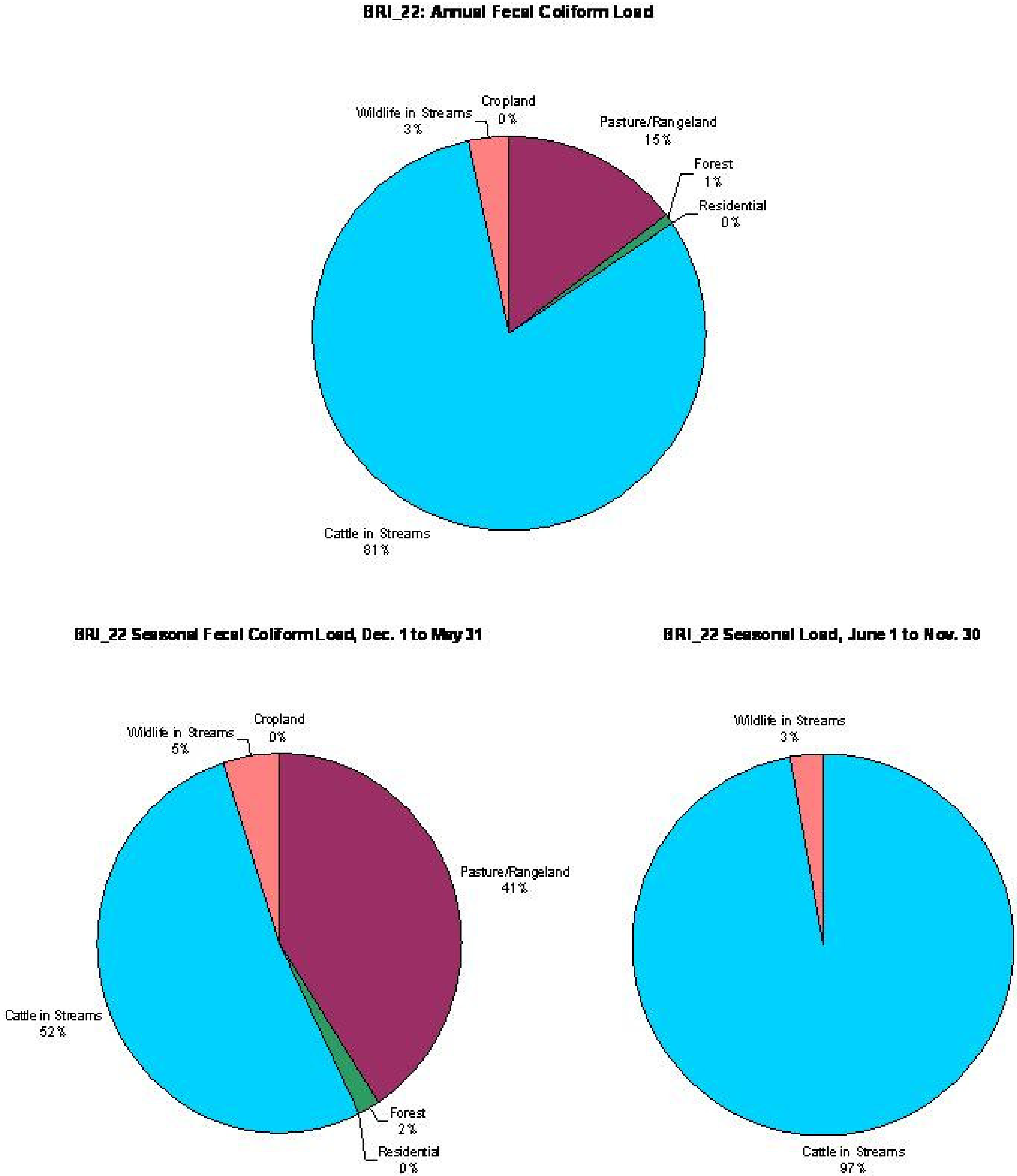
The *predicted* annual load as well as the seasonal loads, falls well within the range of *observed* loads (from monitoring data). The predicted total annual load is also significantly less than a magnitude of difference from an observed annual load calculated from the statistical geomean of the monitoring data. This indicates that the predicted loads from the calculations calibrate reasonably well with observed loads from monitoring data.

The results of the calculations suggest that loads from rangeland and cattle in stream are the predominant source of fecal coliform loading to the San Benito River in subwatershed BRI_22. Calculated wildlife loads are significantly below the assimilative capacity of the water body on an annual, and seasonal basis.

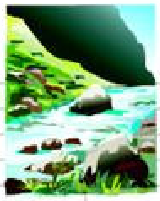
Staff acknowledges that these results do not preclude that background sources can periodically cause exceedences of the fecal coliform water quality objective. It is also recognized that this analysis is specific to the BRI_22 subwatershed, and the results cannot quantitatively be extrapolated to other subwatersheds in the project area. However, the results of this analysis appear to indicate that natural background fecal coliform loads do not cause sustained exceedences of the water quality objective leading to impairment of the San Benito River in this subwatershed (see Figure A.4-4).

In summary, based on the reference stream conditions noted for the Arroyo Seco River, and based on the source load calculations for the BRI_22 subwatershed, staff conclude that uncontrollable natural sources are not likely causing sustained and widespread water quality exceedences of fecal coliform water quality objectives leading to impairment of the waterbodies in the project area.

Figure A.4-4: Proportional Fecal Coliform Source Loading, Annual and Seasonal



7) BSLC Spreadsheets, Calculations, References



Stream Loading Results

(all values listed in cfu/month)

Blue - Wet Season, Yellow -Dry Season

San Benito BRI22

Month	Beef Cows	Sheep	Deer	Raccoons	Wild Turkeys	Other Wildlife (assume = Deer)	Wild Pig	Coyote	Pheasant	Hog	Total
January	4.21868E+12	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	4.95E+12
February	4.51304E+12	0	4.22E+10	6.91E+10	1.53E+10	4.22E+10	3.70E+11	8.19E+10	4.41E+10	0.00E+00	5.18E+12
March	7.64864E+12	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	8.38E+12
April	1.01532E+13	0	4.48E+10	7.34E+10	1.62E+10	4.48E+10	3.93E+11	8.70E+10	4.69E+10	0.00E+00	1.09E+13
May	1.61777E+13	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	1.69E+13
June	3.75243E+13	0	4.48E+10	7.34E+10	1.62E+10	4.48E+10	3.93E+11	8.70E+10	4.69E+10	0.00E+00	3.82E+13
July	3.98023E+13	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	4.05E+13
August	4.08294E+13	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	4.16E+13
September	1.73599E+13	0	4.48E+10	7.34E+10	1.62E+10	4.48E+10	3.93E+11	8.70E+10	4.69E+10	0.00E+00	1.81E+13
October	7.33683E+12	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	8.07E+12
November	5.59137E+12	0	4.48E+10	7.34E+10	1.62E+10	4.48E+10	3.93E+11	8.70E+10	4.69E+10	0.00E+00	6.30E+12
December	2.42115E+12	0	4.63E+10	7.58E+10	1.68E+10	4.63E+10	4.06E+11	8.99E+10	4.84E+10	0.00E+00	3.15E+12

Forest Loading Results

(all values listed in cfu/month)

Blue - Wet Season, Yellow -Dry Season

San Benito BRI22

Month	Deer	Raccoons	Wild Turkeys	Other Wildlife (assume = Deer)	Wild Pig	Coyote	Pheasant	Total
January	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
February	5.81E+11	6.22E+11	2.10E+11	5.81E+11	5.09E+12	1.13E+12	6.07E+11	8.82E+12
March	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
April	6.17E+11	6.60E+11	2.23E+11	6.17E+11	5.40E+12	1.20E+12	6.45E+11	9.36E+12
May	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
June	6.17E+11	6.60E+11	2.23E+11	6.17E+11	5.40E+12	1.20E+12	6.45E+11	9.36E+12
July	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
August	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
September	6.17E+11	6.60E+11	2.23E+11	6.17E+11	5.40E+12	1.20E+12	6.45E+11	9.36E+12
October	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12
November	6.17E+11	6.60E+11	2.23E+11	6.17E+11	5.40E+12	1.20E+12	6.45E+11	9.36E+12
December	6.37E+11	6.82E+11	2.30E+11	6.37E+11	5.58E+12	1.24E+12	6.67E+11	9.67E+12

Cropland Loading Results

(all values listed in cfu/month)
Blue - Wet Season, Yellow -Dry Season

San Benito BRI22

Month	Deer	Wild Turkeys	Other Wildlife (assume = deer)	Wild Pig	Coyote	Pheasant	Total
January	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
February	5.99E+09	2.16E+09	5.99E+09	5.24E+10	1.16E+10	6.26E+09	8.45E+10
March	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
April	6.36E+09	2.30E+09	6.36E+09	5.57E+10	1.23E+10	6.65E+09	8.97E+10
May	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
June	6.36E+09	2.30E+09	6.36E+09	5.57E+10	1.23E+10	6.65E+09	8.97E+10
July	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
August	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
September	6.36E+09	2.30E+09	6.36E+09	5.57E+10	1.23E+10	6.65E+09	8.97E+10
October	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10
November	6.36E+09	2.30E+09	6.36E+09	5.57E+10	1.23E+10	6.65E+09	8.97E+10
December	6.57E+09	2.38E+09	6.57E+09	5.76E+10	1.28E+10	6.87E+09	9.27E+10

Pasture/Rangeland Loading Results

Please Note that this is ONLY Pasture Deposition

(all values listed in cfu/month)

Month	Beef	Sheep	Deer	Wild Turkeys	Other Wildlife (Assume= Deer)	Wild Pig	Coyote	Pheasant	Hog	Total
January	2.70E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	2.95E+15
February	2.88E+15	1.71E+14	3.59E+12	1.30E+12	3.59E+12	3.15E+13	6.97E+12	3.76E+12	1.34E+13	3.12E+15
March	3.26E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	3.51E+15
April	3.24E+15	1.81E+14	3.82E+12	1.38E+12	3.82E+12	3.34E+13	7.40E+12	3.99E+12	1.42E+13	3.48E+15
May	3.44E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	3.69E+15
June	3.39E+15	1.81E+14	3.82E+12	1.38E+12	3.82E+12	3.34E+13	7.40E+12	3.99E+12	1.42E+13	3.64E+15
July	3.60E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	3.85E+15
August	3.69E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	3.95E+15
September	3.69E+15	1.81E+14	3.82E+12	1.38E+12	3.82E+12	3.34E+13	7.40E+12	3.99E+12	1.42E+13	3.93E+15
October	2.34E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	2.59E+15
November	2.38E+15	1.81E+14	3.82E+12	1.38E+12	3.82E+12	3.34E+13	7.40E+12	3.99E+12	1.42E+13	2.63E+15
December	1.55E+15	1.87E+14	3.94E+12	1.43E+12	3.94E+12	3.45E+13	7.65E+12	4.12E+12	1.47E+13	1.80E+15

