San Diego Bay WMA

11.1 Monitoring Site Descriptions

The San Diego Bay watershed management area consists of three major watersheds: Pueblo San Diego watershed (HU 908.00), Sweetwater watershed (HU 909.00), and Otay watershed (HU 910.00). The entire San Diego Bay WMA covers over 888,400 acres (Coastal Conservancy 2001) (Figure 11-1). Major water bodies include San Diego Bay, Otay River, Sweetwater River, Chollas Creek, and Paradise Creek.

San Diego Bay is the largest estuary in San Diego County and has been extensively developed as a port. It covers 10,532 acres of water and 4,419 acres of tidelands. Only 17 to 18% of the original Bay floor remains undisturbed by dredge or fill. Ninety percent of the original salt marshes and 50% of the original mudflats have been filled or dredged for development. Construction of dams and extensive use of groundwater in the Sweetwater and Otay Rivers has reduced the input from these rivers to the Bay by 76%. The majority of freshwater input to the Bay is from surface runoff from urban areas and intermittent flow from rivers and creeks during rain events. There are over 200 storm drain outfalls in San Diego Bay (Coastal Conservancy 2001).

Pueblo San Diego Watershed (HU 908.00)

The Pueblo San Diego watershed lies within the San Diego Bay WMA and is the smallest of the three San Diego Bay WMA watersheds, covering just over 36,000 acres. It is comprised of three hydrologic areas: Point Loma, San Diego Mesa, and National City. Major water bodies include Chollas Creek, Paleta Creek, and San Diego Bay.

Pueblo San Diego is the most developed and most densely populated watershed in the San Diego Bay WMA. Containing the City of San Diego, population in the watershed is expected to reach over 591,000 by the year 2015. Land use in the watershed is primarily residential (54%), public facilities/utilities (13%), and parks and recreation (8%). The majority of land is privately owned with only a small percentage owned by government. Most of the watershed falls under the jurisdiction of the City of San Diego (84%). Other jurisdictions include La Mesa, Lemon Grove, National City, San Diego Unified Port District, and a small percentage of unincorporated land.

Most of the beneficial uses for this watershed lie in its coastal waters; including those of the Bay (Table 11-1). Major impacts on water quality include surface water degradation, habitat degradation, sediment toxicity, and sewer overflows. Constituents of concern include trace metals and other toxic substances, and coliform bacteria (San Diego County 2002). Table 11-2 presents water bodies placed on the SWRCB 2002 303(d) list for this watershed.

Rainfall for the Pueblo San Diego watershed is light with an average rainfall of 10.5 inches in coastal areas to 13.5 inches in the eastern portion of the watershed. The San Diego Formation is the principal aquifer in the watershed.

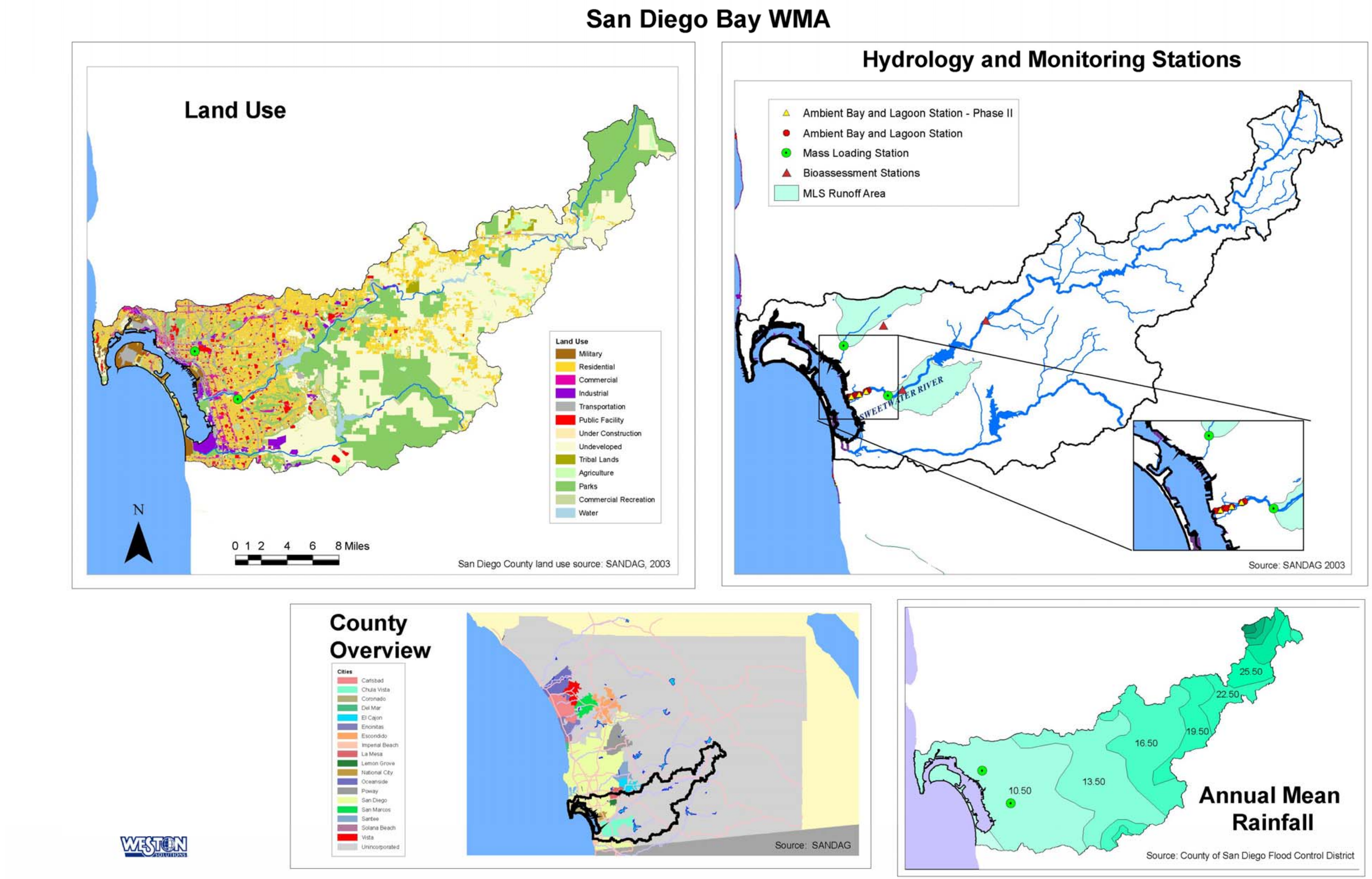

Figure 11-1. San Diego Bay Watershed Management Area.

Table 11-1. Beneficial uses within the Pueblo San Diego watershed.

