SAN LORENZO
WASTEWATER MANAGEMENT PLAN

PROGRAM STATUS REPORT
1999-2001

May, 2003

County of Santa Cruz
Health Services Agency
Environmental Health Services

Table of Contents

Tables and Figures

SAN LORENZO WASTEWATER MANAGEMENT PLAN
PROGRAM STATUS REPORT, 1999-2001

This Status Report on Wastewater Management Efforts in the San Lorenzo River Watershed is a compilation of information from the 1995-98 Program Status Report (March, 2000) and Draft San Lorenzo River Watershed Management Plan Update (March, 2002), with some additional updates of data provided. A more extensive program review is anticipated to be completed by 2005, in conjunction with updating the wastewater management program to conform with statewide regulations for onsite sewage disposal system management, scheduled to be adopted in January of 2004.

Summary of Water Quality Issues in San Lorenzo Watershed

Nitrate and pathogens are the two water quality parameters in the San Lorenzo Watershed that can be affected by wastewater disposal, among other sources.

Nitrate

Nitrate levels in the River are estimated to be 5-7 times above natural background levels (SCCHSA, 1995). At about 0.35 mg-N/l, nitrate levels in the River are well below the safe drinking water standard of 10 mg-N/l. However, nitrate is the limiting nutrient in the River and increased nitrate levels can stimulate biological growth of algae, molds, fungi, and other organisms. This increased biological activity threatens drinking water supply by releasing organic compounds, which cause noxious tastes and odors and produce potentially carcinogenic disinfection byproducts when the water is treated. Localized concentrations of nitrate in groundwater have at times threatened to violate the drinking water standard in areas of Ben Lomond, Boulder Creek, and Scotts Valley.

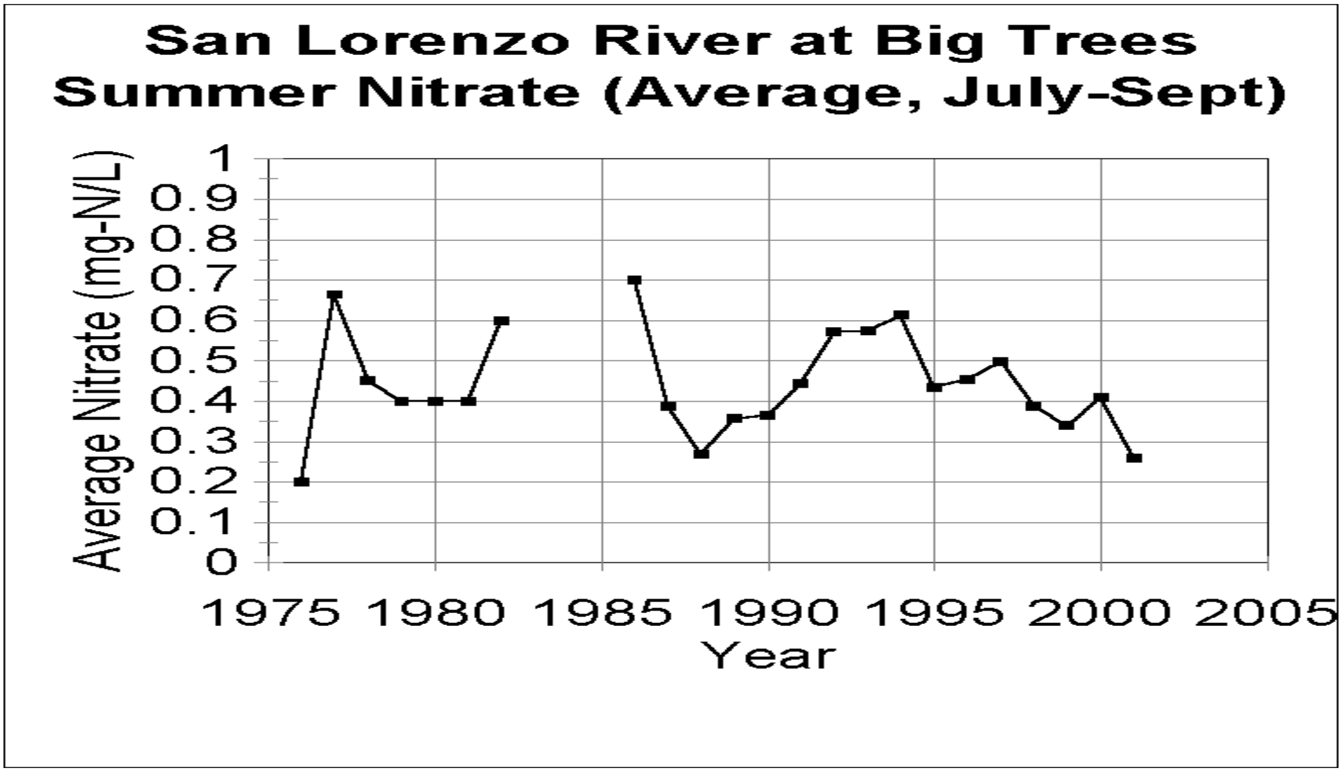
The San Lorenzo Nitrate Management Plan (SCCHSA, 1995) determined that an estimated 84% of the current nitrate load in the River results from human activities in the watershed. Calculations of relative contributions to present summer nitrate levels in the lower River (at Felton) are as follows:

- Septic Systems in sandy areas	38%
- Septic Systems in non-sandy areas	19%
- Natural sources in sandy areas	12%
- Sewer discharge from B.C. Country Club	10%
- Scotts Valley nitrate plume	9%
- Livestock and stables	6%
- Natural sources in non-sandy areas	4%
- Landscaping/fertilizer use	2%

Approximately 67% of the nitrate in the River during the summer comes from areas underlain by sandy soils of the Santa Margarita Sandstone. A septic system in sandy soils contributes 10-15 times as much nitrate to the River as a septic system in less permeable soils. Nitrogen reduction efforts are most needed and will be most effective in areas with sandy areas.

In some parts of the country, harvesting of timber can cause significant release of nitrate to streams. Several monitoring efforts in the San Lorenzo Watershed have indicated that timber harvests are not a significant source of nitrate in this area. This is likely due to several factors: the relatively small extent of individual harvests, harvests are not clear-cuts, forest soils in the San Lorenzo Watershed tend to be more clay-rich and hold onto nitrate, and the other sources of nitrate in San Lorenzo tend to be much more significant than any contribution from timber harvests.

Figure 1: Nitrate Trends in the San Lorenzo River at Big Trees



Pathogens

Presence of bacteria, virus, giardia, cryptosporidium, and other pathogens can make the water unsafe for swimming and require more expensive treatment efforts for drinking water supply. Practically all of the testing for pathogens involves testing for indicator bacteria (total coliform, fecal coliform, E. coli, and enterococcus) that would suggest the possible presence of pathogens from sewage, fecal contamination, or other contamination. Limited testing for pathogens by the City of Santa Cruz has confirmed the presence of cryptosporidium and giardia in the San Lorenzo River. The presence of indicator bacteria, while not necessarily causing illness, causes beaches to be posted with warning signs and significantly impacts recreational opportunity. The frequency of posting of swimming areas in the watershed has declined significantly since the 1970's and the 1980's, as septic systems have been upgraded and better maintained. However, the Rivermouth continues to have consistently high bacteria levels and is permanently posted as unsafe for swimming. Sources of pathogens and indicator bacteria are non-point source urban runoff, failing septic systems, sewer system leaks, pet waste, livestock, encampments, and waterfowl.

There are over 13,000 septic systems in the San Lorenzo Watershed upstream from Santa Cruz. Under current wastewater management programs, the occurrence of septic system failures is relatively low. Since 1986, the wintertime septic failure rate has declined from 5-14% to 1-3%, depending on the area (SCCHSA, 2000). However, during rainfall periods, partially treated sewage which comes to the ground surface from septic failures can be readily washed into ditches, roadways, creeks and then the River. For brief periods after storms and in the early spring when water tables are high, ditches may continue to run, conveying diluted sewage to creeks. During dry periods, sewage from failing septic systems would not reach a waterway unless the failure was right on the banks of the creek. Programs implemented since 1986 have required system upgrades, improved setbacks from creeks and early identification of failures. Summer bacteria levels have shown substantial improvement, and the River generally meets standards for safe swimming at all areas upstream from Santa Cruz. Subsurface contribution of bacteria from apparently functioning septic systems has not been found to occur in the San Lorenzo Watershed (SCCHSA, 1989). Dry season bacteria in the upstream areas are most likely from nonspecific urban sources. The highest levels of indicator bacteria are consistently observed in the more dense urban areas of Santa Cruz and Scotts Valley, which are sewered, indicating most of the bacterial contamination is more related to urban runoff than septic systems. Bacteria levels drop substantially as the River flows out of the suburban areas and through the State Parks or other low-density areas.

Livestock operations are also a potential source of bacterial contribution during storm periods. It is estimated there may be some 400-600 head of livestock kept in the watershed, primarily horses in commercial stables and small homeowner operations. Runoff from paddock areas, trails and manure stockpiles during storms can contribute elevated levels of fecal coliform, Cryptosporidium, and other organisms. Except where animals are allowed into creeks, stables are not a significant source of microbiologic contamination during nonstorm periods. County Environmental Health has had success with encouraging improvement of runoff and manure management at many of the larger operations. However, additional effort is needed.

As a part of the San Lorenzo River Watershed Management Plan Update, the County conducted extensive testing in the lower River area from 1995 through 1997 to better assess the sources of high bacteria in the urban reach of the River. The work found consistently high levels of bacteria downstream from the confluence with Branciforte Creek, which originate from storm drain discharge to the River and Branciforte Creek, as well as the concentrations of waterfowl that congregate in that area. Although the storm drains typically have very high bacteria levels, their dry weather flow is generally light and intermittent. High levels of bacteria in storm drains originate from decaying organic material (including garbage, leaves, and pet waste), occasional sewage spills, and possible subsurface leakage of sanitary sewer systems. Sewage leaks have been confirmed in several storm drains and subsequently corrected, resulting in a decline in bacteria levels in those drains. Leakage may persist in some drains. Since the 1997 sampling, the sewer lines in the vicinity of Branciforte Creek were upgraded and bacteria levels from the Creek have declined significantly. However, the general nonspecific urban contamination keeps the bacteria levels elevated well above standards for safe swimming. Storm sampling of ditches and gutters with no likely sewage influence frequently yielded high levels of indicator bacteria. It has not been confirmed whether pathogens are also present.