Residential Loading

(all values listed in cfu/month)
Blue - Wet Season, Yellow -Dry Season

Month	Rural Pets	Urban Pets	Failed Septic Systems	Total
January	3.906E+11	0	1.5934E+11	5.4994E+11
February	3.56E+11	0	1.45205E+11	5.01155E+11
March	3.906E+11	0	1.5934E+11	5.4994E+11
April	3.78E+11	0	1.542E+11	5.322E+11
May	3.906E+11	0	1.5934E+11	5.4994E+11
June	3.78E+11	0	1.542E+11	5.322E+11
July	3.906E+11	0	1.5934E+11	5.4994E+11
August	3.906E+11	0	1.5934E+11	5.4994E+11
September	3.78E+11	0	1.542E+11	5.322E+11
October	3.906E+11	0	1.5934E+11	5.4994E+11
November	3.78E+11	0	1.542E+11	5.322E+11
December	3.906E+11	0	1.5934E+11	5.4994E+11

REFERENCES AND ASSUMPTIONS FOR BSLC TOOL

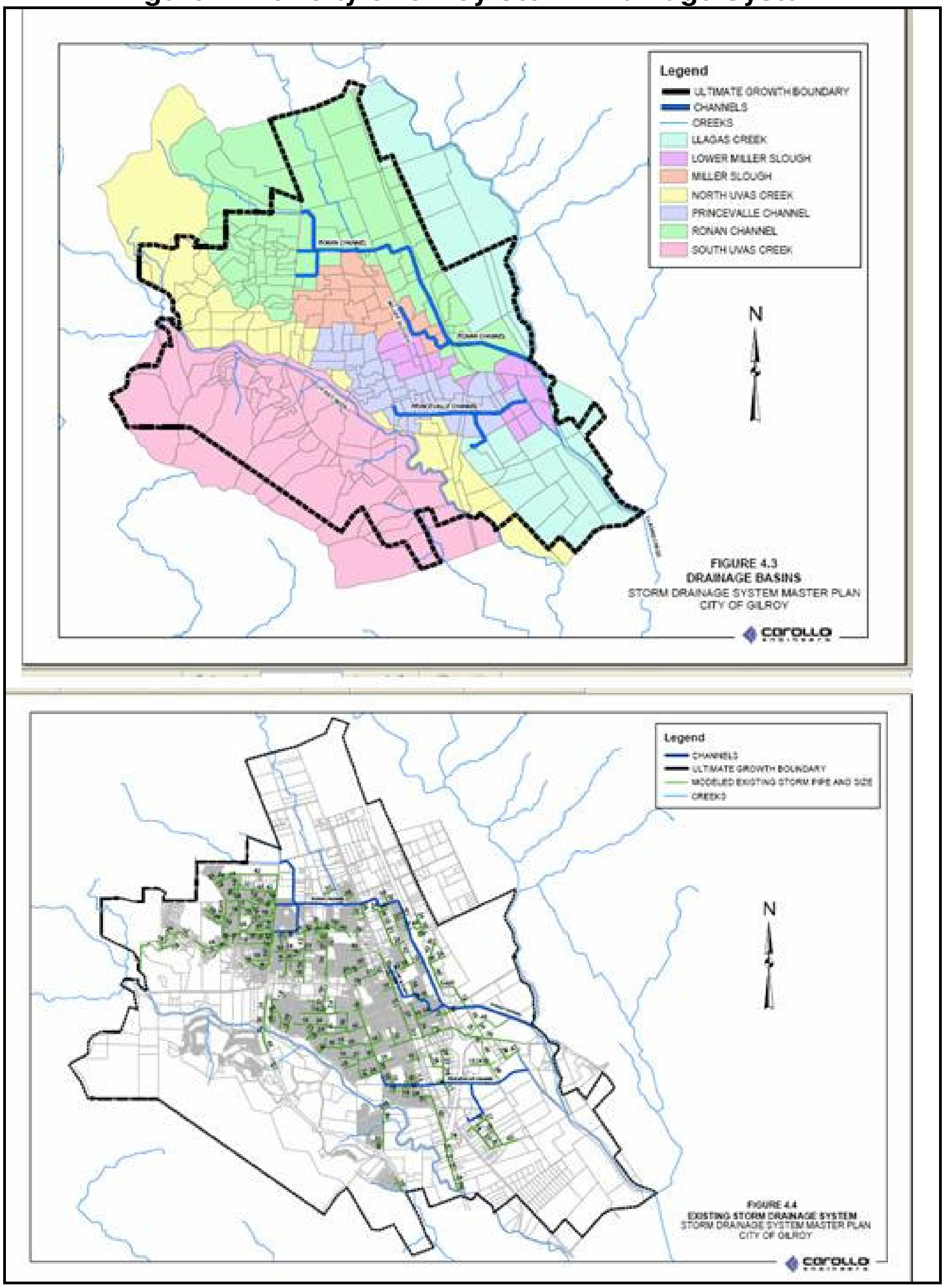
	Parameter	San Benito BRI22	Units	Source
Beef Cow Parameters				
	Average weight of beef cow	1000	lb	
	Fecal coliform production by 1000-lb beef cow	3.30E+10	total cfu/day-animal	within range of values from literature (Mountain Run TMDL, ASAE Standards, Geldreich)
	Ratio of beef cattle on: Pasture 1	4	ratio	Assumed to be 4:2:1 based on information gathered from
	to Pasture 2	2	ratio	beef extension specialists at Virginia Tech.
	to Pasture 3	1	ratio	
	Fraction of rangeland cattle assumed to have access to stream/drainage/water body	0.25		Monterey County NRCS, Danny Marquis (personal comm.), Dec. 2008
	Manure excreted by beef cow	60	lb/day-animal	Livestock Waste Facilities Handbook, MWPS - 18
	Fraction of cows defecating in stream as compared to the cows that are in/around streams (beef)	0.3	ratio	assumed
Sheep and Goat Parameters				
	Ewe Weight	60	lbs	ASAE 1998 Standards: D384.1 DEC93
	Lamb Weight	30	lbs	BPJ - 1/2 weight of ewes
	Goat Weight	140	lbs	ASAE 1998 Standards: D384.1 DEC93
	How many lambs should be associated with each ewe?	2	lambs/ewe	BPJ
	Ratio of sheep and goats on: Pasture 1	3	ratio	
	to Pasture 2	2	ratio	
	to Pasture 3	0	ratio	
	Fraction of sheep defecating in stream as compared to the sheep that are in/around streams	0	ratio	assume domestic sheep are confined or don't have access to streams
	Fecal coliform production by 60-lb sheep	1.20E+10	total cfu/day-animal	ASAE 1998 Standards: D384.1 DEC93
	Manure excreted by sheep	2.4	lb/day-animal	ASAE 1998 Standards: D384.1 DEC93
Poultry Parameters				
	Length of layer cycle (including down time)	336	days	
	Length of broiler cycle (including down time)	56	days	
	Length of turkey cycle (including down time)	70	days	
	Manure production by layers	0.256	lb/day-bird	ASAE D384.1 DEC93
	Manure production by broilers	0.168	lb/day-bird	ASAE D384.1 DEC93
	Manure production by turkeys	0.705	lb/day-bird	ASAE D384.1 DEC93
	Fecal coliform production by layers	1.40E+08	cfu/day-bird	ASAE D384.1 DEC93
	Fecal coliform production by broilers	8.90E+07	cfu/day-bird	based on relative manure production of layers & broilers
	Fecal coliform production by turkeys	9.30E+07	cfu/day-bird	ASAE D384.1 DEC93
	Layer litter produced	30	lb/cycle-bird	Va. Nutrient Management Handbook

Broiler litter produced	2.6	lb/cycle-bird	Va. Nutrient Management Handbook
Turkey litter produced	18	lb/cycle-bird	Va. Nutrient Management Handbook
Occupancy Factor for layers	0.958	ratio	
Occupancy Factor for broilers	0.787	ratio	
Occupancy Factor for turkeys	0.865	ratio	
Die-off coefficient for poultry litter	0.035	1/day	Kimberly Panhorst's research
Survival Factor for poultry litter	0.099	factor	
Hog Parameters			
Ratio of hogs on: Pasture 1	4	ratio	Model default
to Pasture 2	2	ratio	
to Pasture 3	1	ratio	
Fraction of hogs defecating in stream as compared to the sheep that are in/around streams	0	ratio	
Fecal coliform production by hog	1.10E+10	total cfu/day-animal	Pig value, as reported in USEPA Protocol for Developing Pathogen TMDLs (2001)
Hours spent in and around streams	0		assume domestic hogs are confined or don't have access to streams
Wildlife Parameters			
Deer fecal coliform produced	3.50E+08	total cfu/day-animal	Yagow (2001) FC and Harlow (1983) forage
Fraction of time deer defecating in stream	0.01	ratio	
Raccoon fecal coliform produced	5.00E+07	total cfu/day-animal	
Fraction of time raccoons defecating in stream	0.1	ratio	
Wild pig fecal Coliform Produced	1.10E+10	total cfu/day-animal	Assume same as domestic hog
Fraction of time wild pig defecating in stream	0.01	ratio	
Coyote fecal coliform produced	5.00E+09	total cfu/day-animal	Dog values, as reported in USEPA Protocol for Developing Pathogen TMDLs (2001)
Fraction of time coyote defecating in stream	0.01	ratio	
Wild Turkey fecal coliform produced	9.30E+07	total cfu/day-animal	Assume = domestic turkey
Fraction of time wild turkeys defecating in stream	0.01	ratio	
Pheasant fecal coliform produced	9.30E+07	total cfu/day-animal	assume equal to turkey
Fraction of time pheasant defecating in stream	0.01	ratio	
Human Activities			
Human fecal coliform production	2.00E+09	total cfu/day-animal	Geldreich
Pets per sewered household	1		
Pets per unsewered household	1		
Pet fecal coliform production	4.50E+08	total cfu/day-animal	Geldreich
Failure rate of 'old' septic systems	0.4	fraction	
Failure rate of 'mid-age' septic systems	0.2	fraction	
Failure rate of 'new' septic systems	0.02	fraction	
Tillage and Application Activities			
Not applicable for BRI_22 subwatershed			

8) Gilroy Urban Watershed

The City of Gilroy is located in southern Santa Clara county, at the lower end of the Llagas Creek and Uvas Creek watersheds. The two creeks flow southeasterly to their confluence with the Pajaro River south of Gilroy. This screening level analysis is conducted on the urban watershed defined by the City of Gilroy and specifically evaluates the City's estimated urban loads to Llagas Creek. The City's storm drainage system directs most of the City's runoff to Llagas Creek (City of Gilroy Storm Drainage System Master Plan, 2004). Uvas Creek watershed drains the southwest parts of the City, and combines with Llagas Creek south of the City (See Figure A.4-5).