Beneficial Uses	Inland Surface Waters	Coastal Waters	Reservoirs and Lakes	Ground Waters
Municipal and Domestic Supply				●
Industrial Service Supply		●		
Navigation		●		
Contact Water Recreation	O	●		
Non-Contact Water Recreation	●	●		
Warm Freshwater Habitat	●			
Estuarine Habitat		●		
Wildlife Habitat	●	●		
Commercial and Sport Fishing		●		
Rare, Threatened, or Endangered Species		●		
Biological Habitats of Significance		●		
Marine Habitat		●		
Migration of Aquatic Organisms		●		
Shellfish Harvesting		●		

● = Existing
O = Potential

Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5)

There is one mass loading station in the Pueblo San Diego watershed. This mass loading station is within the Chollas sub-watershed (HAS 908.22). The Chollas Creek station (SD8) is located on the north fork of Chollas Creek near the intersection of 33rd and Durant Streets, just east of the Durant Street cul-de-sac in the City of San Diego. The Chollas sub-watershed is divided into two drainage areas. The north fork drains approximately 9,276 acres and the south fork drains approximately 6,997 acres. To avoid tidal influence, the monitoring station is installed on the north fork above the north and south fork confluence. The contributing runoff area consists of 9,105 acres, which is approximately 25% of the Pueblo San Diego watershed. This is considered to be representative of the entire Pueblo San Diego watershed because the land use distribution in the north fork portion of the Chollas sub-watershed is nearly identical to the land use distribution of the entire Pueblo San Diego watershed. Land use within the contributing runoff area is highly urban which includes 48% residential and 28% transportation. At the sampling site, Chollas Creek is a trapezoidal, concrete-lined channel that eventually discharges to San Diego Bay.

Stream bioassessment monitoring in the Chollas Creek sub-watershed began in May of 2003. There is a limited amount of suitable stream habitat for monitoring, as most of the stream bed has been channelized. There is a reach downstream of the Federal Boulevard off-ramp from Highway 94 that has a natural stream bed with year-round flow. The in-stream habitat is good and is dominated by large, smooth cobble. The area lacks riparian trees, and upstream of the monitoring reach the stream is adjacent to light industrial development.

Table 11-2. Water bodies on the SWRCB 303(d) list in the Pueblo San Diego watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
San Diego Bay Shoreline, Near Sub Base	Point Loma	908.10	Benthic Community Effects, Sediment Toxicity
San Diego Bay , Shelter Island Yacht Basin	Point Loma	908.10	Dissolved Copper
San Diego Bay Shoreline, Shelter Island Shoreline Park	Point Loma	908.10	Bacteria Indicators
San Diego Bay Shoreline, Downtown Anchorage	Lindbergh	908.21	Benthic Community Effects, Sediment Toxicity
San Diego Bay Shoreline, G St. Pier	Lindbergh	908.21	Bacteria Indicators
San Diego Bay Shoreline, Near Switzer Creek	Lindbergh	908.21	Chlordane, Lindane, PAHs
San Diego Bay Shoreline, Vicinity of B St. and Broadway Piers	Lindbergh	908.21	Bacteria Indicators, Benthic Community Effects, Sediment Toxicity
Chollas Creek	Chollas	908.22	Bacteria Indicators, Cadmium, Copper, Diazinon, Lead, Zinc
San Diego Bay Shoreline, Near Chollas Creek	Chollas	908.22	Benthic Community Effects, Sediment Toxicity
San Diego Bay Shoreline, 32nd St. Naval Station	Chollas	908.22	Benthic Community Effects, Sediment Toxicity
San Diego Bay Shoreline, Between Sampson and 28th Streets	Chollas	908.22	Copper, Mercury, PAHs, PCBs, Zinc
San Diego Bay Shoreline, Near Coronado Bridge	Chollas	908.22	Benthic Community Effects, Sediment Toxicity
San Diego Bay Shoreline, Seventh St. Channel	El Toyan	908.31	Benthic Community Effects, Sediment Toxicity
San Diego Bay Shoreline, North of 24th St. Marine Terminal	Paradise	908.32	Benthic Community Effects, Sediment Toxicity

Source: SWRCB 2003

Sweetwater Watershed (HU 909.00

The Sweetwater watershed is also part of the San Diego Bay WMA and is the largest of the three watersheds that border San Diego Bay, encompassing over 148,000 acres. The watershed includes three hydrologic areas: Lower Sweetwater, Middle Sweetwater, and Upper Sweetwater. Major water bodies within the Sweetwater watershed include the Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay.

Jurisdiction within the watershed is primarily the County of San Diego for the unincorporated lands (87%) with smaller portions split between the City of Chula Vista, La Mesa, Lemon Grove, National City, the City of San Diego, and the San Diego Unified Port District. Much of the undeveloped land in the Sweetwater watershed is occupied by the Cleveland National Forest, Cuyamaca Rancho State Park, and the unincorporated communities of Pine Valley, Descanso, Alpine, and the Viejas Indian Reservation.

Land ownership is mostly private with the remaining areas controlled by local, state, federal governments, and tribal lands. Population for the watershed is approximately 300,000 and is expected to grow 22% by the year 2015. This is the lowest expected growth rate for any of the San Diego watersheds.

The Sweetwater watershed provides many beneficial uses with its large areas of open space, state parks, national forests, rivers, reservoirs, and the shoreline of San Diego Bay (Table 11-3). Principal aquifers in the watershed include the Lower and Middle Sweetwater Basins and the San Diego Formation. Major impacts to the watershed include surface and groundwater quality degradation, habitat degradation, and invasive species. Constituents of concern include coliform bacteria, pesticides, and nutrients. Table 11-4 presents the water bodies that have been placed on the SWRCB 303(d) list. Rainfall in the watershed widely varies from 10.5 inches near the coast to approximately 35 inches in the far inland areas.

Table 11-3. Beneficial uses within the Sweetwater watershed.

Beneficial Uses	Inland Surface Waters	Coastal Waters [(a)]	Reservoirs and Lakes	Ground Waters
Municipal and Domestic Supply	●		●	●
Agricultural Supply	●		●	●
Industrial Service Supply	●	●	●	●
Industrial Process Supply	●		●	
Navigation		●		
Contact Water Recreation	●	●	●	
Non-Contact Water Recreation	●	●	●	
Commercial & Sport Fishing		●		
Biological Habitats of Significance	●	●		
Warm Freshwater Habitat	●		●	
Cold Freshwater Habitat	●		●	
Wildlife Habitat	●	●	●	
Rare, Threatened, or Endangered Species	●	●		
Marine Habitat		●		
Migration of Aquatic Organisms		●		
Estuarine Habitat		●		
Shellfish Harvesting		●		

[(a)] San Diego Bay

Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5)

Table 11-4. Water bodies on the SWRCB 303(d) list in the Sweetwater watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
San Diego Bay Shoreline, at Chula Vista Marina	La Nacion	909.12	Bacteria Indicators

The Sweetwater River (SR) mass loading station is located in Bonita, north of Bonita Road, under the Plaza Bonita Road Bridge. Sweetwater River is a natural channel at the sampling site. This station receives only localized runoff. The contributing runoff area consists of over 10,800 acres, which is 7% of the total watershed land area. The Sweetwater reservoir captures most of the runoff from the upper watershed and releases only during large storm events. Land use for the contributing runoff area is primarily a mix of residential (32%), parks (32%), and undeveloped (12%).

Stream bioassessment in the Sweetwater River has occurred at three urban affected sites. The upstream site is located at the Highway 94 overcrossing in Rancho San Diego. The river has a fairly low gradient here, and the substrate is dominated by fine particulate sediment and lacks good quality riffles. The riparian zone is dense, providing a thick canopy over the stream bed. This site was not sampled in October of 2004 due to dry conditions. The lower monitoring site is in the Sweetwater County Park near Sweetwater Road. This reach of the river is low gradient, and the riparian zone is dense and undisturbed. The in-stream habitat is fair, dominated by small, unconsolidated gravel with poor substrate complexity. The riffles are infrequent with low flow velocity. Another site was sampled in October of 2002 in Long Canyon Creek along Acacia Avenue. This stream is runoff dominated and is channelized, and was sampled due to lack of flow in Sweetwater River.

