Wasteload Allocation Attainment Program
Stormwater System and Urban Runoff
County of Santa Cruz and City of Capitola
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Prepared by County of Santa Cruz Environmental Health Services

Introduction

A number of waterways in Santa Cruz County have been designated as impaired due to excessive levels of various constituents, pursuant to Section 303d of the Federal Clean Water Act (see Table 1). The Central Coast Regional Water Quality Control Board (Regional Board) has adopted Total Maximum Daily Loads (TMDLs), which identify the sources of impairment and describe implementation measures necessary to reduce the pollutant levels to the point where the waterway will meet standards and will no longer be considered impaired. Discharges from the County's storm drain system have been identified as contributing to impairment. Both the TMDLs and the County and City Stormwater Management Plan (SWMP) call for the preparation of a Wasteload Allocation Attainment Program (WAAP) to describe how the pollutant contributions from the stormwater system will be reduced to acceptable levels for impaired waterbodies where urban runoff has been identified as a significant source.

This WAAP summarizes information already provided in the SWMP, in the TMDL technical reports, and in the various documents prepared by the County which provided much of the basis for the TMDL documents.

Table 1: Possible Pollutants of Concern and Impaired Water Bodies
Santa Cruz County and City of Capitola (updated from Table 2-2 in the SWMP)

Impaired Water Body	Possible Pollutant of Concern [a]				
	Fecal Indicator Bacteria	Sediment	Nutrients	Pesticide / Toxicity (CCAMP)	Trash (CCAMP)
Santa Cruz County					
Pajaro River	X	X	X	X	X
• Salsipuedes Cr.	X			X	X
• Corralitos Creek	X	X			X
• Rider Creek		X			
Watsonville Sloughs	X		X	X	
• Harkins Slough			X	X	
Aptos Creek	X	X	A		
• Valencia Creek	X	X	A		
• Trout Gulch	X				
• Rio Del Mar Beach	X				
Soquel Creek	X				

Impaired Water Body	Possible Pollutant of Concern [a]				
	Fecal Indicator Bacteria	Sediment	Nutrients	Pesticide / Toxicity (CCAMP)	Trash (CCAMP)
• Noble Gulch	X				
Schwan Lake	X		X		
Arana Gulch		X		X	
San Lorenzo River and Tributaries	X	X	X	X	
• Carbonera Creek	X	X	X		
• Lompico Creek	X	X	X		
• Branciforte Creek	X				
City of Capitola					
Soquel Creek	X				
• Soquel Lagoon	X	O	O		
• Nobel Gulch	X				

Note: [a] Based on the Water Quality Assessment presented by the Regional Water Board on May 16, 2008
Information comes from the 303d list of impaired water bodies, unless otherwise noted.
O- Indicates that current information does not support the presence of impairment.
A- Indicates that current information indicates impairment even though it is not listed. All tributaries in the San Lorenzo Watershed are considered to contribute to sediment and nutrient impairment.

Total Maximum Daily Loads for Santa Cruz County and Capitola

TMDLs have been prepared to address the following pollutants in Santa Cruz County:

- Pathogens (Fecal coliform, Fecal Indicator Bacteria (FIB)): Fecal indicator bacteria, including fecal coliform, E. coli and enterococcus indicate the potential presence of disease-causing organisms that may originate from human or animal feces, which can make the water unsafe for swimming or drinking. However, it is important to note the FIB are not actual pathogens, and recent studies have shown that concentrations of FIB may be affected by a variety of factors other than presence of fecal material.
- Sediment: Although sediment transport is a natural occurrence, excessive levels of sediment can fill pools, clog stream bottoms, greatly diminish habitat, create high levels of turbidity and render water unsuitable for municipal water supply.
- Nutrients (Nitrate): Excessive nutrients (particularly nitrate) may exceed drinking water standards, or may cause nuisance algae growth, which reduces dissolved oxygen for aquatic habitat, and imparts taste and odor which makes water difficult to treat for drinking water supply.

Table 2 provides a list of the TMDLs that have been prepared for waterways in Santa Cruz County. The table also includes a ranking of the significant sources of impairment, as estimated by Regional Board staff during preparation of the TMDL. Stormdrain systems and urban runoff have been identified as the primary or secondary source of pollutants in all but one of the TMDLs. It is critical

that the stormwater management programs be conducted to reduce controllable sources of pollutants to the maximum extent practicable. However, it should also be noted that all of the pathogen TMDLs noted that natural sources (birds and wildlife) and other uncontrollable sources accounted for significant contributions of FIB. These uncontrollable sources in urban runoff and receiving waters may make attainment of water quality objectives challenging, if not impossible.