Figure A.4-5: City of Gilroy Storm Drainage System



Source: City of Gilroy, Storm Drainage Master Plan (2004)

9) Land Use

Table A.4-10: Gilroy Urban Subwatershed Land Use:

Landuse	Acres	Impervious Cover (%)
Hillside Residential	1155	15
Low Density Residential	2105	35
Medium Density Residential	225	50
High Density Residential	70	60
Commercial	1028	95
Industrial	614	70
Vacant Lot	3877	-
Rural	231	-
Forest*	36	-

Source: City of Gilroy Website/Master Plans
*Estimated from US Geological Survey, Land Cover Analysis Tool

10) Gilroy Urban Subwatershed Source Load Assessment

A screening level assessment of the load sources of fecal coliform to Llagas Creek were estimated using Watershed Treatment Model, V.3.1 (WTM). This is a spreadsheet tool developed by the Center for Watershed Protection for the U.S. Environmental Protection Agency. It is primarily designed, for rapid assessment of load parameters and treatment options appropriate for urban subwatersheds. WTM uses the Simple Method (Schueler, 1987), a USEPA-recognized empirical methodology of calculating loads from urban stormwater runoff, plus area loading factors to calculate loads from non-urban sources.

The WTM input parameters and spreadsheets are shown below. Staff did not use the default WTM value for fecal coliform loading rate from urban land (20,000 mpn/100mL). Staff used the median urban runoff concentration value (5091 mpn/100mL) from National Stormwater Quality Database (NSQD, 2004). The NSQD median value was judged to be more representative of CCAMP urban stormwater drain outfall data that has been collected in the Central Coast Region.

	A	B	C	D	E	F	G
1	**Gilroy Urban Watershed WTM Fecal Coliform Load Calculations**						
2							
3	**PRIMARY SOURCES - Land Use (Runoff)**						
4			Area (Acres)	Impervious Cover (%)	FC Concentration (MPN/100mL)	Annual Loading Rates (FC # Billion/acre)	Fecal Coliform (# Billion/year)
5							
6	Residential	LDR (<1du/acre)	2105	35	5091	36	76,545
7		MDR (1-4 du/acre)	225	50	5091	50	11,208
8		HDR (>4 du/acre)	70	60	5091	59	4,115
9		Hillside residential	1155	15	5091	18	21,288
10						12	-
11	Commercial		1028	95	5091	90	92,686
12						-	-
13	Roadway			80	20000	301	-
14						-	-
15	Industrial		614	70	5091	68	41,596
16						-	-
17	Forest		36	1		12	432
18							-
19	Rural		231	5		39	9,009
20							-
21	Open Water						-
22	Active Construction						
23	Vacant Lots		3877			0	
24	**Total**		9341	26.58		27	256,877
25							

Partitioning Coefficients for Rural and Forest Land

Pollutant	TN	TP	TSS	FC
Fraction as Storm Load	50%	70%	90%	100%

Watershed Data

Annual Rainfall (inches)	21.11
Watershed Area (acres)	9341
Stream Length (miles)	20
Planning Horizon (years)	13

SECONDARY SOURCES

General Sewage Use Data

Dwelling Units	12152	Indiduals/Dwelling Unit	2.7
		Water Use (gpcd)	70
		Wastewater Characteristics	
		TN (mg/l)	60
		TP (mg/l)	10
		TSS (mg/l)	400
		FC (MPN/100 ml)	10000000

SSOs

Miles of Sanitary Sewer	160	Overflows/1,000 Miles of Sewer	140
Fraction of Load as Storm Flow	50%	Volume per Overflow (gallons)	500

Total Annual Loads-Secondary Sources

Source	F. Coliform Load (billion/year)
Private Laterals	unknown
SSOs	4,234
CSOs	0
Illicit Connections	unknown
Lawns (Subsurface Flow)	0
Hobby Farms/Livestock	unknown
NPDES Dischargers	0
Total Secondary Load	4,234

WTM Data Inputs

Input	Source
Default, except as below	Watershed Treatment Model, v3.1
Urban Runoff conc. values[A]	National Stormwater Quality Database (NSQD, version 1.1)
SSO[B]	Cal. State Water Board - CIWQS database
Land use[C]	City of Gilroy Master Plans
Impervious surface[C]	City of Gilroy Master Plans
Septic data[D]	Census Bureau, Chico State, Onsite Systems Report (2003)
Precipitation[E]	Western Reg. Climate Center, Gilroy COOP Weather Station 043417

A- http://unix.eng.ua.edu/~rpitt/Research/ms4/Paper/Mainms4paper.html

B- https://ciwqs.waterboards.ca.gov

C - http://www.cityofgilroy.org/cityofgilroy/city_hall/community_development/en

E - http://factfinder.census.gov/ http://www.csuchico.edu/cwtrc/Pages/Newspage.htm

Assumed septic repair rates reported in Chico State study equaled rate of septic failure, assumed 2% of OSDS were within 600 feet of waterbody

The City of Gilroy's Master Plan's did not quantitatively identify how much of the City's drainage was directed to Llagas Creek, relative to Uvas Creek. However, narrative in the Master Plan report and published schematics of the City's storm drain system indicate that the large majority of the City's drainage is directed to Llagas Creek. Staff assumed that around 75% of the fecal coliform load from runoff as calculated by WTM was discharged into Llagas Creek.

To derive the assimilative capacity of Llagas creek, and the fecal coliform loads from the Gilroy urban subwatershed, staff evaluated flow data from USGS stream gage 11153650. It should be noted that the 11153650 stream gage has only a few years of recorded recent flow data, and that the gage is not rated for flows above 200 cubic feet/sec (cfs). Llagas Creek flows exceed 200 cfs several times a year. This introduces some uncertainty into the calculated assimilative capacity for the creek, and it is likely that the stream gage flow record marginally underestimates stream load capacity. Table A.4-10 carries no regulatory consequences and is presented for informational purposes only.

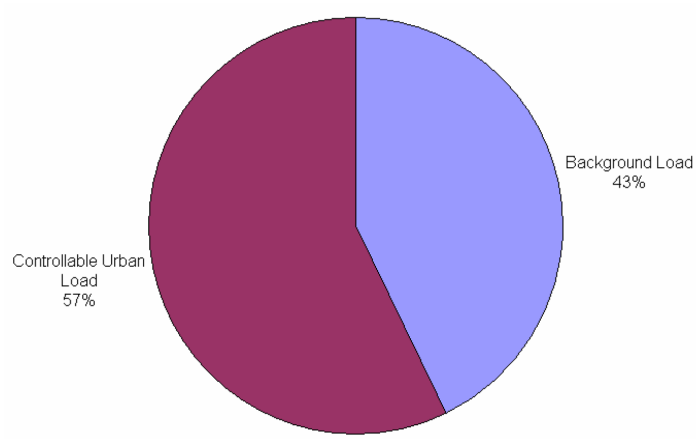
Table A.4-10: Assimilative Capacity of Llagas Creek and Gilroy Urban Loads (Fecal coliform units = MPN/100mL)

Llagas Creek Assimilative Capacity				Urban Watershed Load to Llagas Creek		
Period		**Llagas Creek Mean Flow (cfs)***	**Llagas Creek Loading Capacity**	**Storm Load**	**Non-storm Load****	**Total**
Annual	Year	8.7	2.55E+13	1.93E+14	4.23E+12	1.97E+14
Seasonal	Nov. 1 - April 30	12.6	1.83E+13	1.77E+14	2.12E+12	1.79E+14
	May 1 - Oct. 31	4.9	7.24E+12	1.54E+13	2.12E+12	1.75E+13

* USGS Stream Gage 11153650 (flows, and calculated assimilative capacities likely to be marginally underestimated. The gage is only rated to 200 cfs, and the creek exceeds that flow at least several days a year.
** Non-storm load is likely to be underestimated. WTM input only accounts for SSO overflows. Contribution of loading from private laterals, irrigation, lawn watering, wash water that drain to storm sewers are unknown and unaccounted for.

Table A.4.10 indicates that urban loads to Llagas Creek are exceeding the annual and seasonal capacity of the waterbody. There is uncertainty about how much of the urban load is from controllable sources, and how much is related to uncontrollable natural background. For informational purposes, a screening-level estimate can be derived using the input parameters from the WTM spreadsheet.