The Sweetwater River flows into San Diego Bay. The area of the River that is tidally influenced is known as the Sweetwater River Estuary, located on the border of National City and Chula Vista. The Estuary is a broad, straight, fairly deep channel that forms the mouth of the Sweetwater River, which is the Estuary's primary source of fresh water. Tidal influence is somewhat restricted in the inner areas of the Estuary by bridge crossings at Interstate 5 and Broadway Street. The outer portion of the Estuary is surrounded by commercial and industrial influences to the north, but the Sweetwater Marsh National Wildlife Refuge borders the southern side of the outer Estuary. Freeways border both sides of the middle and inner Estuary north of Interstate 5. Of the three sites selected for the Ambient Bay and Lagoon Monitoring Program, one site was located in the inner stratum, one was located in the middle stratum, and one was located in the outer stratum.

Otay Watershed (HU 910.00)

The Otay watershed also lies within the San Diego Bay WMA and is approximately 98,500 acres. The watershed consists of three hydrologic areas: Coronado, Otay, and Dulzura. Major water bodies include the Upper and Lower Otay Reservoirs, Otay River, and San Diego Bay.

Over 69% of the watershed is unincorporated with the remaining portions divided between the following jurisdictions: Port of San Diego, Chula Vista, Coronado, Imperial Beach, National City, and San Diego. Land ownership is predominantly private with a small percentage of local, state, and federally owned lands.

The Otay watershed is one of the three least populated watersheds in the San Diego Region with approximately 143,000 people. That number is expected to increase 88% by the year 2015. Land use in the watershed is primarily vacant/undeveloped (52%), parks and recreation (27%), and residential (10%).

The Otay watershed provides many beneficial uses with conservation areas that include the San Diego National Wildlife Refuge, the Rancho Jamul Ecological Reserve, and approximately 23,000 acres that provide habitat for endangered plant and animal species as part of the Multiple Species Conservation Plan (Table 11-5). The two major reservoirs in the watershed supply water, important wildlife habitat, and recreational opportunities. The Lower Otay Reservoir lies at the end of the San Diego Aqueduct. The San Diego Formation is the principal aquifer in the watershed. Table 11-6 presents the water bodies that have been placed on the CWA 303(d) list. Annual rainfall varies from 8.25 inches at the coast to 19.5 inches in the inland areas. Most of the runoff from this watershed is collected upstream at the Otay Reservoir. The reservoir only releases water during extremely large rain events and thus no flow was recorded during the 2001-2002 monitoring season and subsequently, this station was decommissioned after that season.

Table 11-5. Beneficial uses within the Otay watershed.

Beneficial Uses	Inland Surface Waters	Coastal Waters [(a)]	Reservoirs and Lakes	Ground Waters
Municipal and Domestic Supply	●		●	●
Agricultural Supply	●		●	●
Industrial Service Supply	●	●	●	●
Industrial Process Supply	●		●	
Commercial & Sport Fishing		●		
Navigation		●		
Hydropower Generation				
Contact Water Recreation	●	●	●[1]	
Non-Contact Water Recreation	●	●	●	
Biological Habitats of Significance		●		
Warm Freshwater Habitat	●		●	
Cold Freshwater Habitat			●	
Estuarine Habitat		●		
Wildlife Habitat	●	●	●	
Rare, Threatened, or Endangered Species	●	●		
Marine Habitat		●		
Migration of Aquatic Organisms		●		
Spawning, Reproduction and/or Early Development				
Shellfish Harvesting		●		

[(a)] San Diego Bay
[1] Shore and boat fishing only. Other REC1 uses prohibited.
Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5)

Table 11-6. Water bodies on the SWRCB 303(d) list in the Otay watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
San Diego Bay Shoreline, Tidelands Park	Coronado	910.10	Bacteria Indicators

11.2 Storm Water Monitoring Summary

Three storm events were monitored at the MLS on Chollas Creek and Sweetwater River during the 2004-2005 wet season events. These events took place on October 17, 2004 and February 11 and 18, 2005. The results from these storms are discussed in the following section (11.2.1) and presented in Table 11-7 (Chollas Creek) and Table 11-8 (Sweetwater River). A comparison of the results to previous years is provided in Section 11.2.2.

11.2.1 2004-2005 Results

Chollas Creek

Nine conventional constituents exceeded water quality objectives at Chollas Creek. Of the conventional constituents measured, TSS and turbidity concentrations exceeded WQO during all of the three storms monitored during the 2004-2005 wet weather season. In addition, COD exceeded the WQO during the October 17, 2004 storm event.

Un-ionized ammonia exceeded the WQO during the February 18, 2005 storm event. None of the other nutrients monitored during the 2004-2005 wet weather season exceeded water quality objectives. All of the nutrients were detected at low levels during all three storms monitored.

All three of the bacterial indicators had elevated density levels. Fecal coliform is the only indicator bacteria with a wet weather water quality objective and it exceeded the objective during all three storms monitored in 2004-2005.

Chlorpyrifos and Diazinon were not detected during any of the storm events in 2004-2005, however, Malathion exceeded the WQO during the October 17, 2004 storm event.

Most total and dissolved metals were detected at low levels. Total copper was detected at levels above water quality objectives during all three storm events. Total zinc was detected at levels above water quality objectives during October 17, 2004 and February 18, 2005. Dissolved zinc exceeded the WQO during the October 17, 2004 storm.

The October 17, 2004 sample from Chollas Creek showed toxicity to *Hyalella and Ceriodaphnia* (See Section 3.1.6.2 for details on toxicity testing). The NOEC for *Hyalella* 96-hour survival was 50% of the test sample in comparison to 100% survival for the control. The NOEC for the *Ceriodaphnia* 7-day reproduction was 25% and was statistically different from the control which met the test criteria for reproduction. No toxicity was expressed in the other storm events monitored from Chollas Creek during 2004-2005.

Table 11-7. Analytes measured at the Chollas Creek mass loading station.