Table 2: Water Bodies in Santa Cruz County for which TMDLs have been completed

		Sources, in order of importance, with 1 the most important, when determined								
Water Body	Constituent	MS4, Urban lands	Sewers and Laterals	Home-less	Pets	Live-stock	Onsite Systems	Manure Fertilizer	Landfill runoff	Extent of Impairment
Aptos/Valencia Creek	Pathogens	1	3	No	2	4	No			Aptos downstream of Valencia Cr, Valencia Cr. downstream of Cox Rd and Valencia Rd, Trout Gulch
Corralitos Cr	Pathogens	1	6	2	3	4	5			Downstream of Browns Valley Rd and Salsipudes Cr.
Pajaro River	Fecal Coliform	1	3	No		2	No			Pajaro River
Pajaro River	Sediment	Yes								Pajaro River and Corralitos Cr.
Pajaro River	Nitrate	Yes								Pajaro River and Corralitos Cr.
San Lorenzo Estuary	Pathogens	2	1	4	3	6	5			
San Lorenzo, Lompico	Pathogens	2	3	5	4	6	1			
Branciforte	Pathogens	1	3	4	2	6	5			
Carbonera,Camp Evers	Pathogens	1	6	3	2	5	4			
San Lorenzo Watershed	Nitrate	No								
San Lorenzo Watershed	Sediment	Yes								
Soquel Lagoon	Pathogens	1	2	4	3	3	No			Soquel Creek downstream of Porter St.and Noble Gulch
Watsonville Sloughs	Pathogens	Yes	Yes			Yes		Yes	Yes	Watsonville, Harkins, Hanson, Gallighan, Struve Sloughs

Note: All TMDLs also acknowledge presence of natural and uncontrollable sources of impairment.

Implementation and Assessment Strategy

Santa Cruz County has historically pursued a number of efforts to identify and address sources of water quality impairment resulting from all potential sources, including urban runoff. These include:

- Water quality monitoring of beaches, lagoons, and streams since the 1970s.
- Preparation of watershed management plans, riparian corridor protection ordinance, and erosion control ordinance in the 1970s and 80s.
- Inclusion of strong watershed and water quality protection policies and programs in the County General Plan beginning in 1980.
- Implementation of onsite wastewater management programs to greatly reduce occurrence of septic system failures and reduce nitrate discharge since 1986.
- Upgrade of sanitary sewers and pump stations to greatly reduce overflows
- Assessment of sources of bacterial contamination through use of ribotyping, qPCR, and other methods of genetic source assessment.
- Use of grant funds for source assessment and sewer system upgrades.
- Adoption of a runoff and pollution control ordinance in 2012.

Information gathered from these efforts has been used to inform the preparation of TMDLs and the County's Stormwater Management Program. This has already lead to implementation of Best Management Practices (BMPs) most likely to control sources of impairment. Water quality monitoring and source assessment continues in order to evaluate the effectiveness of program implementation and to reveal potential new information about sources or causes of impairment that can support adaptive management and evolution of County water quality protection programs.

Source Identification and Prioritization

The TMDLs and supporting documents include extensive information to identify sources of impairing constituents, estimate the amount of contribution, and establish targets for reduction of discharge from the various sources. Discharge of urban runoff from the storm drain system is in reality a conveyance of numerous non-point sources of pollution to the waterways. It is incumbent on the stormwater program to identify those non-point sources, to implement programs to reduce their contribution to the storm drain system, and in some cases to implement treatment or diversion to reduce the discharge of pollutants to the receiving waters. Following is a discussion of source assessment for the three causes of impairment: pathogens, sediment and nitrate.

Source Assessment for Pathogens (Fecal Indicator Bacteria)

The pathogen TMDLs use fecal indicator bacteria (FIB) and specifically fecal coliform or E. coli as the measure of potential presence of pathogens. The objective for the TMDL and the wasteload allocation for each source is the water quality objective for safe swimming: the logmean of fecal coliform should not exceed 200 MPN/100ml. and no more than 10% of the samples should exceed 400 MPN/100ml. Santa Cruz County has found no significant difference between fecal coliform and E. coli results and uses them interchangeably in determining compliance with the objective or evaluating sources of elevated FIB (see Figure 1). While there is an interest in source assessment to determine any variability related to seasonal patterns, the focus of source assessment is on dry weather flows, including winter periods. Storm flows are known to be highly laden with bacteria and typically exceed detection capabilities.