Water quality sampling using the four standard bacteria indicators was coupled with a health risk survey of persons in the water to determine the health risk of swimming in areas adjacent to the San Lorenzo River mouth as well as other areas designated as swimming/surfing areas. The health risk survey showed that there are generally low levels of indicator bacteria producing a good quality swimming water in the beaches adjacent to the mouth of the San Lorenzo River as well as upstream of the City of Santa Cruz in the San Lorenzo River. While the safe swimming standard was almost always exceeded at the mouth of the river only one person out of the 165 persons interviewed that had been swimming or wading in that area became ill. During the study, a total of 1325 people were interviewed at all areas. Eleven cases of illness from swimming were reported.

Figure 2: Fecal Coliform at Lower River Stations, 1996-97

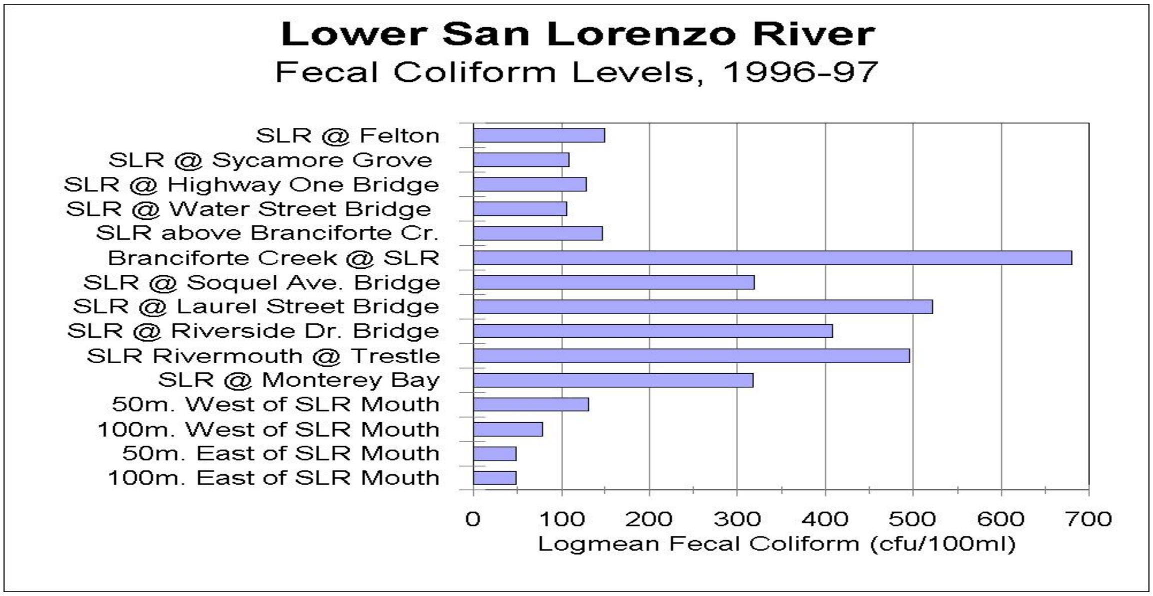


Figure 3: Lower San Lorenzo River Fecal Coliform Trends

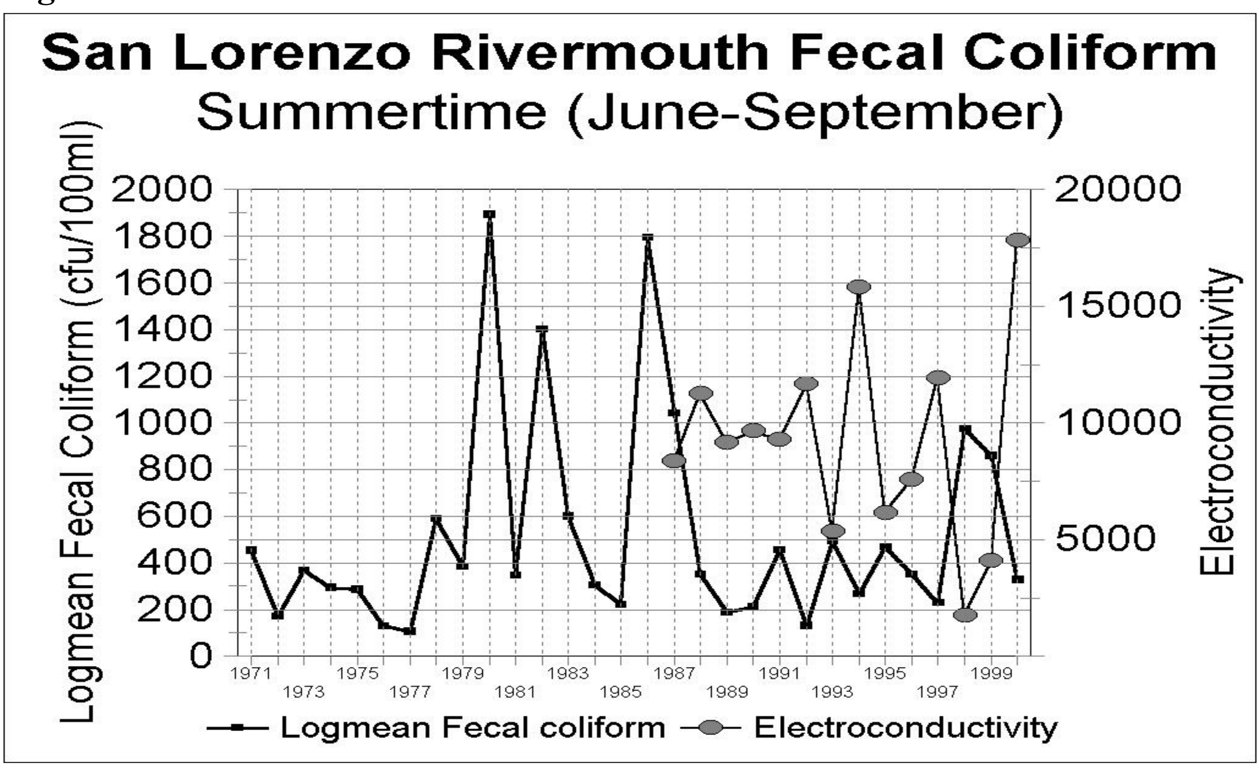
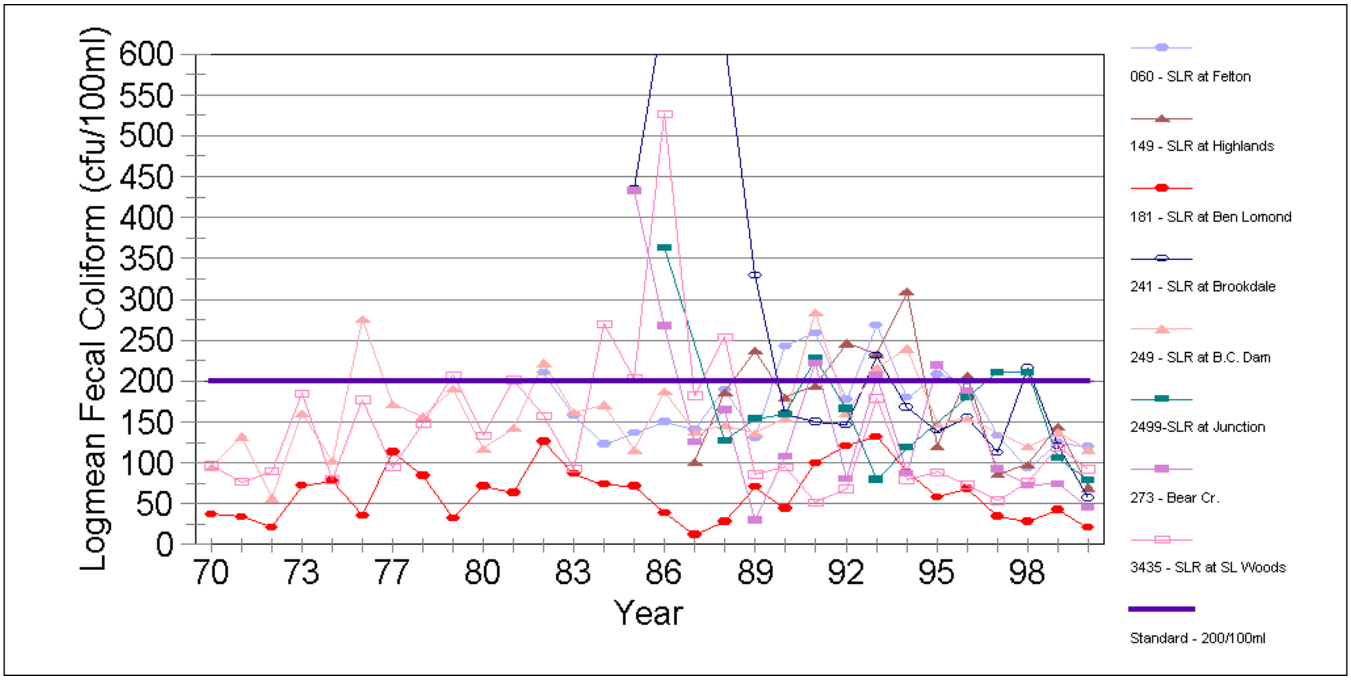


Figure 4: Summer Fecal Coliform Levels in the Upper San Lorenzo River

(Logmean of results for June through September)



Status of San Lorenzo Wastewater Management Program

The San Lorenzo Wastewater Management Program has been implemented by the Santa Cruz County Environmental Health Services since late 1985 and was formalized through the adoption of the San Lorenzo Wastewater Management Plan by the County Board of Supervisors and the California Central Coast Regional Water Quality Control Board in the spring of 1995.

The program provides for management and improvement of approximately 13,500 individual onsite sewage disposal systems in the San Lorenzo River Watershed, which have historically contributed to elevated nitrate and pathogen levels in the River. Proper septic system functioning has been challenged by age of systems, small lot size, high winter groundwater levels, steep slopes, close proximity to waterways, and common occurrence of clay soils or excessively drained soils. The Wastewater Management Program has sought to overcome these constraints through water quality monitoring, system inspection, upgrade of systems to effective standards, public education, and tracking of system performance. Activities within the main elements of the Wastewater Plan are summarized in Table 1 and described briefly in the following sections.