ANALYTE	UNITS	WQO	SOURCE	1993-94			1994-95				1995-96				1996-97		1997-98			1998-99		
				2/17/1994	3/24/1994	4/24/1994	11/10/1994	1/11/1995	2/14/1995	4/16/1995	11/1/1995	1/22/1996	1/31/1996	3/5/1996	12/9/1996	1/16/1997	11/10/1997	12/6/1997	3/14/1998	11/8/1998	1/25/1999	3/15/1999
General / Physical /																						
Electrical Conductivity	umhos/cm						447	176.3	110	193	693	179		427	334	487	310	155	1146	286	270	215
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	2.2	0.6	0.7	1.93	2.11	2.43	1.2	3.3	3.4		3.1	6	1.8	6.9	<0.5	4.56	1.29	1.56	0.95
pH	pH Units	6.5-8.5	Basin Plan																			
Bacteriological																						
Enterococci	MPN/100 mL																					
Fecal Coliform	MPN/100 mL	4000	Basin Plan	**9,300**	**24,000**	**24,000**	**17,000**	**28,000**	**50,000**	**50,000**	**16,000**	**16,000**		**16,000**	**16,000**	**16,000**	**16,000**	**9,450**		1,600	1,600	1,600
Total Coliform	MPN/100 mL			240,000	240,000	240,000	160,000	160,000	90,000	160,000	16,000			16,000	16,000	16,000	160,000	20,000		241,900	298,700	2,419,000
Wet Chemistry																						
Ammonia As N	mg/L			0.4		0.9	1.4	0.3	0.7	0.6	0.64	0.31	<0.2	1.8	<0.2	<0.2	1.3	0.4	10	1	0.78	1.06
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan																			
Biological Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	10	<3	**38.9**	30	25	13.3	18.1	14.5	6	<5	16	7.8	15	**49**	24	**40**	19	6	11
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	47		**149**	**284**	88	**187**	**192**	**122**	90	87	**321**	31	73	**146**	44	**135**	59	41	85
Dissolved Organic Carbon	mg/L																					
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.2	0.2	0.4	0.3	0.4	0.4	0.3	0.5	0.6	0.7		0.2	0.3	0.4	<0.1	1.41	1.07	0.27	0.22
Nitrate As N	mg/L	10	Basin Plan	2.7		1.4	2.7	0.7	1.2	0.98	1.8	1.2	0.91	0.82	0.8	0.81	3.5	0.52	0.4	1.1	0.98	0.44
Nitrite As N	mg/L	1	Basin Plan	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05								0.08	<0.05	0.06	0.12	0.14
Surfactants (MBAS)	mg/L	0.5	Basin Plan	0.12	0.47	**0.69**	0.41	0.07	0.07	0.3	0.16		<0.1	1	<0.1	<0.1	<0.1	0.07	**0.66**	0.48	0.19	0.07
Total Dissolved Solids	mg/L	500	Basin Plan by watershed	250	150	270	460	180	250	250	250	264	148	204	194	278	374	250	344	249	125	222
Total Kjeldahl Nitrogen	mg/L			4.3		4.4	3.9	1.6	<1	7.1	3.4	1.9	1.8	2.7	1.1	1.8	1.6	<1	15	0.44	1.25	3.61
Total Organic Carbon	mg/L																					
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.4	0.7	0.9	0.5	0.6	0.6	0.9	0.7	0.3	0.3	1.1	0.3	0.5	0.7	<0.1	**2.2**	1.28	0.3	0.17
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	**220**	**700**	**400**	**650**	**330**	**1200**	**470**	75	**184**	92	**130**	92	**488**	**182**	**315**	**805**	7.58	**280**	**159**
Turbidity	NTU	20	Basin Plan	**86**	**54**	**54**	**40**	**64**	**85**	**66**	**54.2**	**68.3**	5.7	18.4	**37**	**290**	**90**	**29**	**24**	**69**	**38**	**21**
Pesticides																						
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game																	**0.1**		<0.5*
Diazinon	µg/L	0.08	CA Dept. of Fish & Game																	**0.46**	**0.46**	**0.53**
Malathion	µg/L	0.43	CA Dept. of Fish & Game																			
Hardness																						
Total Hardness	mg CaCO3/L			120	71	110	150	58	100	120	91	74.5	52.2	78.6	57.4	61.5	116	39	96.4	77	42.5	90.8
Total Metals																						
Antimony	mg/L	0.006	Basin Plan	<0.001	0.0013	<0.001	0.0023	<0.001	<0.001		0.001				<0.003	<0.003	0.0016	<32*	<32*	<0.0015	<0.0015	<0.0015
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	<0.005	<0.005	<0.005	<0.005	0.011	0.008	0.006	0.006				0.004	0.005	0.002	<0.053*	<0.053*	0.006	0.0018	0.003
Cadmium	mg/L	(b)	40 CFR 131	0.002	0.002	0.001	0.001	0.001	0.002	0.003	0.001				0.0006	0.0007	0.0003	<0.004	<0.004	0.002	<0.00025	<0.00025
Chromium	mg/L	(b)	CTR (Cr VI)	0.005	0.006	0.008	0.004	0.003	0.01	0.007	<0.005				<0.010	0.010	<0.005	<0.007	0.011	<0.005	0.015	**0.035**
Copper	mg/L	(b)	40 CFR 131	**0.034**	**0.029**	**0.044**	**0.036**	**0.017**	**0.04**	**0.085**	**0.046**				**0.02**	0.01	0.017	**0.028**	**0.028**	0.006	<0.005	**0.015**
Lead	mg/L	(b)	40 CFR 131	**0.11**	**0.14**	0.07	0.035	**0.044**	**0.11**	**0.14**	0.023				0.016	**0.058**	0.003	<0.042	**0.095**	<0.001	0.007	**0.082**
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.011	0.008	0.014	0.016	0.006	0.011	0.013	0.011				<0.010	<0.010	0.009	<0.015	<0.015	0.04	0.028	0.016
Selenium	mg/L	0.02	40 CFR 131	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.001		0.002				<0.004	<0.003	0.001	<0.075	<0.075	0.002	<0.001	<0.001
Zinc	mg/L	(b)	40 CFR 131	**0.26**	**0.24**	**0.32**	**0.18**	**0.15**	**0.36**	**0.56**	<0.025				0.07	**0.20**	**0.176**	**0.11**	0.092	0.03	0.048	**0.21**
Dissolved Metals																						
Antimony	mg/L	(e)	40 CFR 131				0.0022	<0.001	<0.001	<0.001		<0.0015	<0.0015	<0.0015	<0.003	<0.003						
Arsenic	mg/L	0.34 (c)	40 CFR 131				<0.005	<0.005	<0.005	<0.005		0.004	0.003	0.002	0.005	<0.003						
Cadmium	mg/L	(b)	40 CFR 131				0.0002	<0.0002	<0.0002	<0.0002		<0.00025	<0.00025	0.00044	0.0005	0.0012						
Chromium	mg/L	(b)	40 CFR 131				0.002	0.0012	<0.001	0.001		<0.005	<0.005	<0.005	<0.010	<0.010						
Copper	mg/L	(b)	40 CFR 131				0.013	<0.005	0.005	0.010		0.012	0.008	0.034	0.010	0.020						
Lead	mg/L	(b)	40 CFR 131				0.003	<0.001	<0.001	<0.001		0.002	0.002	0.018	0.015	0.007						
Nickel	mg/L	(b)	40 CFR 131				0.013	<0.005	<0.005	<0.005		<0.005	<0.005	0.009	<0.010	0.020						
Selenium	mg/L	0.02 (d)	40 CFR 131				<0.0005	0.001	<0.0005	<0.0005		<0.001	<0.001	<0.001	<0.002	<0.003						
Zinc	mg/L	(b)	40 CFR 131				0.07	0.014	0.012	0.069		<0.025	0.032	0.141	0.080	0.040						
Toxicity																						
Ceriodaphnia 96-hr	LC50 (%)	100																				
Ceriodaphnia 7-day survival	NOEC (%)	100																				
reproduction	NOEC (%)	100																				
Hyalella 96-hr	NOEC (%)	100																				
Selenastrum 96-hr	NOEC (%)	100																				

See last page for footnotes and source references.

Table 11-7. Analytes measured at the Chollas Creek mass loading station.