Source assessment for FIB occurs in two ways: geographic assessment and genetic assessment (microbial source tracking). Geographic source assessment consists of monitoring different locations, tributaries, or input points to identify source areas and relate the results to the surrounding land use. Genetic source assessment consists of ribotyping or DNA fingerprinting with quantitative polymerase chain reaction (qPCR) techniques to determine the types of organism that the indicator bacteria in a particular location comes from. Santa Cruz County staff have conducted extensive source assessment as a part of the onsite wastewater management program, beach water quality assessment and ongoing effectiveness monitoring for Clean Beach Initiative projects. Much of this is presented in the 2006 Beach Water Quality Assessment.

The following tables (Table 3,4,5) are taken from the Beach Water Quality Assessment and show the relative sources of bacteria loading for the lower San Lorenzo River, lower Soquel Creek and lower Aptos Creek. This information is based on ribotyping to determine relative concentration of source organisms applied to the total concentration and load of FIB above and downstream of the urban areas. Estimates have been made about the extent to which these contributions could be reduced through improved management measures (% controllable). Target reductions were set at a

high level for controllable sources of bacteria, as many of the sources (birds and wildlife) have a significant contribution, but will be difficult to control. Aptos and Soquel Creeks have a much higher component from birds and wildlife, and it will be more difficult, if not impossible, to reduce bacteria levels from those sources in order to meet standards (Tables 4 and 5). Additionally, it is unlikely that contributions from birds and wildlife can be reduced by 50% in urban runoff, and thus it is highly likely the assigned wasteload allocation for urban runoff of 200 MPN/100ml cannot be attained in any of the urban lagoons.

The recent pathogen TMDLs all include a prohibition of any discharge containing human waste. In addition to the indication of human sources provided by the ribotyping, Santa Cruz County has utilized QPCR since 2008 to test for presence of human specific bacterioides in various locations. Human contamination has been detected at times in the San Lorenzo Estuary, Soquel Lagoon, Noble Gulch, Aptos Lagoon, and Corralitos Creek. The Pajaro River has not been tested. Testing included storm drains that discharge to the San Lorenzo River Estuary. Two of the four tested consistently showed human contamination, while the other two showed no human contamination.

Ten storm drains that discharge to the lower San Lorenzo River were each sampled 19 times from 2007-11. The logmean of E. coli ranged from 91 to 2,187 MPN/100 ml, with only 3 of the drains meeting the standard of a logmean less than 200. The percent of samples exceeding 400 MPN/100ml ranged from 13 to 83%, with none of the locations meeting the standard for less than 10% exceedence.

Five stormdrains draining to Soquel Creek or the beach in Capitola were sampled in 2005-06. Only one had a logmean fecal coliform level less than 200 MPN/100ml, while the other 4 ranged from 314 to 3,069. These were primarily sampled after wet weather. Most storm drains that drain to Aptos and Soquel Creeks do not run during dry weather conditions, and thus there are limited storm drain sample results from those areas.

Given that stormdrains are a conduit for a range of controllable and uncontrollable sources, and given that the accumulation of organic material in a storm drain system can serve as an incubator promoting FIB regrowth, it is highly unlikely that storm drain discharges can meet wasteload allocation targets.

Table 3: Bacteria Source Allocation (E. coli/fecal coliform) for San Lorenzo Rivermouth: Current Sources and Projected Controllable Amounts and Resulting Concentrations from SCCHSA, 2006.

			cfu/100ml		cfu/100ml
Contributing Area/Source	%Contribution	%Contribution	Load	%Controllable?	Target Load
Upstream Areas (Station 022, Sycamore Grove)	In sub area	25%	70		
Birds	56%		39	0%	39
Wildlife	7%		5	0%	5
Rodent	14%		10	25%	7
Human	7%		5	100%	0
Pets	7%		5	75%	1
Livestock	4%		3	75%	1
Unknown	5%		4	0%	4
Subtotal	100%		70	19%	57
Urban Areas (Calculated by subtraction of results at 022 from results at station 003)		75%	210		
Birds	49%		104	30%	73
Wildlife	7%		15	50%	7
Rodent	9%		18	50%	9
Human	10%		20	90%	2
Pets	7%		15	90%	1
Livestock	3%		6	90%	1
Unknown	16%		33	0%	33
Subtotal	100%		210	40%	126
Total (Measured/projected for 003, Mouth)			280	35%	183

Table 4: Bacteria Source Allocation (E. coli/fecal coliform) for Lower Soquel Creek: Current Sources and Projected Controllable Amounts and Resulting Concentrations from SCCHSA, 2006.