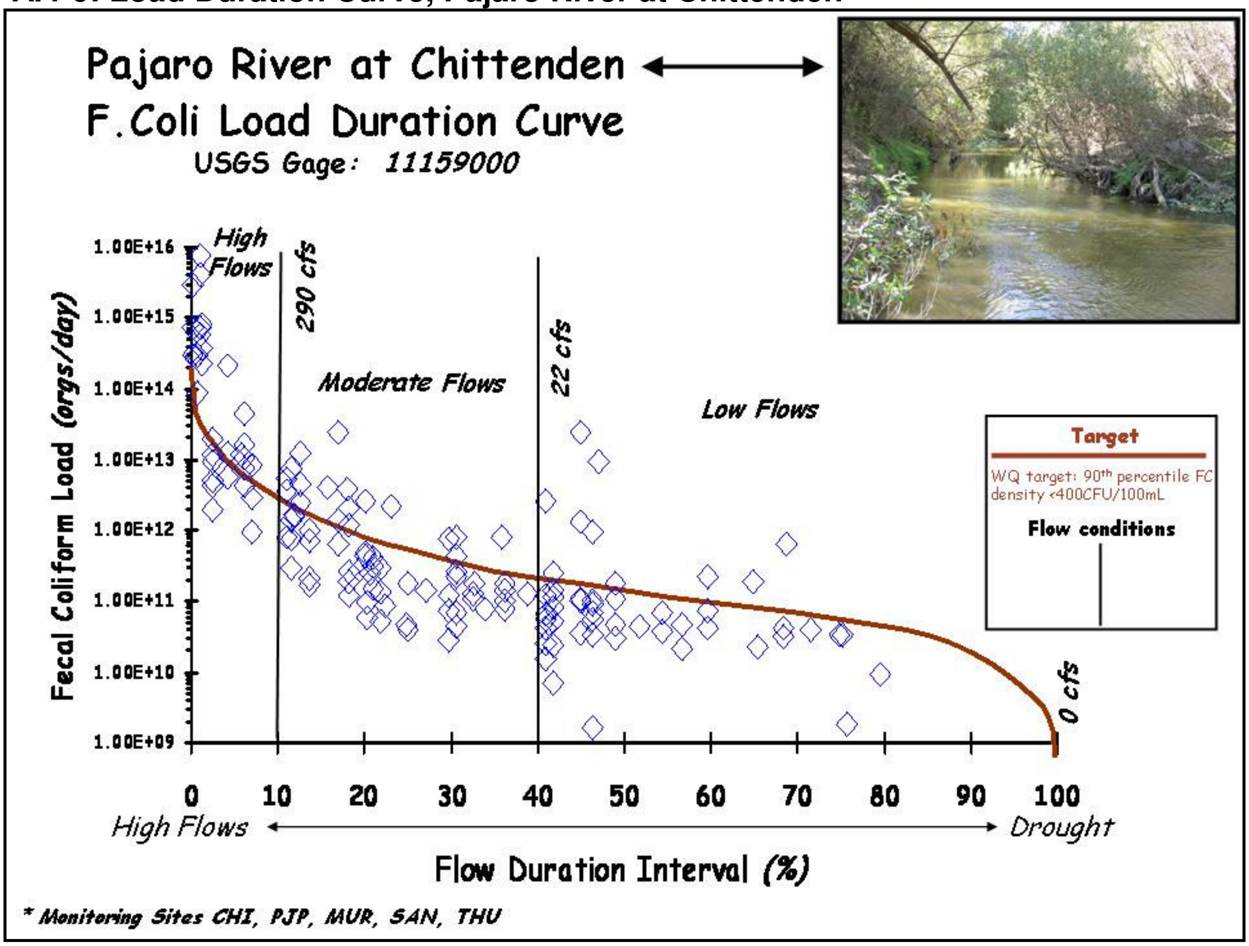
WTM uses input values from the scientific literature for fecal coliform loading rates from various land use categories. It is assumed here that the loading rate associated with "forest" represents a background natural loading rate; 1.2 E+10 MPN/acre-year. Applying this loading rate across the entire geographic extent of the watershed, one can derive a presumed annual fractional "background" load for the urban watershed: (9241 acres) X (1.2 E+10) = 1.12 E+14 MPN. It is assumed, as described earlier, that 75% of the Gilroy urban load drains to Llagas Creek, so the background load to Llagas creek is (1.12 E+14) (0.75)= 8.41 E+13. From Table A.4-10, the total annual storm load to Llagas creek is 1.93 E+14, so the controllable fraction is (1.93 E +$14_{\text{total load}}$) – (8.41 E+$13_{\text{background}}$) = 1.13 E+$14_{\text{controllable load}}$. Consequently, the fractional loads would be represented in the bubble graph to the right.



One further uncertainty pertains to the re-growth and resuspension of bacteria in stream sediment. This naturalized source may have the potential to contribute significant loads to waterbodies. The magnitude and scope to which this naturalized load contributes to degradation of the assimilative capacity of waterbodies in Llagas Creek, and streams throughout the watershed, is largely unknown currently.

The aforementioned stream gage at Llagas creek has a limited flow record, rendering it largely inappropriate for load duration analysis. A load duration curve was developed for the USGS gage station at Chittenden on the Pajaro River, to evaluate the range of water quality responses over the entire spectrum of flow conditions (Figure A.4-6). This stream gage is located approximately 13 miles downstream from the City of Gilroy. Monitoring sites that are proximal to the USGS stream gage at Chittenden were used to plot observed loads. It is assumed that resuspension of bacterial regrowths from sediment substrates will be prevalent during high flows and turbulent conditions.

Figure A.4-6: Load Duration Curve, Pajaro River at Chittenden



The load duration curve indicates that exceedances of the fecal coliform water quality objective are observed during wet and dry weather events. Note that data points above the curve on the left side of the figure are indicative of fecal coliform exceedances during wet weather conditions (higher flows) and data points above the curve to the right side indicate fecal coliform exceedances during dry weather conditions (lower flows). These low flow exceedances indicate that sources of fecal coliform are most likely not related to precipitation events (i.e., runoff). The distribution of exceedances in both high flows and low flows suggests that both non-point sources, direct in-stream depositions, and point sources may be responsible for water quality impairment. Presumably, high flows and turbulence would be the chief factor in resuspending bacteria from stream bottom sediment sinks.

11) Technical References for Appendix A Attachment 4

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APPENDIX A
ATTACHMENT 5
GROUNDWATER AND OSDS HOUSEHOLD SURVEY DATA

Staff evaluated groundwater data from the California Department of Water Resources website to investigate the possibility of shallow groundwater in the project area. Records from six randomly selected wells in the Gilroy-Hollister-San Juan Bautista area indicate that the range to depths to groundwater below surface were between 35 to 126 feet, with an collective average depth of 89 feet below surface, as shown below:

Location	**Well**	**Ave. Depth to Groundwater (ft. below surface)**	**Site Description**
Gilroy-Hollister Valley	12S05E06L001M	110	Valley Floor near Gilroy
Gilroy-Hollister Valley	12S05E17D001M	109	Valley floor near Hollister
Hollister (Ridgemark)	13S05E13J002M	36	Valley Floor @ SB River
San Benito River Hwy 25	19S19E03N001M	126	Upper Watershed
San Juan Batista	12S04E34H001M	104	Valley Floor
Gilroy Hollister Valley (NE of Hollister)	12S05E01G002M	49	Valley Floor Near Tequisquita Slough

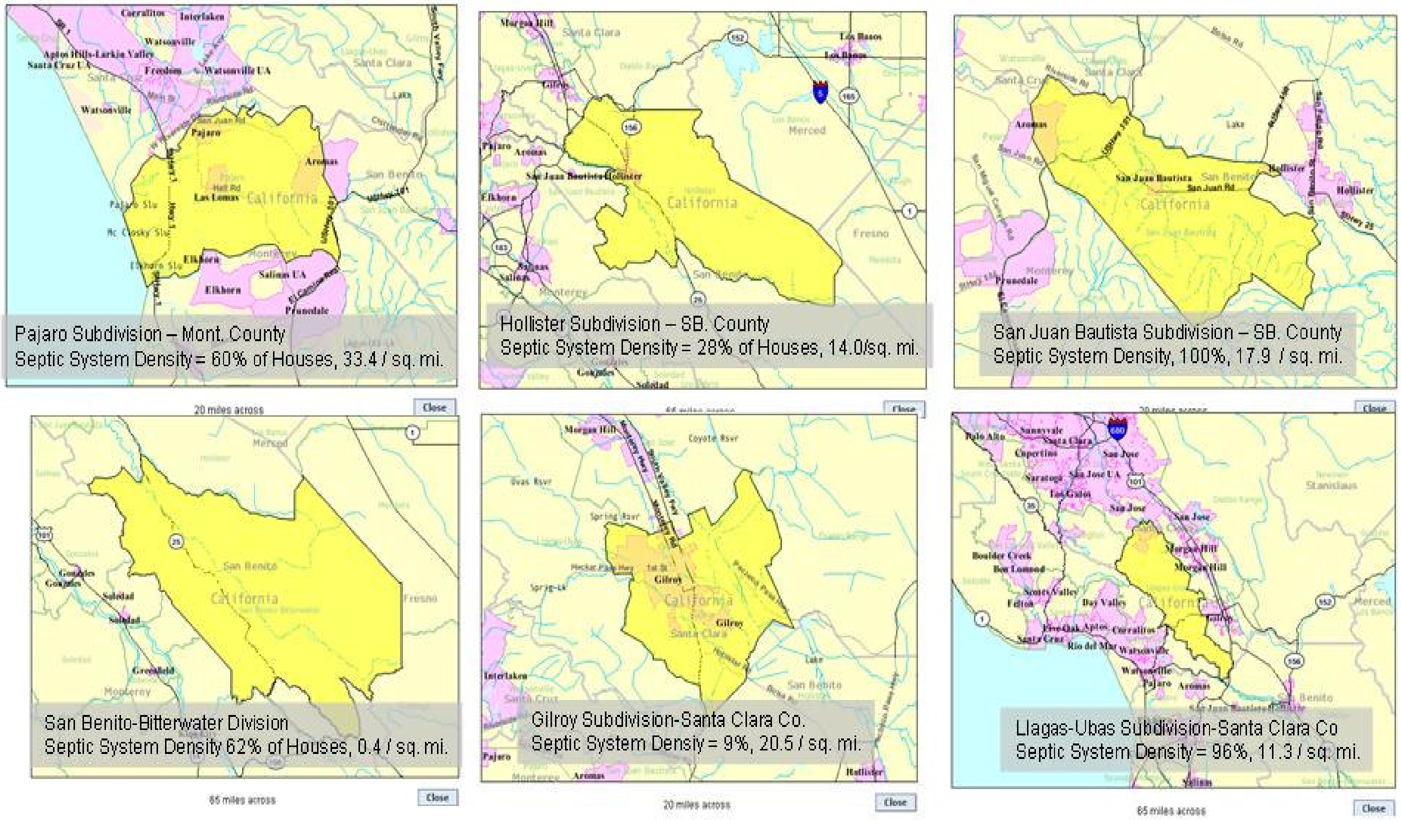
Staff evaluated the amount and density of septic systems in the Pajaro watershed to investigate if there was any positive correlation between the density (number per square mile) of OSDS, and surface water fecal coliform data. The U.S. Census Bureau maintains a database of survey data which reports the type of sewage disposal systems households have. Using the census data staff subdivided the Pajaro watershed into seven census regions which roughly corresponded to the subwatershed scale. Consequently, the estimated densities of OSDS throughout the Pajaro watershed ranged from 0.4 per square mile in the upper San Benito River watershed, to 33.4 per square mile in the lower Pajaro River watershed, as shown below:

	Pajaro division, Monterey County	Hollister division, San Benito County	San Benito-Bitterwater division, San Benito County	San Juan Bautista division, San Benito County	Gilroy division, Santa Clara County	Uvas division, Santa Clara County	Totals
Public sewer	1493	7312	0	655	9631	21	33688
Septic tank or cesspool	2451	2816	294	1083	1015	1026	13829
Other means	117	54	7	9	60	19	343
Total Houses (1990)	4061	10182	301	1747	10706	1066	70% sewered
% on septic	60	28	100	62	9	96	29% septics
Total area Mi^2	79.84	282.49	1041.4	66.85	57.84	102.09	1769.96
Total Houses 2000 Census	4446	14154	413	1932	13150	1199	16323 on Septic
Septic Density (no./mi^2)*	33.41	14.029	0.39	17.91	20.46	11.27	6.3/mi^2

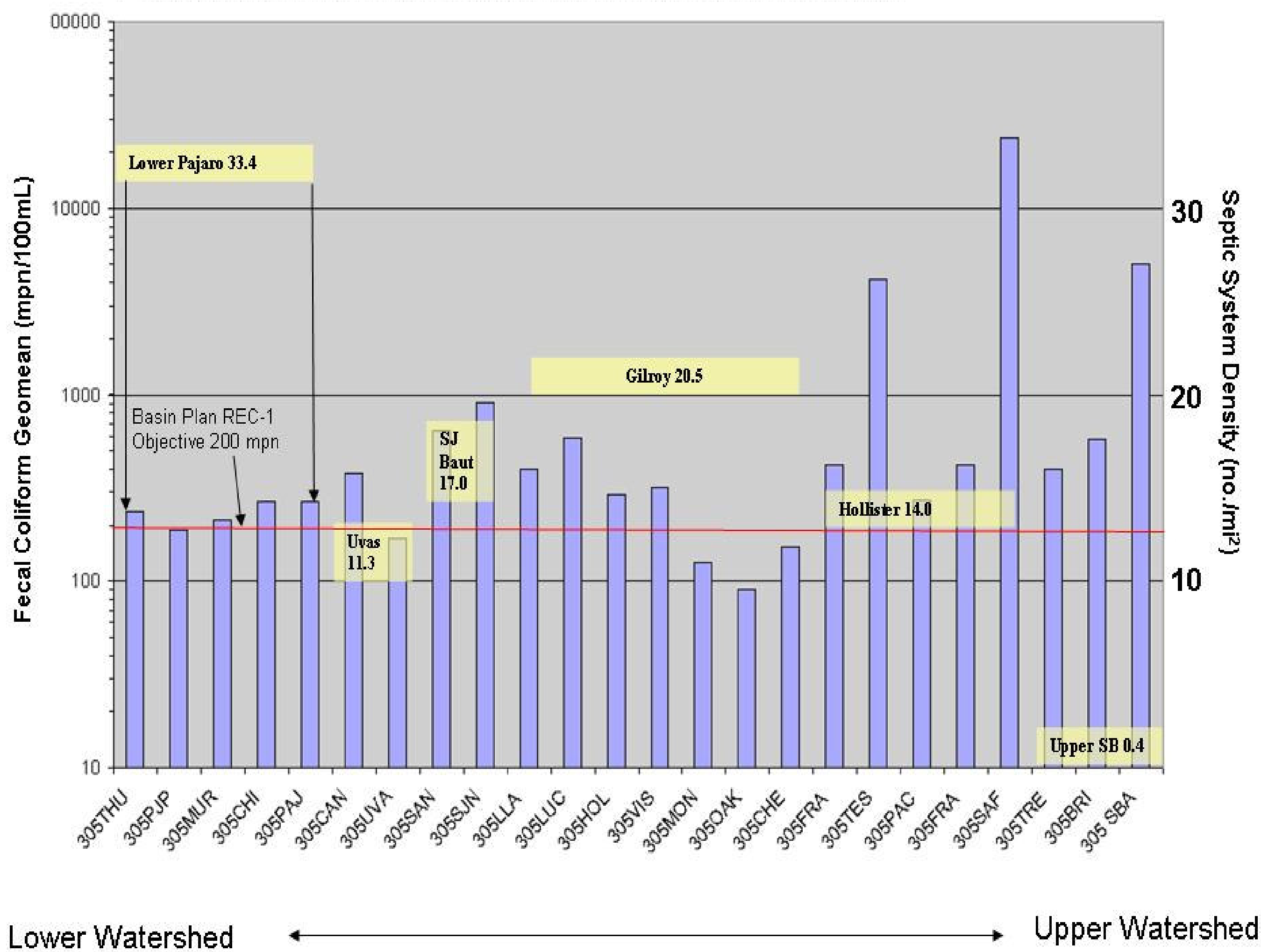
Source: U.S. Bureau of the Census 1990 Census of Population and Housing

*Scaled to reflect 2000 census population; assume % houses on septic in 2000 is same as 1990 Household survey

Census Bureau subdivisions:



The data do not qualitatively suggest a positive correlation between OSDS density and elevated fecal coliform water quality data. In fact, in areas with the highest OSDS densities, the geometric mean concentrations of fecal coliform tended to be lower, whereas in areas of low OSDS densities, fecal coliform concentrations trended towards higher geometric mean values, as shown below:


Fecal Coliform Geomean (mpn/100mL)
Septic System Density (no./mi²)
Lower Pajaro 33.4
Gilroy 20.5
Basin Plan REC-1
Objective 200 mpn
SJ
Baut
17.0
Uvas
11.3
Hollister 14.0
Upper SB 0.4
00000
10000
1000
100
10
30
20
10
305THU
305PJP
305MUR
305CHI
305PAJ
305CAN
305UVA
305SAN
305SJN
305LLA
305LUC
305HOL
305VIS
305MON
305OAK
305CHE
305FRA
305TES
305PAC
305FRA
305SAF
305TRE
305BRI
305 SBA
Lower Watershed
Upper Watershed

Appendix B

CIWQS
Spill Information and Municipal Waste Violations

Place (Facility)	Date Occurred	Violation Description	Comments
Furtado Dairy	12-May-05	Discharger released approximately 240,000 gallons of dairy processed wastewater (manure & wastewater) to Alamias Creek. Wastewater observed in approximately 4.5 mile reach of creek channel.	Santa Clara county district attorney's office filed a criminal case against discharger.
HOLLISTER DOMESTIC WWTP	18-May-01	3,000 gallons spill from door of pump building to containment inlet...pressure relief valve on pump set to low caused spillage.	Spill report received; appropriate followup taken; no further action recommended at this time.
HOLLISTER DOMESTIC WWTP	1-Jun-01	Sewage spill occurring over a 122-day period at a flow rate of 50 gallons per day, for a total of 6,100 gallons.	CDO issued 10/17/02.
HOLLISTER DOMESTIC WWTP	5-Sep-01	Unknown quantity. investigating odor complaints, discovered sewer line (that is part of 18 inch main that was converted to storm main in 94-95) still connect to main serving 6 single family and 2 duplexes. Storm line leads to San Benito River outfall.	NOV sent requesting information to determine quantity/duration.
HOLLISTER DOMESTIC WWTP	26-Mar-02	Treated wastewater seeping from disposal ponds to San Benito River channel.	NOV issued 4/12/02.
HOLLISTER DOMESTIC WWTP	6-May-02	15 million gallons of treated, undisinfected domestic wastewater spilled to the San Benito River channel.	CDO issued 10/17/02.
HOLLISTER DOMESTIC WWTP	10-Sep-02	Approximately 100 gallons water spilled from manhole.	NOV issued 12/20/02.
HOLLISTER DOMESTIC WWTP	7-Oct-02	Approximately 100 gallons water spilled from manhole. Spillage collected in curbside near manhole.	NOV issued 12/20/02.
HOLLISTER DOMESTIC WWTP	2-Nov-02	300-400 gallon spilll due to power outage at lift station. Spill flowed from manhole adjacent to the Weibe Hotel entrance, pooling along roadway.	NOV issued 12/20/02. Technical report due 1/22/03.
HOLLISTER DOMESTIC WWTP	2-Jan-03	800 gallons spill along roadway gutter and into stormdrain leading to industrial wwtp. Main gravity line leading from East and Hawkins Streets and surrounding areas were obstructed with grease and debris.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	10-Jan-03	2,400 gallons spill along San Benito Street into stormwater percolation pond drain. Spillage due to grease accumulated in main sewer line.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	11-Jan-03	300 gallons spill along Power Street gutter into stormdrain that flows into Industrial WWTP. Spillage due to accumulated grease and debris in sewer line.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	11-Jan-03	100 gallons spill flowed to spill containment sump. Spillage occurred from Bridge Street diversion pump station and was caused by broken pipe supporting air relief valve.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	17-Jan-03	Approx. 100 gallons spill along curbside at Somme Street due to accumulated debris and sand.	Issued letter requiring sewer management plan on February 3, 2002.

Place (Facility)	Date Occurred	Violation Description	Comments
HOLLISTER DOMESTIC WWTP	19-Jan-03	1,000 to 1,200 spill along south storm gutter of Hillcrest due to overflow from root intrusion and grease accumulation blocking line. Approximately 700-800 gallons wastewater escaped into stormdrain, remaining amount contained in adjacent grassy area.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	19-Jan-03	Approx. 2400 gallons spill due to root intrusion, grease and debris blockage in line. Overflow ran into stormdrain (1,600 gallons) but did not reach San Benito River. Partial line collapse at intersection of Hillcrest and Memorial.	Issued letter on 2/3/03 requiring sewer system management plan. Will add mandatory requirements when WDRs are revised.
HOLLISTER DOMESTIC WWTP	21-Jan-03	Unknown resident. Overflow ran into stormdrain, but did not reach San Benito River. Root intrusion, grease, debris blocked line causing partial collapse at Hillcrest and Memorial streets.	Issued letter requiring sewer development plan on 2/3/03.
HOLLISTER DOMESTIC WWTP	5-Feb-03	150 gallon spill along gutter to Azule Street due to accumulated grease and debris in line.	No surface water involved. Response timely. No further action.
HOLLISTER DOMESTIC WWTP	5-Feb-03	400 gallon spill along curb/gutter to stormdrain due to grease and roots in line.	No surface water involved. Response timely. No further action.
HOLLISTER DOMESTIC WWTP	26-Feb-03	200 gallon spill along San Felipe Road curb and gutter due to power failure at lift station.	No surface water involved. Response timely. No further action.
HOLLISTER DOMESTIC WWTP	1-May-03	100 gallon spill along gutter on Prospect Street. Spillage due to accumulated pater and other debris from Leahterback Industries had plugged line.	Adequate response. No action taken.
HOLLISTER DOMESTIC WWTP	25-May-03	200 gallons spill along gutter on Sunset Drive to stormdrain. Grease and debris obstructed line.	Adequate response. No action taken.
HOLLISTER DOMESTIC WWTP	26-Oct-04	Lift station power failure caused 300-gallon sewage spill from Lift Station #2 near San Felipe Highway and San Felipe Road to ground and roadway.	Power failure at lift station.
HOLLISTER DOMESTIC WWTP	1-Jan-05	Grease and debris clog caused 500-gallon sewage spill from Clearview and Sunset drives to gutter. No waterbodies affected.	No further action recommended at this time.
HOLLISTER DOMESTIC WWTP	4-Jan-05	Grease and debris clog caused 200-gallon sewage spill from 1420 El Toro Drive to gutter. No waterbodies affected.	No further action recommended at this time.
HOLLISTER DOMESTIC WWTP	3-Sep-06	Overflow Violation: grease blockage resulted in 100-gallons overflow, crew cleaned and disinfected area.	Discharger responded appropriately and quickly to spill.
HOLLISTER DOMESTIC WWTP	4-Sep-06	Overflow Violation: grease blockage resulted in 100-gallon overflow; crew cleaned and disinfected area.	Discharger responded appropriately and quickly to spill.
HOLLISTER DOMESTIC WWTP	5-Nov-06	Overflow Violation: Grease build up led to a blockage, resulting in an overflow of 20 gallons.	After the blockage was cleared, the affected area was properly cleaned.
HOLLISTER DOMESTIC WWTP	24-Nov-06	Overflow Violation: Blockage resulted in an overflow of 25 gallons.	After the blockage was cleared, the affected area was properly cleaned.