ANALYTE	UNITS	WQO	SOURCE	1999-00			2000-01			2001-02			2002-03			2003-04			2004-05			Frequency Above WQO	Mean Ratio to WQO
				2/12/2000	3/5/2000	4/17/2000	10/27/2000	1/8/2001	2/13/2001	11/29/2001	2/17/2002	3/8/2002	11/8/2002	2/11/2003	2/25/2003	2/3/2004	2/18/2004	3/2/2004	10/17/04	02/11/05	02/18/05		
General / Physical /																							
Electrical Conductivity	umhos/cm			186	187	185	258	319	279	155	310	242	315	211	91.2	152.5	148	231	565	348	159		
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	1.92	2.04	1.48	12	4	1	5	10	8	4.24	3.54	2.47	1.61	2.17	3.43	4.17	1.12	<1	0%	0.20
pH	pH Units	6.5-8.5	Basin Plan							7.4	7.4	8	6.96	7.58	7.41	4.05	6.57	6.96	7.09	7.61	7.81	0%	0.00
Bacteriological																							
Enterococci	MPN/100 mL						130,000	26,000	80,000	170,000	110,000	220,000	30,000	50,000	80,000	50,000	220,000	17,000	170,000	30,000	80,000		
Fecal Coliform	MPN/100 mL	4000	Basin Plan	<2	1,600	1,600	70,000	27,000	14,000	30,000	23,000	70,000	50,000	30,000	13,000	22,000	30,000	17,000	140,000	11,000	70,000	78%	6.30
Total Coliform	MPN/100 mL			500	1,600	1,600	1,100,000	500,000	30,000	80,000	300,000	300,000	2,400,000	230,000	300,000	110,000	80,000	800,000	3,000,000	130,000	170,000		
Wet Chemistry																							
Ammonia As N	mg/L			1.65	<0.1	0.21	1.2	1.5	0.6	0.7	2.14	1.04	0.54	0.79	0.52	0.52	0.58	3.1	2.13	0.28	0.19		
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan										1.52	8.93	3.12	0.00	0.59	6.53	2.4	5.9	46.7	3%	0.08
Biological Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	7.8	2.54	6.1	15	32.2	<2	27	73.3	29	8.01	31.8	21.0	41.4	2.25	34.6	138	4.83	3.79	24%	0.75
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	41	104	57	150	109	100	71	244	488	119	184	43	222	271	69	501	89	<25	41%	1.14
Dissolved Organic Carbon	mg/L												11.3	19.2	10.8	5.8	11.6	6.07	134	2.22	2.86		
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.33	0.26	0.22	0.08	0.94	0.39	0.9	0.75	0.46	0.41	0.40	0.14	0.51	0.32	0.21	1.68	0.2	<0.05	0%	0.22
Nitrate As N	mg/L	10	Basin Plan	3.22	1.04	3.1	0.8	2.1	0.8	1.2	1.6	1.3	0.71	1.04	0.45	0.83	0.79	0.37	4.38	0.62	0.61	0%	0.13
Nitrite As N	mg/L	1	Basin Plan	0.086	<0.05	<0.05	0.21	0.22	0.05	0.11	0.22	0.18	0.09	0.12	0.07	0.06	0.08	<0.05	0.15	0.05	0.05	0%	0.06
Surfactants (MBAS)	mg/L	0.5	Basin Plan	0.35	0.22	0.13	0.7	<0.5	<0.5	<0.5	0.7	<0.5	0.3	0.2	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	14%	0.55
Total Dissolved Solids	mg/L	500	Basin Plan by watershed	120	111	140	191	236	173	71	254	199	195	121	87	134	222	129	665	122	112		
Total Kjeldahl Nitrogen	mg/L			2.98	3.1	2.36	2.37	5.9	0.97	4.6	5.7	9.1	2.5	2.4	1.6	3	3.6	3.8	18.6	5.4	3.4		
Total Organic Carbon	mg/L												22.8	27.0	5.45	21.9	20.9	15.9	190	7.58	10.7		
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.46	0.33	0.6	0.12	0.96	0.49	1.08	1.55	2.08	0.68	0.67	0.76	0.91	0.63	0.45	1.85	0.3	0.45	5%	0.36
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	457	62	200	67	294	139	67	151	493	63	193	295	24	290	56	753	135	275	73%	2.92
Turbidity	NTU	20	Basin Plan	50	27	38	72.2	200	96	63.3	36.5	121	57.1	121	178	259	102	37.5	300	40.1	82.2	95%	4.15
Pesticides																							
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	0.04	0.13	0.04	0.111	<0.03*	0.038	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35%	3.05
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	<0.5*	<0.5*	<0.5*	0.75	<0.5*	<0.5*	0.68	0.82	0.61	0.424	0.26	0.09	0.081	0.158	0.088	<0.01	<0.01	<0.01	49%	2.25
Malathion	µg/L	0.43	CA Dept. of Fish & Game										0.25	0.28	<0.10	0.164	0.162	0.168	0.601	0.091	0.065	11%	0.47
Hardness																							
Total Hardness	mg $CaCO_3$/L			40.9	35.1	45.5	85	78	59	68	111	148	69.1	78	44	87	88	74	244	40	46		
Total Metals																							
Antimony	mg/L	0.006	Basin Plan	<0.0015	<0.0015	<0.0015	0.003	0.003	0.002	<0.002	0.003	0.005	<0.002	0.005	0.004	<0.005	<0.006	<0.005	0.005	<0.005	<0.005	0%	0.32
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	<0.001	0.007	0.005	0.004	0.006	0.004	0.002	0.004	0.006	0.003	0.004	0.003	0.009	0.006	0.003	0.007	0.004	<0.002	0%	0.11
Cadmium	mg/L	(b)	40 CFR 131	<0.00025	0.002	<0.00025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.001	0.003	<0.001	<0.001	6%	0.30
Chromium	mg/L	(b)	CTR (Cr VI)	<0.005	<0.005	<0.005	0.007	0.013	0.007	0.012	0.009	0.019	<0.005	0.010	<0.005	0.025	0.019	<0.005	<0.005	<0.005	<0.005	0%	0.01
Copper	mg/L	(b)	40 CFR 131	0.029	0.016	0.014	0.027	0.049	0.016	0.027	0.053	0.056	0.028	0.033	0.016	0.07	0.068	0.036	0.122	0.009	0.015	94%	2.79
Lead	mg/L	(b)	40 CFR 131	0.015	<0.001	<0.005	0.022	0.055	0.027	0.028	0.032	0.061	0.017	0.029	0.023	0.079	0.096	0.057	0.079	0.008	0.018		
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	<0.005	<0.005	<0.005	0.012	0.014	0.005	0.009	0.015	0.017	0.007	0.008	0.004	0.016	0.014	0.002	0.040	0.003	0.003	0%	0.03
Selenium	mg/L	0.02	40 CFR 131	<0.001	<0.001	<0.001	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	6%	0.18
Zinc	mg/L	(b)	40 CFR 131	0.096	0.050	0.08	0.150	0.290	0.12	0.162	0.314	0.430	0.118	0.230	0.154	0.496	0.561	0.394	1.18	0.054	0.100	82%	2.13
Dissolved Metals																							
Antimony	mg/L	(e)	40 CFR 131	<0.0015	<0.0015	<0.0015	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.002	<0.005	<0.006	<0.005	<0.005	<0.005	<0.005		
Arsenic	mg/L	0.34 (c)	40 CFR 131	<0.001	0.005	<0.001	0.003	0.002	0.003	<0.001	<0.001	0.003	0.003	0.002	0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	0%	0.01
Cadmium	mg/L	(b)	40 CFR 131	<0.00025	<0.00025	<0.00025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.13
Chromium	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.01
Copper	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	0.017	0.013	<0.005	0.009a	0.024a	0.018b	0.022	0.052	0.008	0.005	0.009	0.005	0.024	0.006	<0.005	41%	1.09
Lead	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.005	0.003	0.002	0.014	<0.002	<0.002	0.002	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	0%	0.08
Nickel	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	0.011	0.007	0.002	0.004	0.010	0.008	0.006	0.004	<0.002	<0.002	0.002	<0.002	0.027	<0.002	<0.002	0%	0.01
Selenium	mg/L	0.02 (d)	40 CFR 131	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.06
Zinc	mg/L	(b)	40 CFR 131	0.019	0.028	0.008	0.090	0.110	0.030	0.053	0.118	0.079	0.152	0.139	0.018	<0.02	0.034	<0.02	0.267	0.023	<0.02	22%	0.60
Toxicity																							
Ceriodaphnia 96-hr	LC50 (%)	100					50	25	100	75	50	75	77.78	>100	>100	>100	>100	>100	>100	>100	>100	40%	0.80
Ceriodaphnia 7-day survival	NOEC (%)	100					50	25	100	25	25	25	25	50	100	100	100	100	100	100	100	47%	1.60
reproduction	NOEC (%)	100								25	12.5	25	50	100	100	100	100	100	25	100	100	42%	1.83
Hyalella 96-hr	NOEC (%)	100					50	6.25	12.5	100	50	50	50	100	100	50	50	100	50	100	100	60%	2.53
Selenastrum 96-hr	NOEC (%)	100								100	100	100	100	100	100	100	100	100	100	100	100	0%	0.00