Table 1: Summary of Wastewater Management Activities in the San Lorenzo Watershed, 1986-2001

Details are presented in Table 2.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	**Total**
Inspections - Surveys and Rechecks	687	496	96	158	284	1842	1723	1658	1343	1169	1532	1795	1562	1745	792	1633	**18,515**
Repair Permit Applications	207	151	160	177	235	268	361	336	310	303	317	333	277	320	358	358	**4,471**
Tank Pumping (Private Pumpers)	- -	- -	1210	1721	1789	1796	1893	1752	1954	1984	1936	2039	2072	2099	2074	1869	**26,188**
Water Samples	1391	1191	1119	1009	1056	1087	1293	1227	1164	1623	1243	827	1198	790	810	983	**18,011**

Evaluation of Existing Onsite Sewage Disposal Systems

Over 12,000 parcels have been inspected, and over 80 boreholes or shallow monitoring wells have been installed to evaluate soil and groundwater conditions. Data on inspection results, pumping history, septic system characteristics, and site characteristics has been entered into a computerized database for 10,500 of the 13,500 septic systems in the Watershed. This information has been combined with data from water quality monitoring to evaluate the current performance and the potential for continued use of individual onsite disposal systems in various communities of the Watershed. Despite the constraints present, the large majority (at least 85%) of the systems evaluated were found to be functioning well, and it expected that all but about 10% can ultimately be upgraded to meet current standards using conventional technology. The remainder will likely require use of alternative systems or nonconforming systems with a higher level of oversight.

Disposal System Improvements Completed

Minimum standards for septic system repairs were established by ordinance in 1993, and were strengthened further in 1995, pursuant to the adopted Wastewater Management Plan. At least 3000 systems have been upgraded under permit between 1986 and 2001, with 700 upgrades completed in 1999-2001. The number of system repair applications is currently about 300 per year, an increase of 50% since the beginning of the program. The impetus for system upgrade has been: independent property owner initiative (66%), building remodel (9%), loan inspection (11%), complaint investigation (5%), and inspections done under the Management Plan (9%). In 1999-2001, 92% of the major system upgrades were able to meet the requirements for a standard conventional system, 5% used alternative systems, and 3% were approved nonconforming systems that did not full meet standards. At the end of 2001, 130 alternative systems had been installed in the Watershed: 24 mounded bed systems, 4 at-grade systems, 14 sand filters, and 88 other enhanced treatment units. In the year and a half since 2001, another 40 systems have been or are in the process of being upgraded using alternative technologies.

Table 2: San Lorenzo Wastewater Management Program Activities, 1986-2001

(Notes on following page.)

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ACTION																
Total Inspections	688	497	97	160	284	1869	1882	1863	1535	1408	1798	2172	1838	1989	898	1633
Surveys	687	496	95	157	276	1627	1485	1507	1204	472	989	1076	1249	1051	663	1309
Problems	127	76	5	20	35	177	115	152	124	38	67	82	62	50	18	29
	18.5%	15.3%	5.3%	12.7%	12.7%	10.9%	7.7%	10.1%	10.3%	8.1%	6.8%	7.6%	5.0%	4.8%	2.7%	2.2%
Rechecks			1	1	8	215	238	151	139	697	543	719	313	694	129	144
Problems							20	19	23	34	35	33	9	16	14	7
							8.4%	12.6%	16.5%	4.9%	6.4%	4.6%	2.9%	2.3%	10.9%	4.9%
Annual Checks			1				8	34	38	74	76	98	91	99	0	91
Problems							0	0	1	3	1	1	0	1		0
							0.0%	0.0%	2.6%	4.1%	1.3%	1.0%	0.0%	1.0%		0.0%
Complaints				2		27	122	124	116	136	164	135	165	142	104	89
Problems							78	81	73	91	104	65	69	75	66	50
							63.9%	65.3%	62.9%	66.9%	63.4%	48.1%	41.8%	52.8%	63.5%	56.2%
County Loan Insps.		1					28	36	28	22	26	14	12	3	2	0
Problems							1	2	1	2	0	0	0	1	1	
							3.6%	5.6%	3.6%	9.1%	0.0%	0.0%	0.0%	33.3%	50.0%	
Total Insp. Results																
Failures	51	25	2	10	4	31	65	111	93	64	83	72	76	90	67	46
Greywater	76	51	3	10	31	146	122	118	108	58	73	86	55	52	14	45
Failure Rate	18.5%	15.3%	5.2%	12.5%	12.3%	9.5%	9.9%	12.3%	13.1%	8.7%	8.7%	7.3%	7.1%	7.1%	9.0%	5.6%
Annual Rainfall (in.)	**62.6**	**25.9**	**25.4**	**29.9**	**28.3**	**28.6**	**50.4**	**70.6**	**28.5**	**67.6**	**54.9**	**54.1**	**72.2**	**43.4**	**44.2**	**34.0**
Tank Pumping	-	180	1210	1721	1789	1796	1893	1752	1954	1984	1936	2039	2072	2101	2114	1869
Cited Cause																
Maintenance	-	54	468	705	816	835	980	955	967	1089	923	1024	1107	1160	1257	1203
Loan Inspec.	-	65	485	479	408	404	445	392	435	345	432	487	488	541	544	420
Failure	-	45	129	239	223	199	141	144	275	203	238	202	85	49	73	85
Haulaway	-	7	24	138	149	140	119	40	86	137	143	146	129	78	39	15
Other	-	9	104	160	193	218	208	221	191	210	200	180	263	273	201	146
Pumping Results:																
Reported Failure		12	95	130	105	125	105	149	152	208	189	92	151	144	130	109
Failure Rate		7%	8%	8%	6%	7%	6%	9%	8%	10%	10%	5%	7%	7%	6%	6%
Area Fail. Rate		0.1%	0.7%	1.0%	0.8%	1.0%	0.8%	1.1%	1.2%	1.6%	1.5%	0.7%	1.2%	1.1%	1.0%	0.8%
High Level		54	232	411	387	341	410	434	486	441	418	452	476	470	469	479
Pre-Failure rate		30%	19%	24%	22%	19%	22%	25%	25%	22%	22%	22%	23%	22%	22%	26%
Area Pre-Failure Rate		0.4%	1.8%	3.2%	3.0%	2.6%	3.2%	3.3%	3.7%	3.4%	3.2%	3.5%	3.7%	3.6%	3.6%	3.7%
Repairs																
Applications	207	151	160	177	235	268	361	336	310	303	317	333	290	320	358	235
Finalled Permits							318	266	230	243	245	286	208	257	236	116
Info. Available	143	152	122	131	163	202	254	241	217	222	243	268	189	230	206	39
Cause																
Maintenance	57	78	89	97	113	101	139	147	150	181	169	222	146	173	181	34
Build. Permit	2	4	4	3	9	21	43	32	9	16	38	18	25	29	9	3
Loan	3	12	15	25	39	67	38	29	22	3	15	6	7	1	1	0
Complaint	1	9	7	5	1	2	12	10	24	13	12	17	8	13	12	1
Survey/Invest	80	49	7	1	1	11	22	23	12	9	9	5	3	14	3	1

Notes for Table 2:

1. For 1986 - 1991, complete inspection records are available only for surveys. After 1991, inspections include: surveys, rechecks, complaint investigations, and loan inspections. For repair actions, records may be inconsistent prior to July, 1991, when systematic data entry began. Pumping records are good after Sept., 1988, when submittal of pumping reports became mandatory.

2. Numbers of problems under inspections, and total failure rates (unless otherwise indicated) are the total number of leachfield failures and greywater discharges for that year divided by the total number of inspections for that year. Under each type of inspection, the percentage of problems found during that type of inspection is also indicated for each year.

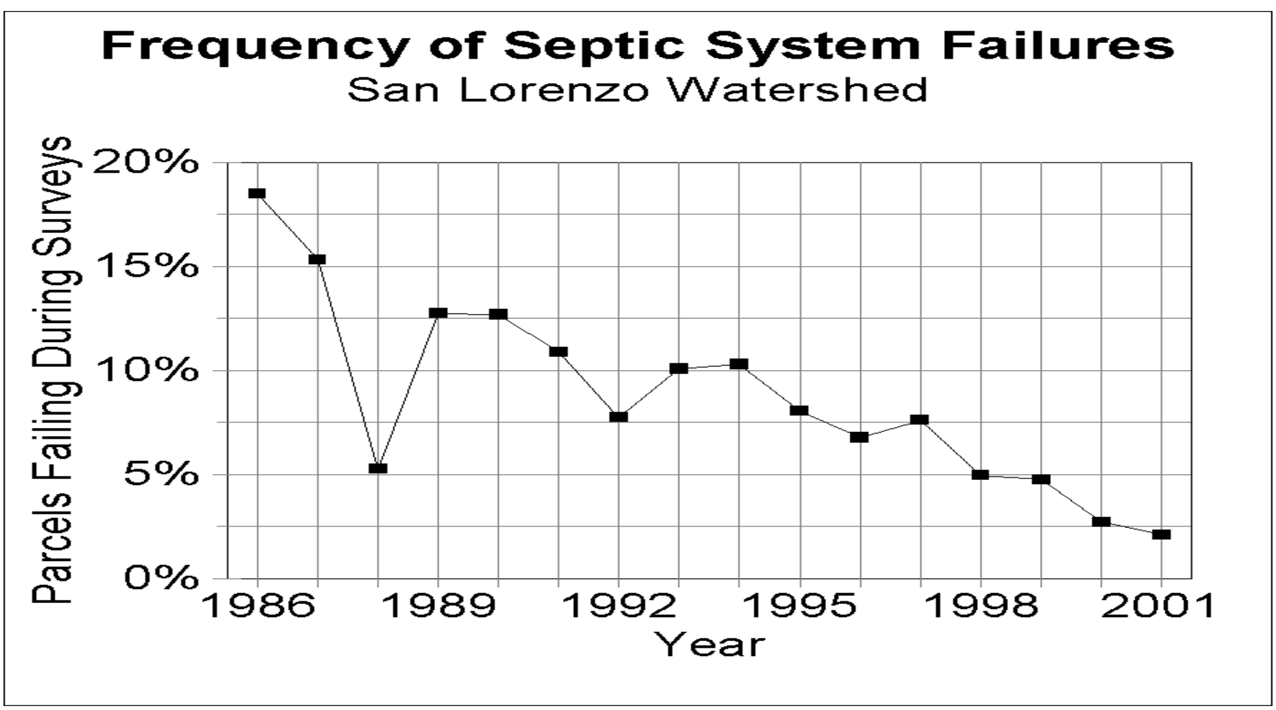
3. Under tank pumping, the area failure rate is the number of failures, divided by the total number of parcels in the study area.

4. Number of repairs is the number of repair permits applied for in that year. Repair figures for 1986 and 1987 also include other repair activities that do not require a permit.

Inspection and Maintenance

Inspection and maintenance activities consist of County inspections, public education, private pumping activities, and management activities by homeowners. Frequently septic problems have been corrected through improved system management by the property owners. System upgrades and improved management have resulted in a significant decline in failure rates from 5-14% during the initial inspections of Class I areas to 1-3% during reinspections in 1995, and 1-5% during reinspections in the wet year of 1997. Failure rates have continued to decline (Figure 5).