			Cfu/100ml		cfu/100ml
Contributing Area/Source	%Contribution	%Contribution	Calculated Load	%Controllable	Target Load
Upstream Areas (Station S23, Nob Hill)	In sub area	22%	154		
Birds	59%		91	0%	91
Wildlife	8%		12	0%	12
Rodent	11%		17	25%	13
Human	8%		12	90%	1
Pets	7%		11	75%	3
Livestock	0%		0	75%	0
Unknown	7%		11	0%	11
Subtotal	100%		154	16%	130
Urban Areas (Calculated by subtraction of results at S23 from results at station S0)		78%	546		
Birds	53%		287	50%	144
Wildlife	7%		37	50%	18
Rodent	14%		74	50%	37
Human	5%		30	90%	3
Pets	16%		87	90%	9
Livestock	0%		0	90%	0
Unknown	4%		24	0%	24
Subtotal	99%		539	56%	235
Total (Measured/projected for S0, Mouth)			693	47%	364

Table 5: Bacteria Source Allocation (E. coli/fecal coliform) for Lower Aptos Creek: Current Sources and Projected Controllable Amounts and Resulting Concentrations from SCCHSA, 2006.

			cfu/100ml		cfu/100ml
Contributing Area/Source	%Contribution	%Contribution	Calculated Load	%Controllable	Target Load
Upstream Areas (Station A03, Aptos Cr at Spreckles)	In sub area	28%	196		
Birds	56%		110	0%	110
Wildlife	20%		39	0%	39
Rodent	10%		20	25%	15
Human	0%		0	90%	0
Pets	10%		20	75%	5
Livestock	0%		0	75%	0
Unknown	4%		8	0%	8
Subtotal	100%		196	10%	176
Urban Areas (Calculated by subtraction of results at A03 from results at station A0)		72%	504		
Birds	64%		268	50%	134
Wildlife	11%		10	50%	5
Rodent	9%		71	50%	36
Human	2%		42	90%	4
Pets	7%		78	90%	8
Livestock	0%		0	90%	0
Unknown	7%		27	0%	27
Subtotal	100%		497	57%	214
Total (Measured/projected for Station A0, at the Mouth)			693	44%	390

Whether or not the wasteload allocation can be obtained, it is critical to reduce all controllable sources of FIB to the greatest extent practicable, and to particularly eliminate sources of human fecal waste, which presents a greater health risk. The Beach Water Quality Assessment identified the following measures to reduce discharge of FIBs to the creeks and beaches:

1. Birds
   a. Keep lagoons full to minimize exposed sand bars.
   b. Minimize roosting areas in bridges, buildings, and areas adjacent to waterways and beaches.
   c. Maintain good sanitation at beaches and areas adjacent to waterways: provide regular litter pickup, maintain bird proof trash receptacles.
   d. Utilize falcons or other means of deterring or reducing bird populations in critical areas
2. Humans
   a. Sewer leaks or spills to streets and storm drains.
      i. Upgrade sewers and laterals.
      ii. Clean storm drains more frequently.
      iii. Provide for dry weather diversions from storm drains to sanitary sewers.
      iv. Improve spill reporting, control and clean up.
   b. Septic Systems
      i. Maintain and expand programs for septic system monitoring, management and upgrade.

   ii. Identify any old septic systems within urban areas and require sewer connection.
c. Direct input
   i. Redirect homeless out of creek areas.
   ii. Work with homeless service providers to provide education to homeless populations regarding proper sanitation and water quality protection.
   iii. Consider providing facilities for homeless people near waterways.
   iv. Provide accessible recreational vehicle dump stations.
   v. Regularly check for sewage leaks under wharves.
   vi. Provide outreach to anchoring boaters to prevent sewage discharge.