See last page for footnotes and source references.

Table 11-7. Analytes measured at the Chollas Creek mass loading station.

Blank spaces have been verified and no data is available due to changes in the monitoring program.

(a) Un-ionized Ammonia is a calculated value, non-detectable values calculated at the detection limit. Basin Plan WQO is 0.025 mg/L; values shown here have been converted to μg/L.
(b) Water Quality Objective for dissolved metal fractions are based on total hardness and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(c) Water Quality Objectives for dissolved metal fractions are based on water effects ratios (WER) and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(d) Water Quality Objective is based on the total recoverable form as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
(e) USEPA has not published an aquatic life criterion value.

Shaded text – exceeds water quality objective.

* Indicates detection limit exceeds water quality objective.

Sources
USEPA National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activities, 65 Federal Register (FR) 64746, Final Reissuance, October 30, 2000. Table 3 - Parameter benchmark values.
Siepmann and Finlayson 2000.
Basin Plan, September 8, 1994.
Assembly Bill 411 - Title 17 of the California Code of Regulations, Section 7958.
USEPA Federal Register Document 40 CFR Part 131, May 18, 2000.

Table 11-8. Analytes measured at the Sweetwater mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-02			2002-03			2003-04			2004-05			Frequency Above WQO	Mean Ratio to WQO
				2/17/02	3/17/02	4/25/02	12/16/02	2/11/03	2/25/03	11/12/03	2/3/04	2/18/04	10/17/04	2/11/05	2/18/05		
General / Physical / Organic																	
Electrical Conductivity	umhos/cm			3820	3430	2980	2990	2760	1955	3040	1742	1995	529	5070	3260		
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	1	1	1	4.47	2	1	4.43	<1	1.05	<1	<1	<1	0%	0.10
pH	pH Units	6.5-8.5	Basin Plan	7.5	7.4	7.3	7.56	6.87	6.94	7.20	7.83	7.58	7.24	7.52	7.49	0%	0.00
Bacteriological																	
Enterococci	MPN/100 mL			300	16,000	9,000	8,000	14,000	30,000	18,792	1,879	17,000	800	3,000	50,000		
Fecal Coliform	MPN/100 mL	400	Basin Plan	130	**500**	**11,000**	**23,000**	**7,000**	**1,700**	**4,000**	**2,200**	**2,300**	300	**1,300**	**1,300**	83%	11.40
Total Coliform	MPN/100 mL			23,000	5,000	230,000	30,000	30,000	170,000	300,000	130,000	130,000	30,000	13,000	28,000		
Wet Chemistry																	
Ammonia As N	mg/L			0.16	0.3	0.2	0.25	0.28	0.19	0.16	0.1	0.15	0.39	0.14	0.14		
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan				2.28	0.64	0.42	0.67	1.44	1.55	1.0	0.8	1.1	0%	0.04
Biological Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	2	14.2	4.7	<2.0	20.4	5.89	9.32	**46.7**	15.3	19.8	2.57	3.42	8%	0.40
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	70	63	55	59	85	39	104	69	86	44	**123**	74	8%	0.60
Dissolved Organic Carbon	mg/L						9.68	25.2	8.94	21.9	7.94	88.2	25.7	5.24	6.19		
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	<0.05	0.2	0.1	0.34	0.20	0.10	0.4	0.18	0.12	0.2	0.18	0.45	0%	0.10
Nitrate As N	mg/L	10	Basin Plan	0.4	0.3	0.2	0.54	0.81	0.39	2.19	0.25	0.27	0.07	1.02	1.93	0%	0.07
Nitrite As N	mg/L	1	Basin Plan	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	0%	0.03
Surfactants (MBAS)	mg/L	0.5	Basin Plan	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0%	0.40
Total Dissolved Solids	mg/L	1500	Basin Plan by watershed	**2000**	1050	**2870**	793	**1660**	1150	**1880**	**1780**	**2230**	**2860**	**2370**	1410	67%	1.23
Total Kjeldahl Nitrogen	mg/L			1.5	3	1.2	1.0	1.0	0.8	2.8	<0.5	0.7	2.1	1.4	1.8		
Total Organic Carbon	mg/L						40.7	12.9	6.72	20.8	12.5	96.4	30.1	10.9	11.7		
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.18	0.29	0.1	0.54	0.22	0.14	0.43	0.22	0.16	0.25	0.57	0.47	0%	0.15
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	21	47	23	74	14	51	<20	<20	<20	20	26	**102**	8%	0.34
Turbidity	NTU	20	Basin Plan	7.7	**20.2**	8.24	**62.9**	13	**46.5**	15.2	11.5	16.8	4.03	5.8	48.8	33%	1.09
Pesticides																	
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.03*	<0.03*	**0.03**	**0.053**	**0.059**	<0.03*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25%	0.90
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	**0.10**	**0.27**	<0.03	**0.301**	**0.146**	**0.171**	**0.084**	<0.01	0.026	<0.01	<0.01	<0.01	50%	1.18
Malathion	µg/L	0.43	CA Dept. of Fish & Game				0.24	<0.10	<0.10	0.423	<0.01	<0.01	<0.01	<0.01	<0.01	0%	0.20
Hardness																	
Total Hardness	mg CaCO3/L			932	499	1010	344	758	549	817	728	816	1210	991	556		
Total Metals																	
Antimony	mg/L	0.006	Basin Plan	<0.002	<0.002	<0.002	0.004	0.004	0.003	<0.005	<0.005	<0.006	<0.005	<0.005	<0.005	0%	0.41
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.002	0.002	0.003	0.004	0.002	0.003	0.005	0.007	0.005	0.004	0.005	<0.002	0%	0.07
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.01
Chromium	mg/L	(b)	CTR (Cr VI)	<0.005	0.007	<0.005	0.009	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.00
Copper	mg/L	(b)	40 CFR 131	<0.005	0.010	0.006	0.010	0.018	0.007	0.009	0.013	0.012	<0.005	<0.005	0.005	0%	0.10
Lead	mg/L	(b)	40 CFR 131	0.002	0.006	0.003	0.010	0.003	<0.002	0.002	<0.002	0.003	<0.002	<0.002	0.002		
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.003	0.003	0.004	<0.002	0.002	<0.002	0.004	0.002	<0.002	0.002	0.003	0.002	0%	0.00
Selenium	mg/L	0.02	40 CFR 131	0.003	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.11
Zinc	mg/L	(b)	40 CFR 131	<0.02	0.045	<0.020	0.042	0.029	0.025	0.036	<0.02	0.029	<0.02	<0.02	<0.02	0%	0.04
Dissolved Metals																	
Antimony	mg/L	(e)	40 CFR 131	<0.002	<0.002	<0.002	0.006	<0.002	0.004	<0.005	<0.005	<0.006	<0.005	<0.005	<0.005		
Arsenic	mg/L	0.34 (c)	40 CFR 131	<0.001	0.001	0.003	0.003	0.003	0.003	0.003	0.004	0.003	<0.002	<0.002	<0.002	0%	0.00
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.01
Chromium	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.00
Copper	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	0.007	0.025	0.008	0.005	0.006	0.008	<0.005	<0.005	<0.005	0%	0.08
Lead	mg/L	(b)	40 CFR 131	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
Nickel	mg/L	(b)	40 CFR 131	0.004	<0.002	0.003	<0.002	0.002	<0.002	0.003	0.002	<0.002	0.002	0.003	0.002	0%	0.00
Selenium	mg/L	0.02 (d)	40 CFR 131	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.10
Zinc	mg/L	(b)	40 CFR 131	<0.020	<0.020	<0.020	0.043	0.097	0.021	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0%	0.04