Figure 5: Observed Septic Failures During Parcel Surveys in the San Lorenzo Watershed



Evaluation of Potential for Community Disposal Systems

The Management Plan calls for an evaluation of the potential for use of community disposal systems for areas where there are severe constraints for meeting current standards using conventional septic systems. Under this program, community disposal alternatives have been explored for parts of Boulder Creek, Brook Lomond, Ben Lomond, Glen Arbor, and Felton. For all areas, community disposal systems were found to be less cost-effective than use of individual systems (including alternative systems) and were found to be unaffordable without some kind of grant funding. A community disposal system could be considered for downtown Boulder Creek, which might be eligible for economic development grants since constraints to standard sewage disposal is limiting expansion of the business district. A community disposal feasibility study has been completed for 900 parcels in the Greater Pasatiempo area, in the lower part of the Watershed, and a sewer project is currently being pursued for that area.

New Development

Any new development served by septic systems, which is the majority of the Watershed, must fully meet current standards, including a one acre minimum parcel size, regardless of the date of parcel creation. This requirement was implemented in 1983 in response to State direction to prevent an increase in cumulative impacts from septic systems. Expansion or remodel of existing development does not need to meet the minimum parcel size, but other standards must be met. Expansion of existing development provides a good trigger to bring older systems up to current standards. Over 63 septic system repairs were related to building remodels (almost 10% of the total repairs).

Water Quality Monitoring

An average of about 1000 water samples per year are currently being collected to measure trends in water quality and identify problem areas. Both nitrate and bacteria levels are significantly elevated above natural background levels in the River and many of its tributaries. Although there have been episodes of bacterial contamination from individual septic system failures, much of the bacteria contamination seems to be related to nonspecific nonpoint contamination in the relatively dense urban areas. Most of the nitrate increase is attributable to septic systems, particularly in sandy soils. There have been significant localized improvements in bacteria levels, and there appears to be an improving trend in bacterial levels at most stations since 1996. Nitrate levels and loading in Boulder Creek and the River north of Ben Lomond declined significantly as a result of upgrades of the Boulder Creek Country Club (CSA 7)Treatment Plant.

Program Administration and Financing

The annual budget for countywide wastewater management activities is about $110,000, with an additional $215,000 for activities specific to the San Lorenzo. (Roughly 60% of the parcels in the county with septic systems are located within the San Lorenzo Watershed.) These budget figures do not include permit processing activities. The program is funded primarily by annual service charges collected from property owners with septic systems. Since 1996-97, the countywide service charges have been $6.90 per parcel, with an additional $18.56 per parcel paid by property owners in the San

Lorenzo Watershed. In late 1995, the State Water Resources Control Board approved the County's request for $2.2 million from the State revolving Fund to set up a loan program to facilitate septic system repairs. This program was available summer of 1998, but for the past several years has been suspended pending an update of procedures with the state to make the program more usable. Only one loan was made under the old program.

<u>San Lorenzo Nitrate Management Plan and Nitrate TMDL</u>

The San Lorenzo Nitrate Management Plan was developed to address all major sources of elevated nitrate in the River. A grant was obtained under Section 205j of the Clean Water Act to investigate the impacts of nitrate on algae growth and water supply, to determine the primary sources of nitrate in the watershed, and to evaluate various alternatives for nitrate reduction. The Plan includes a watershed nitrate budget, which was used to calculate resulting nitrate levels in the River under different scenarios. The adopted Plan represented a balance between cost and available technology and the need to reduce nitrate levels by a moderate amount in order to reduce potential threats to drinking water quality and recreation. The San Lorenzo Nitrate Management Plan was adopted by the County and State in 1995. The Plan findings and recommendations also formed the basis for the Nitrate TMDL (Total Maximum Daily Load Plan) that was adopted by the Central Coast Regional Water Quality Control Board in 2000.

The recommended nitrate management plan provides for implementing the most cost-effective measures to achieve the desired level of nitrate reduction. The plan provides for limiting increased nitrate release from new or expanded development in sandy soils, and gradually reducing nitrate discharge from existing sources as public and private funds become available and reduction technology improves. Implementation of the recommended policies will provide for a 15-20% reduction in current nitrate levels over the next 10 years, with a further reduction of 10% in the following 10 years. The following measures were recommended (the status of implementation is shown in parentheses):

Manage Wastewater Disposal for Nitrogen Reduction

1. Maintain the existing requirement of a one acre minimum parcel size for new development served by septic systems in the San Lorenzo Watershed (Ongoing)

2. Implement improved wastewater disposal management through the San Lorenzo Wastewater Management Plan (Ongoing).

3. Complete ongoing efforts to improve treatment procedures at Boulder Creek Country Club Treatment Plant to reduce nitrate discharge by using wastewater reclamation on the golf course. (Construction was mostly completed by 1997. The treatment process was then refined and fully operational by May 1998. The improvements provide for wastewater reclamation on the golf course much of the year, with treatment for nitrogen removal at other times. These improvements should ultimately reduce the amount of nitrate in Boulder Creek and in the River between Boulder Creek and Ben Lomond by about 75%. Reductions beginning in 1998 appear to be substantial.)

4. Maintain the new requirement for shallow leachfields for new and repaired septic systems (less than 4 feet in sandy areas, and 4-6.5 feet in other areas). (Ongoing)

5. Implement enhanced technology for at least 50% nitrogen removal for septic system in sandy soils:
    a. Require septic systems serving new or expanded uses in sandy soils to install enhanced treatment measures which will reduce nitrogen discharge by at least 50%. (Implemented August, 1995; existing systems to be upgraded at the time of major remodels (projected rate of 1.2% (20 systems) per year).)
    b. Encourage the use of nitrogen removal methods for any onsite disposal system which will use a nonstandard system. (Estimated 20 upgrades per year.)
    c. Continue to evaluate new onsite wastewater disposal technology for nitrogen reduction to identify more cost-effective measures. Require higher levels of nitrogen removal if measures become available that are more cost-effective than sand filters.
    d. Apply for State revolving funds and other funds to develop a funding source to assist property owners in repairing their systems to provide enhanced treatment. (Revised program to be implemented July 2003, with an estimated 40-100 upgrades per year thereafter.)
    e. When more cost-effective technology and/or funding assistance becomes available, require all onsite system repairs in sandy areas to utilize enhanced treatment for nitrogen removal. (Implementation deferred, pending more inexpensive technology.)

6. Require all large onsite disposal systems which serve more than 5 residential units or dispose more than an average of 2000 gallons per day to utilize enhanced treatment to reduce nitrate discharge by at least 50%. Installation of such measures for existing systems shall be required at the time of system repair or upgrade. (Estimated 1-2 upgrades involving approximately 5000 gallons per day per year.)

7. Require all new or revised waste discharge permits and all new development projects in the San Lorenzo Watershed to include nitrogen control measures consistent with this Nitrate Management Plan. (County staff has worked with staff at the Regional Board to include nitrogen reduction requirements in new or amended waste discharge permits. This was included in the permits for expansion of the Mount Hermon Association system, the Boulder Creek Country Club system, and the San Lorenzo Valley High School system.)

Livestock Management for Nitrogen Reduction

8. Continue to work with stable owners and develop a new ordinance requiring practices to reduce nitrate discharge: cover manure piles, maintain manure piles and paddock areas at least 50-100 ft from streams or drainageways, direct drainage away from paddock areas, and provide other measures as necessary to reduce discharge of nitrate, sediment, and contaminants. (Ongoing, after meetings with stable and horse owners, it was decided to pursue an approach of education, technical assistance, and voluntary compliance. A grant funded effort by the Resource Conservation District got underway in 2001 and was completed in early 2003.)

Land Use Regulations for Nitrogen Reduction

9. Maintain current density restrictions requiring 10 acres per parcel for new land divisions and

other protective measures for groundwater recharge areas.

10. Maintain current regulations on erosion control, land clearing, and riparian corridor protection.

11. Do not approve new land use projects within the San Lorenzo Watershed which will increase the discharge of nitrate to groundwater or surface water by more than 15 pounds of nitrogen per acre per year from the project area.

Ongoing Monitoring of Nitrogen Sources

12. Monitor the Scotts Valley nitrate plume, and identify potential ongoing sources of nitrate. Work with the City of Scotts Valley and property owners for reduction of nitrate discharge from Scotts Valley, if feasible. (Ongoing monitoring, implementation of potential control measures in 2005, if necessary and feasible).

13. Continue to monitor nitrate levels in surface and groundwater. Reevaluate implementation of more stringent control measures if summer nitrate levels in the River have not declined by at least 15% by 2010. (Ongoing monitoring, reevaluation in 2010).

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Santa Cruz County Health Services Agency, 1995a, San Lorenzo Wastewater Management Plan