3. Pet Waste
   a. Provide education, ordinances, and adequate supplies for proper handling of pet waste.
   b. Provide dry weather diversions from storm drains to sanitary sewers.
   c. Provide for storm drain cleaning.
4. Livestock
   a. Maintain and enhance livestock water quality programs and manure management efforts.
5. Wildlife and Rodents
   a. Provide education on not attracting nuisance levels of wildlife.
   b. Dry weather diversion of storm drain discharge.
   c. Litter control and sanitation to reduce rats.
6. Nonspecific Contamination
   a. Dry weather diversion.
   b. Improved stormwater management.
   c. Storm drain cleaning.
   d. Reduce dry weather flows from over irrigation, car washing, etc.
   e. Maintain and expand vacuum street sweeping programs.

Source Assessment for Sediment

The sediment TMDLs for the Pajaro Watershed and San Lorenzo Watershed include mathematical load calculations and wasteload allocations for land use classes and sub-basins. It is difficult to translate these allocations to specific sources or source control measures. The primary objective is to minimize all controllable sources of sediment discharge in these watersheds. The same objectives should also be applied to other watersheds where sediment has been identified as an impairment, such as the Aptos/Valencia watershed. The Pajaro sediment TMDL lumps urban and rural lands together and states that the SWMP must contain measures to reduce sediment discharge.

The San Lorenzo sediment TMDL provides a more in-depth analysis of sediment load, extent of impairment, feasibility of source control, and targets for each source category. The San Lorenzo TMDL also combines other urban and rural land and calls for a 30% reduction in sediment discharge from those lands. It calls for a 50% reduction in sediment discharge from public and private roads and a 20% reduction in sediment discharge from channel/bank erosion. The goal is an overall sediment load reduction throughout the watershed of 27%, in order to achieve the desired streambed condition of less than 25% embeddedness and less that 20% fine particles less than 4 mm in diameter. Current average conditions were found to be 43% embeddedness and 23% bottom particles less than 4mm. The TMDL established four other targets for stream bed conditions that have not yet been assessed.

Implementation actions in the San Lorenzo sediment TMDL relative to urban lands and urban runoff include:

E. Develop a strategy for more effective enforcement of County Code violations pertaining to erosion control and sedimentation prevention.
L. Evaluate need to revise erosion control provisions in grading and erosion control ordinances to better protect sandy soils.
P. Implement education programs and modify policies and procedures to improve riparian corridor protection, maintain channel integrity, implement alternatives to hard bank protection, and retain woody material.
S. Develop and implement Storm Water Management Plans and Stormwater Pollution Prevention Plans consistent with NPDES Phase II stormwater regulations.
T. Identify the San Lorenzo Watershed as a priority for site inspection and enforcement of control measures in WMPs and SWPPPs. Establish mechanism by which operators and owners of one acre and greater construction projects are notified of the requirement to prepare SWPPPs.
U. Consider incorporation of sediment control programs/projects into SWMPs and SWPPPs.

In addition to erosion and sediment control practices, it is important to note that increased runoff from impervious surface can cause substantial downstream channel erosion and downcutting, with increases in fine sediment accumulation in creeks. This is particularly an issue in sandy soil areas that are found in the San Lorenzo Watershed, Aptos/Valencia watershed and Pajaro/Corralitos watershed. It is therefore important to implement low impact development practices that maintain natural infiltration and runoff rates.

Source Assessment for Nutrients (Nitrate)

The Pajaro nitrate TMDL identifies urban lands as potential sources of excessive nitrate and includes a calculation of nitrate load based on general land use type. The wasteload allocation was established to ensure any urban discharge not exceed the drinking water standard of 10mg-N/L. The implementation measure for urban lands is to develop and implement a SWMP. The San Lorenzo River Nitrate TMDL assessed sources of nitrate upstream of the City of Santa Cruz water supply intake. It did not identify urban stormwater or residential fertilizer as significant sources of nitrate and primarily called for improved septic system and livestock management. Nevertheless, any reduction in nitrate discharge from urban areas will reduce the potential for eutrophication and have benefits to aquatic habitat in urban lagoons, particularly the San Lorenzo Estuary and Aptos Creek Lagoon.

Prioritization and Implementation of Best Management Practices

Based on the source assessments described above, the County and City SWMP includes BMPs to address the controllable sources of contaminants from urban lands delivered through the storm drain system. These BMPs and their expected relative effectiveness at reducing the contaminants of concern are identified in Table 6. The details of these BMPs and the schedule for implementation are contained in Tables 3-1 through 8-2 of the SWMP. The SWMP addresses all the potential control measures discussed in the San Lorenzo Sediment TMDL and the Beach Water Quality Assessment except for dry weather diversions. These seem to be more appropriate in the City of Santa Cruz and some parts of the City of Capitola. Areas under County jurisdiction do not seem to

experience significant dry weather flows. Dry weather diversions should continue to be considered where appropriate.