Table 11-8. Analytes measured at the Sweetwater mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-02			2002-03			2003-04			2004-05			Frequency Above WQO	Mean Ratio to WQO
				2/17/02	3/17/02	4/25/02	12/16/02	2/11/03	2/25/03	11/12/03	2/3/04	2/18/04	10/17/04	2/11/05	2/18/05		
Toxicity																	
Ceriodaphnia 96-hr	LC50 (%)	100		>100	**70.71**	>100	**72.22**	>100	>100	>100	>100	>100	**50**	>100	>100	25%	0.40
Ceriodaphnia 7-day survival	NOEC (%)	100		100	**25**	100	**50**	100	100	100	100	100	**25**	100	100	25%	0.83
Ceriodaphnia 7-day reproduction	NOEC (%)	100		100	**50**	**50**	**50**	100	100	100	100	100	**12.5**	**50**	100	42%	1.33
Hyalella 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	0%	0.00
Selenastrum 96-hr	NOEC (%)	100		**50**	**50**	**25**	**12.5**	100	100	100	100	**50**	**50**	100	100	50%	1.67

Blank spaces have been verified and no data is available due to changes in the monitoring program.

(a) Un-ionized Ammonia is a calculated value, non-detectable values calculated at the detection limit. Basin Plan WQO is 0.025 mg/L; values shown here have been converted to μg/L.

(b) Water Quality Objective for dissolved metal fractions are based on total hardness and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.

(c) Water Quality Objectives for dissolved metal fractions are based on water effects ratios (WER) and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.

(d) Water Quality Objective is based on the total recoverable form as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.

(e) USEPA has not published an aquatic life criterion value.

Shaded text – exceeds water quality objective.

* Indicates detection limit exceeds water quality objective.

Sources
USEPA National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activities, 65 Federal Register (FR) 64746, Final Reissuance, October 30, 2000. Table 3 - Parameter benchmark values.
Siepmann and Finlayson 2000.
Basin Plan, September 8, 1994.
Assembly Bill 411 - Title 17 of the California Code of Regulations, Section 7958.
USEPA Federal Register Document 40 CFR Part 131, May 18, 2000.

Sweetwater River

Most conventional constituents monitored for in the Sweetwater River were detected at low levels with only a few exceedances during the 2004-2005 monitoring season. TDS was the only constituent with a persistent problem. TDS exceeded the WQO during October 17, 2004 and February 11, 2005 storms. COD exceeded the WQO during the February 11, 2005 storm event, and TSS exceeded the WQO on February 18, 2005.

Fecal coliform exceeded the REC-1 water quality objective during two of the storms. Total coliform and enterococcus also had elevated density levels, however there are no water quality objectives for total coliform and enterococcus to compare these results.

None of the objectives for nutrients, pesticides, total metals, and dissolved metals were exceeded in the 2004-2005 season at the Sweetwater River mass loading station.

The October 17, 2004 sample from Sweetwater River showed toxicity to *Ceriodaphnia* and *Selenastrum* (See Section 3.1.6.2 for details on toxicity testing). For *Ceriodaphnia*, the NOEC for the 7-day survival test was 25% in comparison to 90% for the control. The NOEC for the 7-day reproduction test was 12.5% and was statistically different from the control which met the test criteria for reproduction. For *Selenastrum*, the NOEC for 96-hour algal cell growth was 50% of the test sample and was statistically different from the control which met the test criteria for algal cell growth. Toxicity to *Ceriodaphnia* was also observed during the February 11, 2005 storm event. No toxicity to *Hyalella* was observed in any of the Sweetwater River samples collected in 2004-2005.

11.2.2 Relationships/Analyses

Chollas Creek

Chollas Creek is one of two water bodies in San Diego County which has been monitored since 1994. The larger number of sample points allow for trend analyses to be conducted. Trend analysis graphs using these historical data are presented in Appendix C.

Five conventional constituents have had water quality objective exceedances throughout the 12 year monitoring history at Chollas Creek. These include BOD, COD, MBAS, TSS, and turbidity. During this time period, turbidity has exceeded the WQO 95% (35/37) of the time, TSS exceeded the WQO 73% (27/37) of the time, COD exceeded the WQO 42% (15/36) of the time, and BOD exceeded the WQO 22% (8/37) of the time. Surfactants (MBAS) exceeded the water quality objective only 11% (4/36) of the time and actually had more non-detect values (15/36) than exceedances. Turbidity was the only conventional constituent to have a significant increasing trend, although the trend is weak (R^2=0.12).

Nutrients were also monitored at Chollas Creek since 1994, with the exception of un-ionized ammonia as N which was initiated in the Fall of 2002. Only two nutrient constituents had detectable levels above a water quality objective. Un-ionized ammonia was detected once (11%) above the WQO during nine monitoring events. Total phosphorus was detected above the WQO of 2.0 mg/L twice (5%) during 37 monitoring events. The remaining nutrient results were either non-detect or below respective water quality objectives.

Total and fecal coliform values have consistently been elevated during the 12 year monitoring period. Fecal coliform, the only bacterial indicator with a water quality objective, has exceeded the criteria of

4,000 MPN/100mL 29 times out of 35 storm events (83%). During the 1998-1999 and 1999-2000 monitoring year, however, fecal coliform levels were an order of magnitude lower than all other observations, and there was even a single non-detect value. Monitoring for enterococcus began during the 2000-2001 wet weather season. Enterococcus values have been persistently high. None of the bacterial indicators analyzed for had a statistically significant ($p<0.05$) trend.