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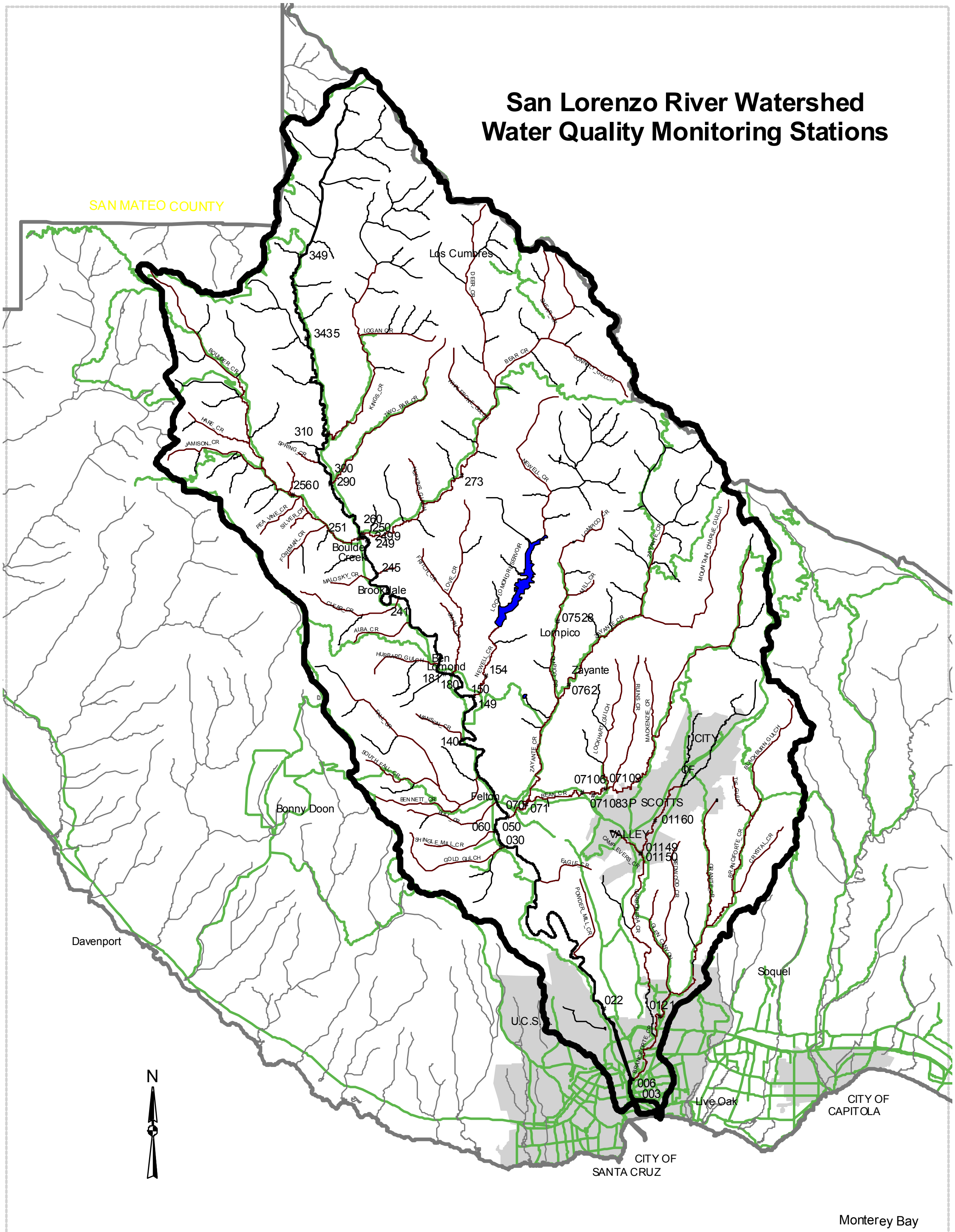
Santa Cruz County Health Services Agency, 2000, San Lorenzo Wastewater Management Plan, Program Status Report, 1996-1998.

Appendix A – Water Quality Monitoring Data



San Lorenzo Watershed Surface Water Quality - Santa Cruz County Environmental Health

Station / Water Year	Fecal Coliform (cfu/100ml) No.Samples	Fecal Coliform Logmean	Nitrate (mg-N/l) No.Samples	Nitrate Mean	Flow (cfs) Number	Flow Mean	Dis.Oxy (mg/L)	Elcond umho
003 SLR RIVERMOUTH @ TRESTLE								
198586	16	404	0	0.00	0	0.00	0.00	0
198687	62	787	11	0.13	0	0.00	10.05	6,417
198788	57	450	11	0.17	0	0.00	9.16	12,213
198889	68	335	15	0.20	0	0.00	10.10	6,812
198990	62	317	12	0.20	0	0.00	9.54	5,032
199091	60	257	12	0.31	0	0.00	10.20	11,830
199192	61	200	9	1.28	0	0.00	10.42	11,758
199293	59	293	10	0.48	0	0.00	9.83	3,876
199394	59	253	8	0.75	0	0.00	9.03	12,375
199495	64	398	10	0.22	0	0.00	9.55	6,820
199596	61	548	17	0.30	0	0.00	9.29	7,598
199697	46	195	8	0.39	0	0.00	9.09	7,559
199798	55	484	1	0.41	0	0.00	9.33	6,020
199899	29	584	0	0.00	0	0.00	9.52	3,095
199900	52	368	0	0.00	0	0.00	9.53	9,641
200001	54	176	0	0.00	0	0.00	9.42	14,775
200102	51	174	0	0.00	0	0.00	9.27	13,971
006 SLR @ BROADWY/LAUREL ST BRIDGE								
198889	4	1,407	2	0.50	0	0.00	11.17	4,650
199091	1	240	1	0.23	0	0.00	0.00	0
199192	1	32	1	0.36	0	0.00	15.60	2,700
199293	1	256	0	0.00	0	0.00	0.00	0
199495	3	421	3	0.20	0	0.00	11.36	312
199596	54	597	49	0.47	0	0.00	10.97	2,234
199697	48	379	39	0.33	0	0.00	10.10	2,196
199798	52	358	47	0.59	0	0.00	24.59	3,795
199899	27	491	43	0.37	0	0.00	10.25	1,174
199900	46	277	46	0.20	0	0.00	9.83	2,952
200001	50	291	37	0.27	0	0.00	10.28	5,492
200102	51	217	41	0.31	0	0.00	9.42	4,530
01160 CARBONERA CR AB SPRG LKS CR								
198687	3	90	3	0.27	0	0.00	10.17	400
198788	1	760	0	0.00	0	0.00	9.30	600
198889	2	124	2	0.10	0	0.00	9.10	450

San Lorenzo Watershed Surface Water Quality - Santa Cruz County Environmental Health

Station / Water Year	Fecal Coliform (cfu/100ml) No.Samples	Fecal Coliform (cfu/100ml) Logmean	Nitrate (mg-N/l) No.Samples	Nitrate (mg-N/l) Mean	Flow (cfs) Number	Flow (cfs) Mean	Dis.Oxy (mg/L)	Elcond umho
199192	1	200	1	1.09	1	2.56	10.80	290
199495	1	948	1	0.50	1	2.07	9.29	394
199596	4	1,338	2	0.58	1	1.62	12.21	492
199697	7	178	9	0.43	3	0.59	10.07	588
199798	10	360	10	0.44	4	2.52	9.86	528
199899	5	366	8	0.66	0	0.00	10.22	530
199900	10	295	9	0.24	0	0.00	10.75	550
200001	8	312	7	0.18	0	0.00	10.55	619
200102	12	198	12	0.37	3	4.31	10.43	579
0121 BRANCIFORTE CR. @ ISBEL DR.								
198586	12	217	13	0.41	10	4.34	10.60	520
198687	4	206	6	0.15	3	1.21	10.97	383
198788	4	371	5	0.15	1	0.93	9.30	493
198889	5	282	5	0.16	2	1.92	10.37	419
198990	14	243	14	0.25	1	2.55	10.41	434
199091	13	202	12	0.24	11	1.10	10.69	457
199192	10	295	9	0.52	12	1.34	10.02	535
199293	12	257	14	0.29	12	2.47	10.05	469
199394	12	121	13	0.34	12	1.76	10.42	577
199495	12	278	12	0.26	9	1.69	10.53	517
199596	8	242	8	0.31	2	1.79	10.67	511
199697	9	270	9	0.17	2	0.80	9.74	568
199798	10	160	11	0.29	4	2.47	10.02	505
199899	7	157	13	0.32	5	3.56	10.21	493
199900	9	193	11	0.19	4	1.54	10.98	498
200001	10	222	11	0.24	3	5.39	9.51	589
200102	8	73	10	0.29	3	2.28	9.78	537
022 SLR @ SYCAMORE GROVE								
198586	29	98	11	0.34	3	27.66	0.00	386
198687	63	85	12	0.27	1	26.31	10.49	310
198788	57	61	13	0.34	0	0.00	9.60	407
198889	63	51	13	0.27	0	0.00	11.23	395
198990	59	104	26	0.32	13	16.81	10.84	428
199091	59	63	16	0.30	14	18.17	11.24	483
199192	58	73	11	0.34	11	25.70	10.74	564
199293	56	80	36	0.35	7	24.67	9.96	494

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199394	53	51	52	0.45	12	19.50	10.87	369
199495	60	95	55	0.34	5	23.24	10.82	343
199596	59	64	56	0.35	1	26.55	11.22	367
199697	47	58	45	0.34	2	26.31	10.39	373
199798	48	59	48	0.31	1	26.13	10.74	362
199899	33	62	43	0.24	1	33.84	10.80	365
199900	57	62	55	0.24	3	280.55	14.37	361
200001	57	39	56	0.28	2	24.66	10.55	382
200102	61	47	56	0.29	2	29.17	10.32	371
030	**GOLD GULCH @ SLR, HWY 9**							
198586	40	152	11	0.18	9	1.37	0.00	365
198687	13	130	13	0.15	1	0.30	11.06	201
198788	11	168	11	0.12	0	0.00	9.74	341
198889	12	138	12	0.15	0	0.00	10.43	325
198990	12	71	12	0.19	0	0.00	10.55	392
199091	12	94	11	0.20	10	0.44	11.21	459
199192	11	163	10	0.30	11	0.44	10.94	573
199293	10	142	11	0.15	10	0.90	9.83	406
199394	12	124	12	0.19	12	0.68	10.55	403
199495	11	135	8	0.17	8	0.91	10.98	360
199596	7	73	7	0.17	1	2.18	11.07	355
199697	12	54	10	0.21	1	0.47	10.32	357
199798	10	49	10	0.16	3	2.10	10.42	287
199899	7	73	11	0.17	3	1.96	10.33	347
199900	11	92	11	0.16	4	1.21	10.63	369
200001	10	61	10	0.16	2	0.33	9.49	381
200102	12	61	10	0.26	4	1.53	9.88	509
050	**SHINGLE MILL CR. @ SLR**							
198586	23	270	13	0.82	16	19.29	0.00	289
198687	24	195	13	0.82	1	0.33	10.87	131
198788	11	193	11	0.67	0	0.00	9.51	195
198889	13	193	13	0.83	0	0.00	10.34	231
198990	13	185	12	0.65	0	0.00	10.31	250
199091	12	108	11	0.69	10	0.20	10.61	309
199192	10	203	11	0.97	10	0.14	10.57	451
199293	11	270	11	0.89	10	0.37	9.78	323