Table 6: Priority BMPs to Address Pollutants of Concern (from SWMP, Table 2-3)
1-High Effect, 2- Medium Effect, 3-Lower Effect, 0-No Effect

		Pollutant of Concern				
BMP#	BMP	Pathogens	Sediment	Nutrients	Toxicity	Trash
Public Outreach and Education, Chapter 3. Table 3-1						
PE-1,2,3,16	Brochures, website, community events, and media campaign on preventing stormwater pollution.	3	3	3	3	3
PE-4	Dog Waste program at parks	2				
PE-6	Distribute Stream Care guide for Riparian Corridor Protection	3	3	3	3	3
PE-7	Promote Septic System Maintenance	2				
PE-10	Educational programs for school children	3	3	3	3	3
PE-11	Education of industrial operators				3	
PE-13	Monterey Bay Area Green Business Program				3	
PE-14	Green Building Outreach		3	3	3	
PE-15	Business outreach to minimize illicit discharge	3			3	
PE-17	Outreach to Farmers		2	2	2	
Public Involvement and Participation, Chapter 4, Table 4-1						
PI-1	Stormdrain Stenciling	3	3	3	3	3
PI-5	Community Clean-ups					2
PI-6	Clean Beaches Coalition for marine debris clean-up					2
Illicit Discharge Detection and Elimination, Chapter 5, Table 5-1						
ID-1,2	Storm Drain and Sanitary Sewer Mapping	2				
ID-3	Program to identify potentially polluting operations	3			2	3
ID-4	Field investigations of storm drain outfalls and creeks.	1		2	2	
ID-5	MS-4 Maintenance	2			3	
ID-6	Commercial / Industrial Facility Inspections	2		2	2	
ID-7	Respond to reports about non-stormwater discharges	2			2	
ID-8	Correct sewer leaks and cross-connections, including laterals	1		2		
ID-9	Implement pet waste ordinance	2				
ID-10	Septic Systems Maintenance and Management Program	2		3		
ID-11	Implement Ordinance to limit non-stormwater discharges	2		2	2	
Construction Site Stormwater Runoff Control Program, Chapter 6, Table 6-1						
CS-1,2,3	Grading, Erosion Control, and Riparian Corridor Ordinances		1	3	3	3
CS-4,5	Condition Building Permits and Discretionary Permits		2	3	3	3
CS-6	Erosion and sediment control plans		2			
CS-7	Site inspections of construction projects		2			
CS-9	Provide BMP information for construction community.		1			
CS-10	Respond to public complaints		1			
Post-Construction Stormwater Management in New Development and Redevelopment, Chapter 7, Table 7-1						
PC-1	Assess effectiveness of policies for watershed protection		2	2	2	
PC-2	Develop additional stormwater ordinance if needed		2	2	2	
PC-3	Evaluate and revise permit review procedures if necessary		2	2	2	
PC-4	Review and update design standards as needed	2	2	2	2	
PC-5	Review and update hydromodification criteria as needed	2	1	3	3	
PC-7	Provide for ongoing monitoring and maintenance	2	1	2	2	
PC-8,10,11	Provide information and train staff and the development industry on post-construction measures for stormwater mgt.		2	2	2	

		Pollutant of Concern				
BMP#	BMP	Pathogens	Sediment	Nutrients	Toxicity	Trash
Pollution Prevention/Good Housekeeping for Municipal Operations, Chapter 8, Table 8-1						
MO-2	Implement improved BMPs for agency facilities	3	2	3	2	3
MO-3	Integrated Pest Management and Vegetation Magt. Programs		3	3	2	
MO-4	Municipal Parking Lot Sweeping				2	2
MO-6,7	Implement storm drain and pump station BMPs	2	3	2	2	2
MO-8	Street sweeping	2	2	2	2	2
MO-9	Road Repair and maintenance BMPs	3	1	3	3	3

Monitoring Program

Two completely different approaches are needed for monitoring pathogens and nitrate versus sediment.

Pathogens and Nitrate

The County and City conduct ongoing monitoring programs for FIB and nitrate, as shown in Table 7, which also includes some additional stations to ensure that all areas with TMDLs are addressed. (This table does not include the ocean stations tested.) Samples are collected weekly, monthly or seasonally, depending on the station. Testing for FIB is generally done for E. coli and total coliform in freshwater systems, with the addition of enterococcus in marine waters and some freshwaters. The County discontinued testing for fecal coliform, but extensive parallel testing showed that there is not a statistically significant difference between the two results (Figure 1). The fecal coliform numeric standard is applied to E. coli results.