Place (Facility)	Date Occurred	Violation Description	Comments
HOLLISTER DOMESTIC WWTP	29-Nov-06	Overflow Violation: Blockage resulted in an overflow of 20 gallons.	After the blockage was cleared, the affected area was properly cleaned.
HOLLISTER DOMESTIC WWTP	31-Dec-06	Paper blockage caused 300 gal. sewage spill from Powell St. at South St.	
HOLLISTER DOMESTIC WWTP	2-Jan-07	Root intrusion caused 100 gal sewage spill from Busby Ct. at Memorial Dr.	
HOLLISTER INDUSTRIAL WWTP	15-Dec-98	@40 gal sewage spill from pipe going to beds 9, 10, and 11; pipe's glued fitting pulled apart; no sewage got to river	
HOLLISTER INDUSTRIAL WWTP	6-May-02	Levee failure caused discharge of approximately 15 million gallons of treated wastewater to the San Benito River.	ACP issued 7/31/02.
HOLLISTER INDUSTRIAL WWTP	1-Mar-04	Grease and debris obstructed line causing 1,000-gallon sewage spill from Sierra Vista Drive to gutter. No water bodies affected.	No further action recommended at this time.
HOLLISTER INDUSTRIAL WWTP	11-Mar-04	Construction rock and grit obstructed line causing 200-gallon sewage spill from Colorado and Hospital Drives to gutter. No water bodies affected.	No further action necessary at this time.
HOLLISTER INDUSTRIAL WWTP	8-Jan-06	A blockage of grease, rags, and materials caused 250-gallons of sewage to spill from Cerra Vista and Sunset Drive along the gutter and around a manhole.	Cooler temperatures increase chances of these types of spills to occur. Water Board staff contacted Mark Clifford and discussed the spill.
HOLLISTER INDUSTRIAL WWTP	18-Jan-06	A blockage of grease and debris caused 200-gallons of sewage to spill from Clearview and Hillcrest Drive along the gutter near the manhole.	Cooler temperatures increase chances of these types of spills to occur. Water Board staff contacted Mark Clifford and discussed the spill.
HOLLISTER INDUSTRIAL WWTP	5-Mar-06	Grease and debris obstructing the line caused 150-gallons of sewage to spill from the intersection of Powell and Suiter Street along the gutter.	Grease and debris had obstructed line. Overflow began at 12pm.
HOLLISTER INDUSTRIAL WWTP	11-Mar-06	Grease and debris blockage caused 100-gallons of sewage to spill from the intersection of Versailles and Somme Drive around immediate area.	Grease and debris had obstructed line. Overflow began at 13:15.
HOLLISTER INDUSTRIAL WWTP	20-Mar-06	Loss of electrical power caused 250-gallons of sewage to spill from Liftstation #2 along gutter and side of the frontage road.	Loss of electrical power at Liftstation #2. Overflow began at 12:30.
HOLLISTER INDUSTRIAL WWTP	1-May-06	A blockage of grease caused 100-gallons of sewage to spill from a manhole at the intersection of Mapleton and 4th Street along gutter line.	City used VacCon vehicle to clean and flush line.
HOLLISTER INDUSTRIAL WWTP	27-May-06	A blockage of grease caused 950-gallons of sewage to spill from a manhole at the intersection of Memorial and Hillcrest Drive along the curb line.	Crew members used VacCon vehicle to clean and flush line.
SAN JUAN BAUTISTA WWTP	25-Aug-99	Overflow in collection system caused estimated 4500 gal discharge to ditch.	

Place (Facility)	Date Occurred	Violation Description	Comments
SAN JUAN BAUTISTA WWTP	20-Nov-00	400-500 gallons raw sewage spill and percolated into ground. Spill due to partially clog in gravity sewer.	Staff sent letter requesting spill prevention program for review.
SAN JUAN BAUTISTA WWTP	27-Jan-01	Estimated 100-200 gal sewage spill flowed from manhole lid into stormdrain in Lang Court. No wastewater entered waterbody. Failed check valve and stuck alarm float resulted in City not being able to respond to sewage before it spilled.	2/8/2001 sent letter requesting spill prevention program for review.
SAN JUAN BAUTISTA WWTP	8-Feb-01	50-75 gallons raw sewage due to grease in sewer line flowed from manhole wetting street around manhole; no solids escaped.	Appropriate following taken; no further action necessary.
SAN JUAN BAUTISTA WWTP	4-Aug-01	1500 to 2000 gallon raw sewage spilled when manhole overflowed; overflow due to grease clogging gravity sewer below manhole, most of spilled materials percolated into ground in ditch; some spill reached creek	Sent NOV 8/29/01, request report on sewer video test and restaurant grease trap inspections by 10/1/01.
SAN JUAN BAUTISTA WWTP	1-Sep-02	2-3000 gallons of sewage spill from plugged line. Approximately 1000 gallons went into drainage ditch feeding Pajaro, the remainder percolated into the ground.	Staff will send NOV.
SAN JUAN BAUTISTA WWTP	6-Sep-02	Two to three thousand gallons of raw sewage spilled into drainage ditch and 1,000 gallons eventually reached Pajaro River.	NOV sent 01/08/03.
SAN JUAN BAUTISTA WWTP	16-Nov-02	300 to 400 gallons raw sewage spilled onto Washington Street. Congealed grease on roots in sewer downstream of manhole caused overflow.	NOV issued 1/8/03.
SAN JUAN BAUTISTA WWTP	7-Mar-03	Estimated 400-500 gallon spill originated from manhole at intersection of Washington Street and Lang. Waste water was contained and no water body affected.	Adding sewer maintenance program requirements to Permit for September 2003 meeting. No further action.
SAN JUAN BAUTISTA WWTP	2-Apr-03	600 TO 800 gallons spill from lateral on Washington Street to stormdrain emptying onto grassy field. Plugged sewer main caused backup.	San Benito County Health Department was on-site. Spill did not reach surface water. Enforcement not required. Spill site cleaned up and disinfected.
SCRWA WWTP	25-Nov-99	City of Morgan Hill. 500 gallon spill to land; roots crushed sewer line causing stoppage and spillage.	Spill was handled properly.
SCRWA WWTP	29-Nov-99	City of Morgan Hill. 900 gallon spill to stormdrain. When flushing lots of grease chunks came out; water was very milky (grease blockage).	
SCRWA WWTP	10-Dec-99	City of Gilroy. Unknown quantity of wastewater spilled into creek. Spill due to grease/contractor debris.	Meeting 10/10. City employees were not aware that RWQCB requires spill notification. In future, spills will be reported in accordance with our regulations.
SCRWA WWTP	3-Jan-00	City of Morgan Hill. 600 gallon sewage spill. Customer's private liftstation overflowed and spilled onto curb, then into creek.	No action taken.

Place (Facility)	Date Occurred	Violation Description	Comments
SCRWA WWTP	12-Feb-00	Morgan Hill. 600 gallon spill (soapy water/sewage) due to stoppage in sewer main;	Discharger has taken action to prevent a recurrent. No further action warranted. Spill vacuumed and cleaned.
SCRWA WWTP	2-Mar-00	Unknown quantity discharged to Llagas Creek when levee was breached. 50 gallon per minute spill; leak discovered 11:35 am (spill stopped at 12:15 pm) on 2/29, levee last checked at 2:00 pm on 2/28.	NOV sent 3/28/00 requesting date for correction and report detailing the preventative measures taken to insure it will not happen again.
SCRWA WWTP	27-May-00	City of Morgan Hill. 100 gallon spill to stormdrain/creek. Direct cause of stoppage unknown after breaking through stoppage paper and liquid (soap).	No further action necessary.
SCRWA WWTP	4-Jul-00	City of Morgan Hill. 1,000 gallon spill; grease and soapcake plugged sewer main	Discharger took appropriate action; no followup needed.
SCRWA WWTP	9-Jul-00	City of Gilroy. 500 gallon spill due to blockage. Spilled to Santa Theresa Blvd between Mantelli/Longmeadow.	Meeting 10/10. City employees were not aware that RWQCB requires spill notification. In future, spills will be reported in accordance with our regulations.
SCRWA WWTP	11-Jul-00	10 gallon spill behind 250 Longview Drive due to soap and grease blockage Blockage from Halle Ave.	
SCRWA WWTP	25-Jul-00	City of Gilroy. Backup from sewer at Safeway.	Meeting 10/10. City employees were not aware that RWQCB requires spill notification. In future, spills will be reported in accordance with our regulations.
SCRWA WWTP	9-Aug-00	Pneumatic sewer line plug ruptured and failed resulting in release of raw sewage into construction excavation pit. Excavation pit is part of current station improvements project. Quantity unknown.	No action necessary.
SCRWA WWTP	15-Aug-00	City of Morgan Hill. 250 gallon spill to stormdrain when sewer main line plugged (intersection Alkine and DeWitt).	Corrective action taken by City; no followup needed.
SCRWA WWTP	19-Aug-00	City of Gilroy. Less than 100 gallons spill due to sewer blockage.	Meeting 10/10. City employees were not aware that RWQCB requires spill notification. In future, spills will be reported in accordance with our regulations.
SCRWA WWTP	25-Aug-00	City of Gilroy spill due to small leak of secondary effluent from one of the site pipeline air release valves. Spill flowed into nearby drainpipe to drainage pit. Floor of pit was damp, but not pooled.	No action necessary.
SCRWA WWTP	1-Sep-00	City of Gilroy. Less than 500 gallons spill due to sewer blockage.	Meeting 10/10. City employees were not aware that RWQCB requires spill notification. In future, spills will be reported in accordance with our regulations.