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199394	13	244	12	1.07	12	0.27	10.09	267
199495	12	291	10	0.98	7	0.33	10.19	249
199596	12	269	9	1.04	1	2.44	10.40	273
199697	12	120	11	0.86	1	0.15	10.18	280
199798	10	171	10	0.77	3	0.70	9.71	266
199899	7	182	11	0.90	3	0.62	10.04	262
199900	11	107	11	0.80	4	0.50	10.96	259
200001	12	168	10	0.91	3	0.43	9.55	280
200102	10	81	10	0.89	2	0.29	9.25	279
060	**SLR @ BIG TREES**							
198586	61	256	14	0.47	62	182.10	11.40	427
198687	62	123	50	0.42	54	23.95	10.35	288
198788	60	207	57	0.39	59	20.60	9.22	386
198889	64	172	64	0.45	64	22.97	10.22	403
198990	63	262	75	0.40	77	21.71	9.92	424
199091	64	168	66	0.48	69	81.34	10.51	490
199192	58	242	56	0.59	59	67.85	10.92	552
199293	58	243	60	0.49	64	92.48	9.49	484
199394	60	198	61	0.62	62	33.92	10.35	376
199495	67	253	65	0.40	69	174.23	10.25	358
199596	58	188	56	0.44	61	153.38	11.50	382
199697	49	150	47	0.42	51	139.05	10.09	392
199798	52	149	54	0.35	54	269.01	10.46	372
199899	30	119	48	0.32	50	119.56	10.50	374
199900	50	162	49	0.37	50	116.02	10.65	373
200001	52	82	56	0.38	51	87.91	9.84	397
200102	53	111	49	0.35	53	82.12	9.41	391
070	**ZAYANTE CR. @ SLR**							
198586	38	168	14	0.67	10	13.57	10.85	428
198687	13	121	14	0.63	3	6.48	10.83	281
198788	13	181	14	0.74	2	4.72	9.84	414
198889	12	150	14	0.57	2	9.40	10.39	438
198990	12	211	27	0.48	15	5.02	10.09	442
199091	13	172	14	0.55	13	3.96	10.44	486
199192	14	231	13	0.69	13	6.23	11.20	556
199293	12	204	13	0.62	12	12.66	11.02	433

Station Water Year	Fecal Coliform (cfu/100ml) No.Samples	Logmean	Nitrate (mg-N/l) No.Samples	Mean	Flow (cfs) Number	Mean	Dis.Oxy (mg/L)	Elcond umho
199394	12	159	13	0.82	13	7.99	10.51	410
199495	12	190	10	0.57	9	14.89	10.43	441
199596	9	86	9	0.62	2	17.28	11.81	401
199697	8	136	9	0.59	4	7.87	9.94	417
199798	9	72	10	0.60	5	17.87	9.37	409
199899	6	115	11	0.55	3	18.56	10.01	431
199900	13	106	12	0.44	4	13.46	10.78	405
200001	9	83	10	0.52	2	5.02	9.68	435
200102	10	92	13	0.49	5	8.92	9.94	456
071	**BEAN CR. ABOVE ZAYANTE CR.**							
198788	1	190	1	0.70	0	0.00	9.40	500
198990	0		3	0.40	3	3.27	9.07	417
199091	0		2	0.45	2	2.35	9.55	550
199192	4	225	4	0.69	4	4.75	11.37	638
199293	2	87	2	0.83	2	3.79	10.10	325
199394	3	151	3	0.45	3	2.35	10.25	486
199495	1	196	1	0.67	1	4.12	9.44	451
199596	1	128	2	0.57	2	5.66	9.02	431
199697	1	136	2	0.56	1	3.61	9.13	441
199798	0		2	0.56	2	6.37	9.32	410
199899	0		4	0.54	4	5.06	9.16	397
199900	0		4	0.48	4	4.49	9.01	453
200001	0		4	0.46	4	3.25	8.47	483
200102	0		4	0.50	4	3.10	8.76	506
07106	**BEAN CR @ MT HERMON RD (USGS)**							
198586	0		3	0.70	2	4.34	10.90	376
198687	0		2	1.05	2	3.03	11.30	346
198788	0		2	0.70	2	2.73	9.35	356
198889	0		2	0.50	2	3.77	10.10	332
198990	0		7	0.43	7	2.21	8.69	424
199091	11	180	13	0.58	13	4.39	9.39	501
199192	11	183	12	0.64	11	3.18	10.60	593
199293	9	151	13	0.67	12	11.10	10.01	397
199394	10	159	12	0.66	12	2.26	8.91	397
199495	10	141	11	0.46	11	3.77	9.13	407
199596	9	120	10	0.54	9	7.45	10.04	420

Station Water Year	Fecal Coliform (cfu/100ml) No.Samples	Logmean	Nitrate (mg-N/l) No.Samples	Mean	Flow (cfs) Number	Mean	Dis.Oxy (mg/L)	Elcond umho
199697	6	189	7	0.46	5	3.20	9.28	411
199798	3	103	5	0.42	3	4.55	8.89	432
199899	1	120	8	0.49	8	9.98	9.45	405
199900	0		4	0.42	4	4.02	8.79	455
200001	0		4	0.36	4	2.70	8.98	496
200102	1	250	4	0.39	6	9.57	8.16	523
07109	**BEAN CR. BELOW LOCKHART GULCH**							
198586	53	294	11	0.61	9	3.46	0.00	518
198687	25	179	13	0.93	0	0.00	9.29	371
198788	11	247	11	0.72	0	0.00	8.78	455
198889	12	185	12	0.80	0	0.00	9.38	458
198990	11	179	15	0.59	4	0.87	8.97	450
199091	0		2	0.57	2	1.00	8.35	525
199192	3	328	3	0.58	3	3.61	10.10	633
199293	1	280	2	0.54	2	1.59	8.40	375
199394	3	212	3	0.47	3	0.80	8.79	449
199495	1	180	1	0.46	1	2.11	8.13	496
199596	1	240	2	0.30	2	2.93	7.83	467
199697	1	60	3	0.45	3	0.90	8.40	507
199798	0		2	0.35	2	2.54	8.20	482
199899	0		5	0.47	5	2.82	8.28	467
199900	0		4	0.39	4	1.88	7.73	467
200001	0		4	0.41	4	0.77	8.18	527
200102	1	128	4	0.42	4	1.16	7.54	496
07528	**LOMPICO CR @ CARROL AVE**							
198586	62	277	12	0.32	10	1.50	0.00	488
198687	63	213	13	0.22	1	0.43	10.59	339
198788	60	265	13	0.22	0	0.00	8.94	393
198889	51	223	12	0.42	0	0.00	9.96	402
198990	12	247	11	0.18	0	0.00	9.43	363
199091	10	132	10	0.26	9	0.14	9.99	400
199192	12	132	10	0.32	12	0.13	10.25	517
199293	11	220	11	0.29	10	0.55	10.43	436
199394	11	228	9	0.15	10	0.07	9.17	630
199495	11	239	9	0.16	9	0.51	10.11	436
199596	9	70	9	0.21	1	0.72	11.44	427

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199697	9	47	8	0.30	4	0.32	9.63	483
199798	9	35	9	0.14	4	0.96	9.28	410
199899	5	140	9	0.19	3	0.81	9.87	403
199900	12	207	11	0.11	4	0.45	10.61	442
200001	10	164	10	0.13	1	0.25	9.16	501
200102	12	79	12	0.24	3	2.14	9.67	494
0762	**ZAYANTE CR. @ ZAYANTE**							
198586	60	214	13	0.20	51	10.99	10.40	584
198687	61	149	14	0.18	56	1.46	10.89	395
198788	57	134	12	0.18	56	1.41	9.45	419
198889	50	109	14	0.16	53	1.14	10.58	452
198990	12	100	14	0.23	14	1.55	10.48	414
199091	12	120	12	0.24	15	1.14	11.08	432
199192	14	218	14	0.28	14	1.67	10.61	533
199293	10	168	13	0.18	11	3.51	10.04	485
199394	10	120	12	0.23	12	0.88	10.91	660
199495	12	179	12	0.17	10	5.56	10.58	589
199596	9	104	9	0.30	1	5.95	12.07	621
199697	9	122	7	0.18	4	2.17	10.49	626
199798	9	76	9	0.10	4	6.76	9.99	625
199899	7	82	11	0.10	3	5.53	9.96	574
199900	11	113	11	0.10	4	2.96	11.41	617
200001	10	58	9	0.13	2	1.13	9.78	658
200102	12	76	11	0.15	4	21.43	10.00	632
140	**SLR @ MT. CROSS BRIDGE**							
198586	12	184	11	0.46	6	13.33	0.00	430
198687	12	95	12	0.47	1	8.07	10.54	258
198788	11	128	11	0.45	0	0.00	9.57	382
198889	12	109	12	0.50	0	0.00	10.38	442
198990	10	125	12	0.46	3	6.82	10.39	450
199091	12	267	13	0.56	12	7.11	10.68	450
199192	10	202	10	0.69	9	11.33	10.60	577
199293	9	163	9	0.57	8	14.79	10.66	483
199394	10	213	10	0.75	10	10.76	10.03	390
199495	8	173	7	0.45	6	33.67	10.51	371
199596	6	168	7	0.42	2	35.73	10.51	407

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199697	5	98	7	0.44	2	26.15	10.34	392
199798	0		1	0.45	1	18.09	8.61	413
199899	0		3	0.43	3	20.12	8.71	408
199900	0		3	0.38	3	15.35	8.99	429
200001	0		3	0.57	3	9.92	9.46	460
200102	0		3	0.59	3	10.23	8.96	453
149	**SLR @ HIGHLANDS PARK**							
198687	17	128	3	0.47	0	0.00	8.84	359
198788	22	173	4	0.40	0	0.00	9.45	467
198889	18	229	1	0.40	0	0.00	10.01	475
198990	19	162	2	0.33	0	0.00	9.81	487
199091	18	119	2	0.55	0	0.00	9.69	546
199192	21	244	0	0.00	0	0.00	9.54	532
199293	18	246	0	0.00	0	0.00	8.09	509
199394	22	313	0	0.00	0	0.00	8.68	382
199495	21	211	0	0.00	0	0.00	9.31	409
199596	18	197	0	0.00	0	0.00	11.43	393
199697	20	91	0	0.00	0	0.00	8.88	437
199798	26	130	1	0.09	0	0.00	8.69	407
199899	20	125	0	0.00	0	0.00	10.38	419
199900	17	68	1	0.29	0	0.00	10.03	402
200001	24	142	1	0.35	0	0.00	10.15	401
200102	19	75	2	0.36	0	0.00	8.77	412
150	**NEWELL CRK @ SLR IN GLEN ARBOR**							
198586	37	80	12	0.80	9	2.91	0.00	379
198687	13	105	13	0.78	1	2.56	9.26	138
198788	12	135	12	0.67	0	0.00	9.14	308
198889	15	92	13	0.57	0	0.00	9.65	413
198990	11	88	13	0.64	3	1.06	9.29	414
199091	16	286	14	0.66	12	1.04	9.79	513
199192	13	243	12	0.87	11	1.18	9.73	558
199293	10	96	10	1.05	8	1.23	8.78	478
199394	15	192	10	1.12	10	1.43	9.21	345
199495	11	154	8	1.11	6	2.91	9.14	324
199596	8	142	8	1.09	2	2.62	10.28	312
199697	10	218	10	0.82	4	1.97	9.27	317