Figure 1: Comparison of E. coli to fecal coliform results for parallel samples from Lower San Lorenzo River Stations (003, 006 and 022), 1987-2010, 362 samples (outliers over 6500/100ml not included)

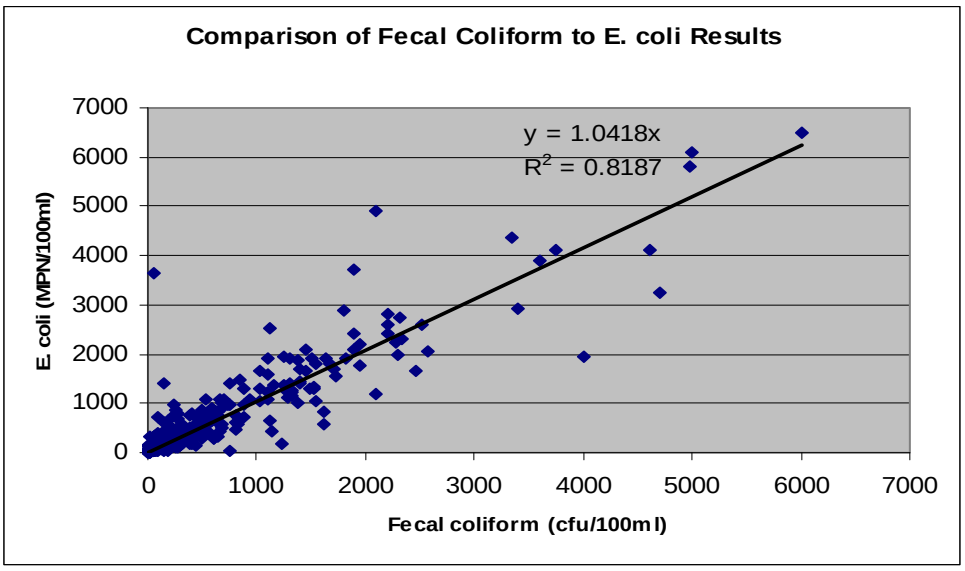

Table 7: Stations to be Monitored for Fecal Indicator Bacteria (E. coli) and Nitrate:
W-Weekly, M-Monthly, S- Seasonally (3-4 times/year)B-Bathing Areas (weekly in summer)

Stanum	LOCATION	E. coli	NITRATE
003	SAN LORENZO RIVERMOUTH @ TRESTLE	W	
006	BRIDGE	W	W
010	BRANCIFORTE CREEK @ SAN LORENZO RIVER	M	M
0110	CARBONERA CREEK @ BRANCIFORTE CREEK	M	M
01160	CARBONERA CREEK ABOVE SPRING LAKES CREEK	M	M
0121	BRANCIFORTE CREEK @ ISBEL DRIVE	M	M
0141	BRANCIFORTE CREEK @ DELAVEAGA PARK	B	
022	SAN LORENZO RIVER @ SYCAMORE GROVE	W	W
030	GOLD GULCH @ SAN LORENZO RIVER, HWY 9	M	M
0332	SOUTH FORK GOLD GULCH @ DAM	B	
050	SHINGLE MILL CREEK @ SAN LORENZO RIVER	M	M
060	SAN LORENZO RIVER @ BIG TREES	W	W
070	ZAYANTE CREEK @ SAN LORENZO RIVER	M	M
0709	ZAYANTE CR @ BEAN CR	M	M
071	BEAN CREEK AB ZAYANTE	M	M
07528	LOMPICO CREEK @ CARROL AVE	M	M
0762	ZAYANTE CREEK @ ZAYANTE	M	M
149	SLR @ HIGHLANDS PARK	B	
150	ARBOR	M	M
180	SAN LORENZO RIVER ABOVE LOVE CREEK	W	
245	SAN LORENZO RIVER @ RIVER ST	W	W
2499	SAN LORENZO RIVER BELOW BOULDER CREEK	B	
250	BOULDER CREEK @ SAN LORENZO RIVER	M	M
270	BEAR CREEK @ SAN LORENZO RIVER	M	M
290	TWO BAR CREEK @ SAN LORENZO RIVER	M	M
300	SAN LORENZO RIVER @ TWO BAR CREEK	M	M
310	KINGS CREEK @ HWY 9	M	M
A0	APTOS CREEK @ MOUTH	W	S
A03	APTOS C @ BRIDGE ON SPRECKLES	M	S
A1	VALENCIA CREEK @ APTOS CREEK	M	S
A11	TROUT GULCH @ VALENCIA CREEK	M	S
A12	VALENCIA CREEK @ TROUT GULCH	M	S
A2	APTOS CREEK @ VALENCIA CREEK	M	S
P0	PAJARO RIVER @ MOUTH	M	S
P301	CORRALITOS CREEK AT GREEN VALLEY RD	M	S
P3049	CORRALITOS CREEK BELOW BROWNS	M	S
P3051	BROWN CREEK @ 621 BROWNS V RD	M	S
P3062	CORRALITOS CREEK @ RIDER ROAD	M	S
P3112	SALSIPUEDES CR BELOW FAIRGROUNDS	M	S
P47	PAJARO RIVER @ CHITTENDEN PASS	M	M
S0	SOQUEL CREEK @ FLUME OUTLET	W	
S1	NOBLE GULCH @SOQUELCR	M	M
S23	SOQUEL CR AT NOB HILL	M	M
S3	BATES CREEK @ SOQUEL CREEK	S	S
S4	SOQUEL CREEK @ BATES CREEK	S	S
S51	EAST BRANCH SOQUEL CREEK @ 152 OLIVE S.	S	S
S6	WEST BRANCH SOQUEL C @ SAN JOSE-OLIVE S	M	S