Place (Facility)	Date Occurred	Violation Description	Comments
SCRWA WWTP	18-Sep-00	City of Morgan Hill. 50 gallon spill to street/stormdrain. Spill due to due to grease and towels in sewer line. Used vactor to also unplug resident at 17660 Monterey Road (check valve stuck open allowing sewage to backup)	Staff tracking all spills for this discharger.
SCRWA WWTP	3-Oct-00	City of Morgan Hill. 100 gallon spill to stormdrain due to blockage in line.	
SCRWA WWTP	2-Nov-00	City of Morgan Hill. 75 gallon spill to catch basin stormdrain line leading to West Little Llagas Creek; no sewage reached the creek. Spill due to due to grease blockage in line.	Staff tracking all spills for this discharger.
SCRWA WWTP	6-Nov-00	City of Morgan Hill. 825 gallon spill to land. Sewer mainline blockage from Circle land to sewer main behind home on OakView Circle.	Called Ray Dellanini on 1/29/01. Line too long, installed manhole midway.
SCRWA WWTP	7-Nov-00	City of Morgan Hill. 600 gallon spill due to blockage in 8 inch line which runs from E. Dunne behind Thomas Grade.	Staff phoned Ray Bellanini on 1/29/01. Incomplete spill report, 3 yes/no items not addressed. Will submit complete reports in future.
SCRWA WWTP	7-Dec-00	City of Morgan Hill. 25 gallon spill due to possible grease stoppage in main line.	Tracking spills. No further action necessary.
SCRWA WWTP	9-Dec-00	City of Gilroy. 200 gallons spill due to sewer plug at 175 west 9th street lateral cleanout.	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease plugs in collection system.
SCRWA WWTP	12-Dec-00	City of Gilroy. 100 gallons sewer cleanout spill to storm catch basin.	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease plugs in collection system.
SCRWA WWTP	8-Jan-01	City of Morgan Hill. 15 gallon spill to stormdrain due to grease and rags. Location: 40 West Dunne Avenue	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease plugs in collection system.
SCRWA WWTP	11-Jan-01	City of Morgan Hill. Unknown quantity spill from residence at 16215 Keith Way	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease plugs in collection system.
SCRWA WWTP	12-Jan-01	City of Morgan Hill. 30 gallons spill to street due to grease, towels, some roots.	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease

Place (Facility)	Date Occurred	Violation Description	Comments
			plugs in collection system.
SCRWA WWTP	30-Jan-01	City of Morgan Hill. 50 gallons spill to private property; grease cam through when plug was broken.	Staff tracking spills and comparing to other POTWs to determine if volume is normal/common for plants of this size. Staff investigating possible caused for oil/grease plugs in collection system.
SCRWA WWTP	20-Feb-01	Estimated 500 gallon spill to stormwater system due to control system failutre on plant drain pump station.	Staff spoke to discharger; will send more informatio about mechanical failure that caused spill, additional alarms and other system changes, and Bod data. Due with next monitoring report.
SCRWA WWTP	6-Mar-01	City of Morgan Hill; 150 gallon spill due to plug of paper towels and diapers.	Staff tracking spills.
SCRWA WWTP	10-Mar-01	50 gallons spilled due to sewer plug.	Staff tracking all spills for this discharger.
SCRWA WWTP	18-Mar-01	Citry of Morgan Hill; 200 gallon spill due to unknow causes.	Staff tracking spills.
SCRWA WWTP	24-Mar-01	City of Morgan Hill; 400 gallon spill possibly due to grease and towels causing blockage.	
SCRWA WWTP	19-May-01	600 gallon spill to stormdrain due to rootball, towels, grease.	Spoke with discharger; majority of spill contained in puddles in field, which were vacuumed and disinfected; small trickle from one puddle reached stormdrain.
SCRWA WWTP	4-Jun-01	Overflow of one of the secondary effluent pond distribution boxes; water flowed northward to bridge across Llagas creek, flowing off north side of bridge onto east bank of creek; does not appear any water entered creek flow. Quantity unknown.	Spoke w/ SCRWA staff; they hired engineer to investigate distribution box failure; prelim investigation: no problem w/system design; overflow may have been caused by debris in lines, waiting for findings and recommendation (about 3 wks).
SCRWA WWTP	10-Aug-01	Morgan Hill Grease build up in sewer main caused spill of unkown quantity of sewage to flow from manhole across intersection into storm drain.	No action taken.
SCRWA WWTP	23-Aug-01	Morgan Hill-Unknown quantity of spill. Witnessed dye in on site storm drain which traveled to catch basin.	No action taken.
SCRWA WWTP	2-Sep-01	Morgan Hill. 30 gallon spill due to plug (grease and soap cake) in sewer mainline.	No further action recommended at this time.
SCRWA WWTP	1-Nov-01	Discharge of raw sewage to storm drains without NPDES permit or ROWD.	NOV issued 4/2/02
SCRWA WWTP	6-Nov-01	Morgan Hill. 10 gallons spill; cause of spill unknown. Very little liquid came out of sewer hook hole.	No action taken.

Place (Facility)	Date Occurred	Violation Description	Comments
SCRWA WWTP	8-Nov-01	Morgan Hill. 180 gallons spill due to grease and paper towels.	NOV for discharge to storm drain.
SCRWA WWTP	29-Dec-01	Morgan Hill.400 gallons spill due to plug (possibly grease) in system. Seal on manhole caused discharge to come out of around concrete cap	NOV for discharge to storm drain.
SCRWA WWTP	31-Dec-01	Morgan Hill. 150 gallons due to root ball.	NOV for discharge to storm drain.
SCRWA WWTP	6-Jan-02	Discharge to storm drain.	
SCRWA WWTP	16-Feb-02	200 gallon spill at Fifth and Carmel Streets flowed to catch basin. Spillage caused by grease blockage in city main line.	Spill did not reach surface waters. Maintenance crews will maintain problem sites more frequently. No further action.
SCRWA WWTP	19-Apr-02	Sewer spill of 5-10 gallons.	No action taken by staff.
SCRWA WWTP	20-Jul-02	Morgan Hill. 100 gallon spill due to grease and paper towels.	No action taken.
SCRWA WWTP	4-Aug-02	Morgan Hill. 200 gallon spill due to roots and grease causing blockage causing manhole to surcharge and exit hole in top of lid and sides.	No action taken.
SCRWA WWTP	8-May-03	200 gallons spill at 100 Edes Court. Roots plugged line.	Discharger response adequate.
SCRWA WWTP	12-May-03	300 gallon spill to stormdrain due to grease build up in main line.	Discharger response adequate.
SCRWA WWTP	12-Jun-03	100 gallon spill into stormdrain due to grease and debris.	No action taken at this time.
SCRWA WWTP	2-Sep-03	900 gallons spill when manhole surcharged due to roots and grease blockage. Spillage into stormdrain to Little Llagas Creek.	No action taken at this time.
SCRWA WWTP	2-Sep-03	City of Morgan Hill - 900 gallon sewage overflow at 50 W. Edmundson caused by roots and grease in private collection system.	No action taken against SCRWA. City of Morgan Hill emergency response will bill South County Property Management since blockage occurred in their collection system.
SCRWA WWTP	11-May-04	City of Morgan Hill. Grease blockage caused 850-gallon sewage spill from manhole at 3075 Oakleaf Lane to stormdrain.	No further action recommended at this time.
SCRWA WWTP	17-May-04	City of Morgan Hill. Root blockage caused 250-gallon sewage spill from manhole at 16830 Price Street to stormdrain.	No further action recommended at this time.
SCRWA WWTP	19-May-04	City of Morgan Hill. Root and paper blockage caused 20-gallon sewage spill from manhole at 220 W. Dunne Avenue.	Minor spill. No further action recommended at this time.
SCRWA WWTP	5-Mar-05	Roots in line caused 50-gallons of sewage to spill from manhole at Del Monte Avenue & Nob Hill Terrace then to storm drain.	Minor spill. No further action recommended at this time.
SCRWA WWTP	11-Mar-05	Roots in the line caused 200-gallons of sewage to spill from manhole at 16941 Barnell to W. Dunne.	Minor spill. No further action recommended at this time.
SCRWA WWTP	12-Apr-05	Root intrusion in mainline caused 250 to 300-gallons of sewage to spill from manhole #85 behind 3015 E. Dunne Avenue.	No futher action recommended at this time.