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199798	7	95	9	1.19	5	2.96	8.50	316
199899	7	169	11	0.59	3	4.02	9.69	376
199900	11	85	11	0.87	5	3.63	9.31	322
200001	11	180	8	0.73	2	1.58	9.53	341
200102	13	150	13	0.70	5	4.05	9.33	359
154	**NEWELL CR. @ RANCHO RIO**							
198586	0		2	0.00	1	0.55	11.85	318
198687	1	60	3	0.27	2	0.94	11.50	287
198788	1	247	3	0.00	2	0.51	8.90	381
198889	0		2	0.20	2	1.17	11.25	313
198990	0		4	0.30	4	0.85	9.90	375
199091	3	33	4	0.17	3	0.92	9.98	551
199192	4	66	5	0.25	5	0.95	9.20	568
199293	4	236	6	0.26	5	1.09	10.45	422
199394	5	326	5	0.10	5	0.86	10.45	392
199495	3	154	2	0.28	1	1.01	9.61	424
199596	0		1	0.11	1	1.00	8.97	415
199697	0		2	0.29	2	1.11	8.07	377
199798	0		2	0.21	2	1.25	8.39	397
199899	0		4	0.22	4	2.48	8.01	401
199900	0		4	0.20	4	2.19	8.63	413
200001	1	60	4	0.20	4	1.05	9.07	476
200102	0		4	0.15	4	2.04	9.31	460
180	**SLR ABOVE LOVE CR.**							
198586	50	168	12	0.27	7	17.51	0.00	434
198687	61	78	12	0.20	1	7.43	9.96	320
198788	58	115	12	0.23	0	0.00	9.18	405
198889	59	123	12	0.27	0	0.00	10.41	415
198990	58	177	25	0.25	13	8.39	10.57	433
199091	64	223	14	0.26	13	6.16	10.81	483
199192	59	298	12	0.35	10	18.04	10.88	580
199293	55	206	9	0.24	8	23.96	9.75	484
199394	58	195	8	0.30	10	9.19	10.52	413
199495	58	184	6	0.20	5	31.44	10.63	375
199596	57	136	7	0.20	2	29.51	11.22	482
199697	37	93	3	0.15	2	17.92	10.22	428

Station	Water Year	Fecal Coliform (cfu/100ml) No.Samples	Fecal Coliform Logmean	Nitrate (mg-N/l) No.Samples	Nitrate Mean	Flow (cfs) Number	Flow Mean	Dis.Oxy (mg/L)	Elcond umho
	199798	46	150	3	0.12	1	11.40	10.94	387
	199899	29	90	4	0.10	3	15.97	10.53	402
	199900	49	141	7	0.13	4	23.11	10.67	406
	200001	56	74	5	0.14	4	14.34	10.21	434
	200102	52	86	4	0.14	4	17.03	9.82	421
181	**SLR @ BEN LOMOND DAM**								
	198586	12	53	0	0.00	0	0.00	0.00	0
	198687	1	12	0	0.00	0	0.00	8.70	500
	198788	1	28	0	0.00	0	0.00	7.50	500
	198889	11	88	1	0.30	0	0.00	10.10	483
	198990	9	44	0	0.00	0	0.00	10.88	467
	199091	10	112	0	0.00	0	0.00	10.85	519
	199192	14	112	0	0.00	0	0.00	10.09	558
	199293	15	127	0	0.00	0	0.00	8.62	497
	199394	17	97	0	0.00	0	0.00	11.31	439
	199495	17	73	0	0.00	0	0.00	9.50	434
	199596	17	85	1	0.01	0	0.00	11.15	423
	199697	10	35	0	0.00	0	0.00	8.32	501
	199798	5	28	0	0.00	0	0.00	8.58	452
	199899	13	45	0	0.00	0	0.00	8.92	442
	199900	14	25	1	0.08	0	0.00	9.05	437
	200001	23	69	1	0.16	0	0.00	9.37	443
	200102	14	41	1	0.21	0	0.00	7.86	454
241	**SLR @ PACIFIC AVE., BROOKDALE**								
	198586	19	596	0	0.00	0	0.00	0.00	0
	198687	33	671	3	0.23	0	0.00	8.83	425
	198788	20	702	2	0.35	0	0.00	7.67	484
	198889	17	299	1	0.60	0	0.00	8.76	471
	198990	18	158	3	0.44	1	2.70	8.79	472
	199091	21	138	5	0.33	1	1.93	9.80	525
	199192	19	217	4	0.38	3	3.38	9.38	571
	199293	24	278	3	0.28	3	18.39	9.47	484
	199394	18	246	3	0.31	3	4.81	9.12	453
	199495	19	152	1	0.10	0	0.00	9.86	464
	199596	18	154	1	0.21	0	0.00	11.37	455
	199697	22	119	1	0.09	0	0.00	8.79	538

Station / Water Year	Fecal Coliform (cfu/100ml) No.Samples	Fecal Coliform Logmean	Nitrate (mg-N/l) No.Samples	Nitrate Mean	Flow (cfs) Number	Flow Mean	Dis.Oxy (mg/L)	Elcond umho
199798	23	208	1	0.09	0	0.00	9.22	427
199899	17	100	0	0.00	0	0.00	10.46	470
199900	13	66	0	0.00	0	0.00	9.72	474
200001	20	80	1	0.20	0	0.00	9.24	437
200102	19	77	1	0.16	0	0.00	8.76	486
245	**SLR @ RIVER ST., B.C.**							
198586	63	453	11	0.31	6	8.51	0.00	555
198687	63	122	47	0.23	1	4.13	10.18	342
198788	59	193	57	0.31	0	0.00	8.59	409
198889	60	159	57	0.45	0	0.00	9.93	422
198990	62	239	69	0.38	13	4.70	10.19	427
199091	60	190	60	0.43	13	4.00	10.20	483
199192	59	309	57	0.50	11	9.31	10.75	584
199293	52	258	49	0.34	8	13.11	10.43	474
199394	58	316	53	0.37	9	6.61	9.92	452
199495	61	218	57	0.20	4	11.51	10.53	413
199596	56	189	54	0.22	2	17.84	11.11	450
199697	48	128	38	0.23	2	13.68	9.77	488
199798	54	162	52	0.13	1	9.40	10.28	428
199899	29	111	47	0.13	3	14.04	10.50	425
199900	49	151	50	0.14	4	19.93	10.55	437
200001	53	104	52	0.17	2	7.50	15.77	452
200102	52	101	47	0.23	0	0.00	9.68	433
249	**SLR @ LOMOND ST. BRIDGE**							
198586	22	271	1	0.10	0	0.00	9.90	610
198687	26	142	2	0.35	1	5.89	8.66	426
198788	20	206	5	0.35	2	3.96	8.93	468
198889	11	148	3	0.43	2	15.50	9.98	470
198990	8	140	2	0.25	2	7.57	9.87	481
199091	5	285	1	0.60	1	7.16	10.10	521
199192	8	175	2	0.50	2	6.06	10.00	517
199293	10	232	2	0.25	2	10.55	8.86	481
199394	7	202	2	0.30	2	6.80	9.70	428
199495	17	169	2	0.20	1	6.40	9.65	468
199596	5	154	0	0.00	0	0.00	12.71	441
199798	3	182	0	0.00	0	0.00	9.97	462

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199899	8	113	0	0.00	0	0.00	9.97	446
199900	15	110	1	0.10	0	0.00	9.19	472
200001	28	142	1	0.20	0	0.00	9.50	473
200102	18	77	1	0.17	0	0.00	8.92	452
2499	**SLR BELOW BOULDER CR.**							
198586	4	471	0	0.00	1	1.70	0.00	0
198788	16	147	2	1.05	0	0.00	8.72	493
198889	18	171	2	0.65	0	0.00	9.94	459
198990	11	159	3	0.93	3	3.29	9.37	475
199091	15	250	4	0.45	1	0.86	10.13	532
199192	13	190	3	0.45	3	22.05	10.34	579
199293	11	117	3	0.38	3	11.80	11.73	486
199394	11	132	3	0.35	3	5.56	9.54	464
199596	15	178	2	0.19	1	8.15	11.63	463
199697	22	210	3	0.30	2	12.79	9.41	534
199798	32	245	3	0.04	1	10.15	9.32	492
199899	11	99	3	0.07	1	8.44	9.54	485
199900	18	94	4	0.13	1	45.21	9.52	489
200001	30	176	5	0.18	2	17.72	9.22	466
200102	18	79	5	0.21	2	17.89	8.78	503
250	**BOULDER CR. @ SLR**							
198586	35	132	6	0.43	33	17.12	0.00	223
198788	2	98	2	0.70	0	0.00	8.95	250
198889	2	135	1	1.00	0	0.00	11.20	150
198990	0		3	1.30	3	1.25	10.10	367
199091	4	56	2	1.06	1	0.41	10.35	375
199192	3	88	3	0.77	3	0.59	9.50	450
199293	3	85	3	0.33	3	3.73	11.37	350
199394	9	94	9	0.67	9	1.95	10.08	237
199495	8	64	7	0.34	5	3.65	10.54	190
199596	10	55	8	0.35	1	8.47	11.34	222
199697	10	63	9	0.27	3	3.13	10.02	210
199798	8	97	9	0.20	5	10.96	9.62	195
199899	6	82	13	0.74	6	11.47	10.23	219
199900	10	97	12	0.25	5	5.66	10.15	221
200001	18	79	11	0.25	3	4.80	19.31	259

Station		Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
	Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
	200102	10	39	13	0.27	4	4.52	9.56	304
2560	**BOULDER CR @ BRACKEN BRAE**								
	198687	2	35	0	0.00	0	0.00	0.00	0
	198990	0		3	2.18	3	0.67	10.20	383
	199091	0		2	2.40	2	1.36	7.80	375
	199192	4	54	4	1.24	4	1.82	10.73	425
	199293	3	59	3	0.57	3	3.03	9.50	350
	199394	3	150	3	0.92	3	1.17	9.77	243
	199495	1	48	1	0.29	1	5.09	9.92	242
	199596	1	30	1	0.51	1	1.66	14.24	227
	199697	0		2	0.40	2	3.15	8.62	229
	199798	0		2	0.14	2	6.70	8.20	273
	199899	0		2	0.20	2	4.35	9.56	245
	199900	0		4	0.21	4	4.45	9.90	242
	200001	0		4	0.27	4	2.50	9.83	270
270	**BEAR CR. @ SLR**								
	198788	1	340	1	0.10	0	0.00	9.20	500
	198889	1	120	1	0.20	0	0.00	10.40	500
	199091	3	129	1	0.15	0	0.00	10.70	350
	199293	2	466	2	0.07	1	0.93	10.15	425
	199394	9	273	8	0.16	9	1.20	9.82	617
	199495	8	189	6	0.13	5	3.64	10.51	545
	199596	9	141	7	0.09	1	10.22	11.37	594
	199697	9	134	4	0.10	3	2.08	9.48	594
	199798	7	123	8	0.10	4	10.89	10.07	570
	199899	7	129	10	0.10	3	7.09	9.96	502
	199900	11	143	10	0.07	4	4.82	10.38	561
	200001	14	181	10	0.46	3	7.13	10.53	525
	200102	11	117	11	0.17	3	6.28	9.89	565
273	**BEAR CR. @ SCOUT CAMP**								
	198586	17	217	0	0.00	0	0.00	0.00	0
	198687	20	151	1	0.09	0	0.00	8.62	447
	198788	20	161	4	0.10	0	0.00	7.77	484
	198889	12	53	2	0.10	0	0.00	8.43	450
	198990	12	132	0	0.00	0	0.00	8.88	255