The focus of testing is on dry weather flows, not storm flows. Due to the high variability of flow and pollutant load during a storm event, it is difficult to accurately characterize loading conditions without frequent sampling throughout the event. Both FIB and nutrient loads tend to be very high during storms, but they flush through the system. Some stormwater testing is provided by the First Flush monitoring conducted by the Coastal Watershed Council using volunteers during the first significant rainfall of the season.

Sediment

Monitoring sediment load is very challenging as it is storm dependent and highly variable from storm to storm and year to year. The County utilized grant funds to conduct sediment load monitoring for 3 years on the San Lorenzo River, Zayante Creek, Bean Creek, Soquel Creek, Corralitos Creek and Valencia Creek, at a cost of approximately $60,000/ year. Sediment load does not directly measure impairment, and the County is now considering some form of channel condition monitoring to assess the presence of fine sediment. In both the San Lorenzo and Pajaro TMDLs, the Regional Board indicated that a sediment monitoring program would be developed by the Regional Board staff, and supplemented by voluntary efforts of other agencies. The County also collects grab samples of suspended sediment during storm events at a number of locations to provide an indication of relative sediment transport conditions throughout the county. The load measurements from 2009-12 indicate that sediment loads in Soquel and San Lorenzo are significantly reduced as compared to historical USGS records from 1976-1991. On Soquel Creek, for a given flow, the sediment current load is 30% of what was measured in 1976-1991. San Lorenzo shows a comparable load reduction of 50% from 1972-93 compared to 2009-12 (Balance Hydrologics, 2012). This compares favorably to the TMDL target for San Lorenzo of a 27% load reduction.

Reporting and Effectiveness Assessment

Progress on BMP implementation is reported each year in the annual report of the SWMP implementation. During year 3 and 4 of SWMP implementation, the County will develop an overall effectiveness assessment strategy. It is proposed that every 5 years the County will include a more detailed analysis of water quality results and trends to assess attainment of wasteload allocation targets, and impact on beneficial uses. Recommendations for additional BMP implementation and/or modification of wasteload allocations will be made.

Coordination with Stakeholders and Other Agencies

County and City staff coordinate with a variety of stakeholders and other agencies in the preparation and implementation of the SWMP and the WAAP, including:

- City of Capitola
- City of Santa Cruz
- City of Watsonville
- City of Scotts Valley
- County Sanitation District
- Regional Water Quality Control Board

- Water Supply Agencies
- Monterey Bay National Marine Sanctuary Water Quality protection Program
- Members of the public interested in the Stormwater Management Program

References

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Santa Cruz County Health Services Agency, 2006, Assessment of Sources of Bacterial Contamination at Santa Cruz County Beaches, http://sccounty01.co.santa-cruz.ca.us/eh/environmental_water_quality/2006SCBeachWaterQualityReport.pdf

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