Place (Facility)	Date Occurred	Violation Description	Comments
SCRWA WWTP	2-May-05	Possible dirt and rocks in sewer line caused 400-gallons of sewage to spill from 17810 Holiday Drive to open land. No water entered Anderson Lake.	Cause Unknown
SCRWA WWTP	10-May-05	Possible cleaning towels caused 100-gallon sewage spill from 16840 Joleen Way to the Storm Drain.	Spill caused by rags blocking the line.
SCRWA WWTP	2-Jan-06	Excessive rain caused 1,200-gallons of sewage to spill from manhole on Fountain avenue to Tennant Creek.	Low rate discharge, likely had little effect on creek.
SCRWA WWTP	29-Jul-06	Paper towel and grease build up caused 900-gallons of sewage to spill from 550 Grey Ghost Avenue.	Plugged with paper towels. No waterway affected
SCRWA WWTP	3-Mar-07	Blockage in sewer main caused 13,000 gal. sewage spill from Spring Ave. and Monterey St. in Morgan Hill to Little Llagas Creek and land	Somebody has flushed clothing and other objects, which are blocking sewer. Discharger has recently cleaned line several times.
TRES PINOS WWTP	10-Mar-98	WWTP Washed away by winter creek flows, temporary emergency pond is leaking.	
WATSONVILLE WWTP	27-Jul-98	10-50 gal sewage spill caused from property line cleanout which was blocked by tree roots; no solids were found; surface sewage watered down; roots extracted from lateral by plummer, removed and disposed of properly.	Small spill; Will track in WDS. No further action.
WATSONVILLE WWTP	27-Jul-98	10-50 GAL SPILLED DUE TO TREEROOTS BLOCKAGE;ROOTS EXTRACTED	
WATSONVILLE WWTP	4-Aug-98	Sewer main impacted with grease; approx 50 gal sewage spilled into stormdrain that empties into Salsipuedes Creek near manhole 13; no solids were found, watered down surface area.	Small spill; will track in WDS. No further action.
WATSONVILLE WWTP	4-Aug-98	@50 gal sewage spill caused by blockage in sewer main.	Small spill; will track in WDS. No further action.
WATSONVILLE WWTP	4-Aug-98	50 GAL SPILL DUE TO SEWER MAIN IMPACTED BY GREASE;RECOMMEND FREQUENT FLUSHING;LETTERS TO RESIDENTS	
WATSONVILLE WWTP	6-Sep-98	Est. 10 gals sewage spilled caused by grease buildup in sewer main; notified propeerty owners of proper disposal of grease; regular 6 month flushing of that portion of sewer main is being recommended at Sept 16 Sanitary Board mtg.	Will implement flushing on a regular basis; staff will monitor.
WATSONVILLE WWTP	6-Sep-98	10 gal sewage spilled caused by mainline grease buildup; est. 6-month flushing of main; notifying residents proper disposal	

Place (Facility)	Date Occurred	Violation Description	Comments
WATSONVILLE WWTP	20-Nov-98	Approx. 2,000 gal overflow from cleanout to drainage ditch caused during road reconstruction.	Pumps were shut down until clean complete; sand dumped in spill area for contaminent, vacuumed 13,500 gal from ditch which had 8-10 water prior to spill; vacuuming halted when minnow or stickleback type fish were observed."
WATSONVILLE WWTP	21-Nov-98	30 gal overflowed south across parking lot and puddled at southern end; caused by malfunction of float level controllers; pump station was placed in the hand" mode and floats were repaired."	Minor spill not to surface waters.
WATSONVILLE WWTP	3-Feb-99	Grease blockage in mainline caused 500-900 gal sewage to spill to stormdrain system	Area impacts were vacuumed and flushed with fresh water; area scheduled for annual maintenance; adequate response.
WATSONVILLE WWTP	19-Dec-99	200-400 gallon spill from manhole on Holm Road to stormdrain to drainage ditch that runs @1600 feet before entering west branch of Struve Slough	No action.
WATSONVILLE WWTP	13-Feb-00	Unknown quantity spill into stormdrain system that discharges to Pajaro River, Salsipuedes Creek, and several sloughs; unknown effects due to high dilution rate. Spill caused by infiltration of heavy rains into sewer system.	City is preparing a letter summarizing I/I activities. Should be in our office by May 5, 2000.
WATSONVILLE WWTP	13-Nov-00	Salsipuedes Sanitary District. 50 gallon sewage spill due to manhole overflow near Drew Lake; unknown if spill entered lake.	No action needed. Discharger will send letter summarizing situation.
WATSONVILLE WWTP	26-Dec-00	Salsipuedes sewer district reported 25 gallon sewage spill to Kelly Lake.	Staff spoke to discharger and determined that no cleanup was possible. No additional action taken.
WATSONVILLE WWTP	11-Jan-01	Unknown quantity sewage spill. High tides and mouth of Pajaro River were closed and Watsonville Slough flooded Pajaro Dunes complex resulting in surcharge by flood waters to sewer system causing manholes to overflow.	Flooding beyond management's control; no action on our part.
WATSONVILLE WWTP	19-Jan-01	200-300 gallon spill due to large amount of rock in downstream manhole. Spill origin at two manholes on Hanger Way to stormdrain system into Struve Slough.	Discharger contacted by phone 1/24/01. Suspected problem with private lateral. Discharger will continue to investigated provide Board with letter explaining situation once it is resolved. <CR>Letter provided by Discharger received on 1/31/2001.
WATSONVILLE WWTP	21-Apr-01	900 gallon spill due to grease and rags blocking line; spilled to drainage ditch flowing into Struve Slough.	NOV issued 6/19/01.
WATSONVILLE WWTP	24-Jun-01	100-200 gallons spill from private property easement to catch basin; spill due to lead from old repair to split in forcemain; appears that repair was due to damage from equipment when someone attempted to install private stormdrain	No apparent discharge to surface waters. Repairs completed. No further action recommended at this time.

Place (Facility)	Date Occurred	Violation Description	Comments
WATSONVILLE WWTP	6-Oct-01	Cabrillo Shopping Center. 20-100 gal spill due to grease in private lateral sewer. Overflow from manhole in parking lot to stormdrain 30-50 ft away. Stormdrain discharges to flowing drainage ditch 300 ft away emptying to Watsonville Slough 1,000 ft away.	No further action recommended at this time.
WATSONVILLE WWTP	7-Jan-02	600-900 gals spill from city easement at 18th and 25th street; most of overflow absorbed into ground; sewage partially reached drainage ditch to Struve Slough. Sewer main was apparently broken, became partially blocked when ground collapsed.	No further action necessary.
WATSONVILLE WWTP	17-Feb-02	80 - 120 gallon spill due to sewer main partially blocked with paper towels and rags. Overflow ran along Carey Ave into stormdrain.	Staff phoned discharger on 3/1/02. No further action recommended at this time.
WATSONVILLE WWTP	27-Mar-02	100-200 gallon private sewage spill. All contained on-site. Spill caused by blockage.	Staff spoke to City on 3/28 via phone and via email on 3/28 and 4/3. Supplemental spill report deated 4/2 received via email on 4/3. No further action recommended at this time.
WATSONVILLE WWTP	4-May-02	100-200 gallons caused by grease and debris blocking sewer main overflowed into stormdrain. Verbal report from discharger not received within 24 hours due to cleanup staff oversight. Discharger from stormdrain to waterbody not confirmed during cleanup.	Board staff spoke with City on 5/8/02, reminded them of reporting requirement. Recommended visual observation of stormdrain outlets to confirm waterbody impact whenever feasible. City response and cleanup appropriate. No further action at this time.
WATSONVILLE WWTP	11-May-02	Pajaro County Sanitation District. Less than 500 gallons raw sewage overflowed to street. No discharge to waterbody or conveyance. Duration approximately 20-30 minutes.	OES report received. DFG and County health responded, confirmed no discharge to waterbody. Board staff confirmed Pajaro County Sanitation District awareness of Board spill reporting policy. Written report w/i 30 days. No further action recommended.
WATSONVILLE WWTP	26-Aug-02	500-700 gallon sewage spilled to Struve Slough	NOV sent 9/17/02.
WATSONVILLE WWTP	26-Aug-02	500-700 gallon overflow into stormdrain which empties into Struve Slough. Main breaker turned off by vandals; station run on backup engine until battery would no longer start engine. City's initial response ws not adequate and contributed to overflow.	Spoke with City staff on 8/29/02. NOV pending. Spill report did not adequately characterize City's role in causing spill.
WATSONVILLE WWTP	9-Nov-02	FCSD. 250 gallon spill from Diamond Estates Pump Station to stormdrain.	Staff verbal enforcement 11/13/02. No further action recommended at this time.

Place (Facility)	Date Occurred	Violation Description	Comments
WATSONVILLE WWTP	15-Nov-02	750 gallon spill when sewer main blocked by debris overflowed into storm drain inlet, 10 ft from manhole that was surcharging. Storm drain flows through heavily overgrown area before discharging tinto Struve Slough.	Staff verbal enforcement 11/18/02. Adjacent sewer line is being considered for use as overflow/blockage bypass to minimize or prevent furture events. Line will be monitored for more frequent preventive maintenance flushing. No further action recommended
WATSONVILLE WWTP	16-Jan-03	Pajaro County SD. 300 gallon spill from manhole.	Staff left message with discharger on 2/13/03.
WATSONVILLE WWTP	13-Sep-03	Sewer line clean-out cap failure caused 870 gallons overflow into storm drain inlet. Storm drain discharged 50 ft from Struve Slough.	Staff discussed with City on 9/15/03. City responded quickly to repair line, clean-up approximately 900 gallons of sewage and clean area. No further action ,recommended at this time.
WATSONVILLE WWTP	2-Nov-03	200-250 gallon overflow into drainage ditch at Holm Road. Overflow ran into drainage ditch that enters pipe crossing Hwy 1. After total of 2,000 ft, discharges into West Branch Struve Slough.	Discussed with Discharger on 11/4. No further action recommended.
WATSONVILLE WWTP	14-Jun-04	Grease blockage caused 100-200 gallons of sewage to spill from manhole at Rio Boca Road near Beach Road to asphalt. No waterbodies affected.	Discharger response was adequate. No further action recommended at this time.
WATSONVILLE WWTP	30-Jun-04	Sewer main grease blockage caused 500-1000 gallons of sewage to spill from Meadow Terrace and Lawrence Avenue to storm drain.	Discharger response was adequate. No further action recommended at this time.
WATSONVILLE WWTP	26-Jul-04	Roots in private lateral cause 200-300 gallon sewage spill from 2661 Beach Road (Pajaro Dunes complex) to parking lot. No waterbodies involved.	Discharger response was adequate.
WATSONVILLE WWTP	21-Nov-04	Private lateral blockage caused unknown quantity of sewage to flow from 349 East Beach Street to storm drain and Pajaro River.	This is a chronic source of spills. City requiring lateral inspection and defects repaired.
WATSONVILLE WWTP	7-Feb-05	Uknown blockage caused 300-500 gallon sewage spill from 2021 Freedom Boulevard into Freedom Branch Library and storm drain.	Discharger response was adequate.
WATSONVILLE WWTP	5-Jun-05	Grease build up created a partial line blockage causing a 40-50 gallons of sewage to spill from 95 Alta Vista to parking lot and storm drain.	Discharger response was adequate.
WATSONVILLE WWTP	9-Jun-05	PG&E power failure caused 200-gallons of sewage to spill from two manholes on the City easement between Oakridge & Peace Drive. One flowed to the storm water retention basin and the second flowed to a drainage ditch to Struve Slough.	Discharger response was adequate.
WATSONVILLE WWTP	9-Jan-07	Failure at shared private sewer lift station caused 100 gal sewage spill from Applebee''s Restaurant 1195 S. Green Valley Rd., Watsonville to storm drain.	