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199091	16	187	1	0.10	0	0.00	8.83	413
199192	16	105	0	0.00	0	0.00	9.97	523
199293	20	201	0	0.00	0	0.00	9.93	444
199394	16	130	0	0.00	0	0.00	7.94	628
199495	20	194	0	0.00	0	0.00	8.34	599
199596	17	191	0	0.00	0	0.00	10.82	563
199697	21	94	0	0.00	0	0.00	7.73	656
199798	22	103	1	0.09	0	0.00	8.89	569
199899	17	78	0	0.00	0	0.00	9.77	599
199900	11	53	0	0.00	0	0.00	9.19	596
200001	18	70	0	0.00	0	0.00	9.29	556
200102	18	75	1	0.09	0	0.00	8.95	645
290	**TWO BAR CR. @ SLR**							
198586	5	718	0	0.00	0	0.00	0.00	0
198687	8	419	7	0.33	0	0.00	9.82	400
198788	11	273	12	0.37	0	0.00	9.01	421
198889	13	166	13	0.35	0	0.00	9.83	446
198990	11	154	11	0.32	0	0.00	10.54	405
199091	13	158	12	0.41	11	0.13	10.23	471
199192	12	188	12	0.35	11	0.29	10.79	518
199293	8	125	7	0.24	7	0.58	9.95	543
199394	11	436	9	0.34	9	0.17	9.56	579
199495	8	482	7	0.16	6	1.77	10.24	470
199596	8	246	8	0.18	1	1.84	11.02	541
199697	11	309	8	0.17	3	0.27	9.15	502
199798	10	866	7	0.16	4	1.22	9.37	548
199899	7	143	10	0.17	3	0.99	10.44	542
199900	11	201	10	0.20	4	0.62	10.07	533
200001	11	180	8	0.20	3	3.40	10.09	544
200102	10	91	10	0.27	2	1.96	9.74	457
300	**SLR @ TWO BAR CR.**							
198687	1	220	1	0.20	0	0.00	14.70	400
198889	8	236	8	0.19	0	0.00	9.67	400
198990	10	157	10	0.19	0	0.00	10.77	380
199091	12	147	11	0.21	10	1.03	10.54	373
199192	12	254	11	0.25	10	3.36	9.95	497

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199293	7	301	7	0.18	6	4.04	9.92	533
199394	9	156	8	0.23	9	2.03	9.05	698
199495	7	163	7	0.13	5	4.86	10.40	519
199596	8	146	6	0.17	1	15.52	11.39	608
199697	9	106	6	0.14	3	4.52	9.84	593
199798	8	116	7	0.16	4	12.51	9.69	621
199899	7	141	10	0.12	3	9.35	10.51	593
199900	11	186	10	0.08	4	5.76	10.01	574
200001	11	76	9	0.11	2	1.23	10.02	632
200102	10	125	10	1.03	1	31.42	9.82	572
310	**KINGS CR. @ HWY 9**							
198586	59	252	10	0.27	9	4.11	0.00	537
198687	63	196	12	0.22	0	0.00	10.37	358
198788	50	698	11	0.34	0	0.00	8.81	400
198889	45	410	12	0.31	0	0.00	10.38	429
198990	50	203	10	0.23	0	0.00	9.93	336
199091	60	223	11	0.29	10	0.41	10.38	356
199192	60	357	10	0.31	10	1.03	10.65	490
199293	58	373	7	0.18	7	1.79	10.39	480
199394	52	232	7	0.29	8	0.51	9.47	583
199495	58	197	6	0.12	6	4.26	9.99	551
199596	49	138	7	0.08	1	3.89	11.14	585
199697	10	149	7	0.16	3	1.11	9.63	633
199798	7	116	7	0.12	4	3.62	9.90	616
199899	7	103	9	0.07	3	3.23	10.35	621
199900	13	158	11	0.08	4	2.15	10.30	632
200001	10	105	9	0.19	2	0.24	9.81	663
200102	11	155	10	0.16	3	6.68	9.84	616
3435	**SLR @ FERN DR., S.L. WOODS**							
198586	17	432	0	0.00	0	0.00	0.00	0
198687	23	255	0	0.00	0	0.00	8.54	439
198788	21	203	1	0.00	0	0.00	7.91	490
198889	14	89	2	0.10	0	0.00	8.70	482
198990	14	91	1	0.10	0	0.00	9.03	496
199091	15	39	1	0.09	0	0.00	9.43	550
199192	19	79	0	0.00	0	0.00	9.83	547

San Lorenzo Watershed Surface Water Quality - Santa Cruz County Environmental Health

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199293	17	158	0	0.00	0	0.00	10.18	493
199394	14	87	0	0.00	0	0.00	8.83	498
199495	18	79	0	0.00	0	0.00	9.48	534
199596	16	74	0	0.00	0	0.00	11.42	538
199697	21	54	0	0.00	0	0.00	8.33	590
199798	25	52	2	0.09	0	0.00	8.84	541
199899	19	68	0	0.00	0	0.00	9.19	569
199900	11	91	0	0.00	0	0.00	9.12	546
200001	20	61	1	0.06	0	0.00	9.71	488
200102	18	57	1	0.10	0	0.00	9.08	561
349	**SLR @ WATERMAN GAP**							
198586	33	17	13	0.13	32	26.07	10.10	548
198687	46	6	47	0.10	43	1.07	10.55	379
198788	28	32	28	0.10	30	0.70	9.46	412
198889	12	4	14	0.15	14	0.47	10.39	435
198990	11	11	16	0.10	17	1.58	10.02	436
199091	12	14	15	0.10	16	7.31	10.74	473
199192	10	14	10	0.19	13	2.63	10.45	557
199293	7	17	8	0.15	9	3.47	10.56	483
199394	9	5	8	0.07	11	1.22	10.01	455
199495	7	9	8	0.10	6	5.42	10.28	457
199596	7	3	3	0.07	2	3.63	10.50	521
199697	0		2	0.07	2	2.20	9.39	533
199798	0		2	-0.06	2	5.33	8.03	524
199899	0		4	0.03	4	4.74	9.08	517
199900	1	1	5	0.03	4	3.72	9.98	549
200001	0		4	0.05	4	2.18	9.52	592
200102	0		4	0.05	4	2.06	9.39	583
BC1	**JUNCTION AVE., BOULDER CR.**							
198788	9	1	9	3.56	0	0.00	0.00	0
198889	12	1	11	6.21	0	0.00	0.00	0
198990	9	1	11	3.38	0	0.00	6.75	500
199091	11	9	12	3.14	0	0.00	9.20	0
199192	11	7	11	4.52	0	0.00	7.94	590
199293	10	1	11	2.39	0	0.00	6.30	483
199394	7	1	7	4.43	0	0.00	5.94	348

Station Water Year	Fecal Coliform (cfu/100ml) No.Samples	Logmean	Nitrate (mg-N/l) No.Samples	Mean	Flow (cfs) Number	Mean	Dis.Oxy (mg/L)	Elcond umho
199495	10	1	10	6.60	0	0.00	5.07	318
199596	6	1	6	2.77	0	0.00	4.81	342
199697	1	1	1	0.57	0	0.00	3.73	325
199798	4	810	3	2.85	0	0.00	4.94	359
199899	3	300	3	1.26	0	0.00	4.70	344
199900	2	122	2	1.97	0	0.00	4.41	339
200001	1	110	1	6.46	0	0.00	4.37	329
200102	0		0	0.00	0	0.00	0.00	0
BC3	**13180 OAK, BOULDER CREEK**							
198788	4	1	5	4.12	0	0.00	0.00	0
198889	12	1	11	5.55	0	0.00	0.00	0
198990	12	1	12	5.69	0	0.00	0.00	0
199091	12	2	10	4.00	0	0.00	0.00	0
199192	9	3	8	4.40	0	0.00	6.85	463
199293	9	1	10	2.63	0	0.00	5.55	400
199394	7	1	7	2.11	0	0.00	3.35	201
199495	9	2	10	1.30	0	0.00	2.81	238
199596	6	1	6	1.27	0	0.00	2.43	234
199697	1	1	1	0.85	0	0.00	1.64	175
199798	3	52	3	0.69	0	0.00	2.42	244
199899	3	38	3	0.30	0	0.00	5.07	206
199900	2	17	2	2.31	0	0.00	2.24	205
200001	2	5	3	2.18	0	0.00	2.71	222
200102	1	1	1	1.30	0	0.00	0.00	0
BC6	**OAK @ LOMOND STS., B.C.**							
198788	8	1	9	6.28	0	0.00	0.00	0
198889	11	1	10	5.92	0	0.00	0.00	0
198990	8	1	8	7.59	0	0.00	0.00	0
199091	7	5	6	10.84	0	0.00	0.00	0
199192	8	1	7	5.24	0	0.00	10.90	517
199293	10	1	11	2.98	0	0.00	7.35	500
199394	6	1	6	4.02	0	0.00	7.86	289
199495	10	1	9	1.96	0	0.00	6.80	178
199596	6	1	6	1.38	0	0.00	6.44	238
199697	1	1	1	0.53	0	0.00	5.89	252
199798	2	1	3	0.61	0	0.00	6.06	185

San Lorenzo Watershed Surface Water Quality - Santa Cruz County Environmental Health

Station	Fecal Coliform (cfu/100ml)		Nitrate (mg-N/l)		Flow (cfs)		Dis.Oxy	Elcond
Water Year	No.Samples	Logmean	No.Samples	Mean	Number	Mean	(mg/L)	umho
199899	4	2	3	1.35	0	0.00	7.47	209
199900	2	2	2	1.18	0	0.00	6.83	176
200001	1	5	1	1.24	0	0.00	5.30	205
200102	0		0	0.00	0	0.00	0.00	0