Monitoring for Chlorpyrifos and Diazinon started in the Fall of 1998. Analytical methods used in 2000-01 and 2001-02 did not achieve detection limits below the current water quality objectives for Chlorpyrifos (0.5 μg/L vs 0.02 μg/L) or Diazinon (0.5 μg/L vs 0.08 μg/L) and are not used in the scatterplots or trend analysis. With the exception of Chlorpyrifos results for 2003-2004 and 2004-2005, all historical results for Chlorpyrifos and Diazinon were either above the water quality objective or had a non-detect result greater than the water quality objective. Chlorpyrifos has not been detected in Chollas Creek or Sweetwater River during the past two years. Diazinon was not detected during any monitoring events in 2004-2005 at both MLS, however concentrations exceed WQO during all three events in Chollas Creek and during one event in 2003-2004. All three samples of Diazinon exceeded the WQO during the 2003-04 monitoring season at the Chollas MLS, however there were no exceedances during the 2004-05 monitoring season. There was one WQO exceedance for Diazinon at the Sweetwater MLS during the 2003-04 monitoring season but no exceedances during the 2004-05 monitoring season. Analysis for Malathion began in Fall of 2002. Low levels of Malathion have been detected and only one storm has exceeded the WQO. None of the pesticides analyzed had a statistically significant ($p<0.05$) trend.

Total metals have been analyzed during every storm event since 1994 except for three storm events in Spring 1996. Total copper and zinc have exceeded water quality objectives the most, with copper exceeding 85% (29/34) and zinc exceeding 79% (27/34) of the time. Historical results show total lead as frequently exceeding the water quality objectives (8 of the first 13 monitored storm events); however, it has only exceeded the water quality objective three times since 2000 (all three times occurred during the 2003-2004 wet weather season). Despite the total lead exceedances in the previous monitoring season, there is a significant but weak decreasing trend in total lead concentrations ($R^2=0.14$).

Dissolved metals were not monitored in Spring 1994 or during the period from Spring 1996 through Spring 1997. With the exception of dissolved copper and zinc, dissolved metals have either not been detected or detected at levels below the water quality objectives. Dissolved copper has exceeded the water quality objectives eight times during the 27 storm events monitored (30%). Dissolved zinc has only had concentrations greater than its WQO four times during the 27 storm events monitored (15%).

Results of the chi-square test for Chollas Creek showed significant relationships for all *Ceriodaphnia* endpoints with Chlorpyrifos. Acute survival and reproduction were significant at $p=0.004$ with only one storm when Chlorpyrifos was above the WQO and no toxicity was observed (only the last four years were included in the analysis due to the high detection limits in the 2000-01 storm season). Chronic survival had a significant relationship with Chlorpyrifos at $p=0.023$. Toxicity to *Ceriodaphnia* has decreased in the last two years of sampling while intermittent toxicity to *Hyalella* has continued to be observed.

In order to illustrate the magnitude of the water quality exceedances for 2004-2005, the ratio of water quality results to the WQOs were plotted for several of the most common constituents of concern. The results are shown in Figure 11-2. The largest single exceedance was for fecal coliform, which exceeded the WQO by 35 times during the October 17, 2004 storm. There were also noticeable single exceedances for turbidity (15 times the WQO), TSS (7.5 times the WQO), total zinc (4.5 times the WQO), BOD (4.5 times the WQO), COD (4.2 times the WQO), total copper (3.8 times the WQO), and

Ceriodaphnia 7-day reproduction tests (3 times the WQO) all during the October 17, 2004 storm event. The average magnitude of water quality exceedances was also determined for each constituent by calculating the mean ratio of water quality results to the WQOs from all storm events from October 2001 through April 2004. Mean ratios are illustrated in Figure 11-2. The largest average exceedance for the period of record was for fecal coliform, which exceeded the WQO by nearly 8 times. There were also notable average exceedances ratios for turbidity (5.4 times), Diazinon (4.5 times), total copper (3.5 times), and total zinc (3 times).

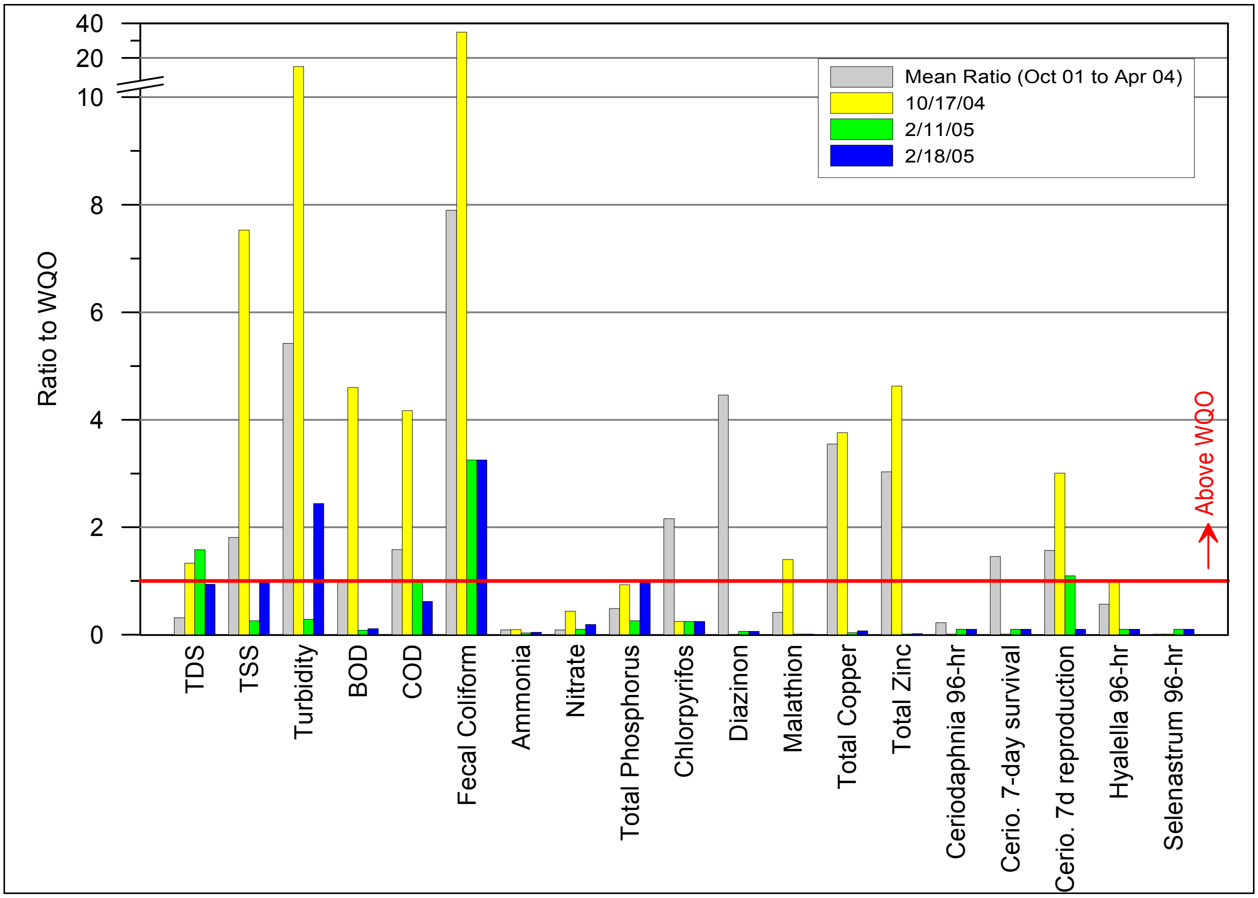

Figure 11-2. Chollas Creek water quality ratios.

In addition to the wet weather monitoring discussed above, there were a total of 23 dry weather monitoring sites in the Pueblo San Diego watershed. Of these 4 sites are located in the Chollas sub-watershed. Further, only four of these sites are located upstream of the MLS on Chollas Creek (See Section 3.4 for details on dry weather sampling).

Table 11-9 lists exceedances of dry weather action levels and the ratios of exceedance for COC that were measured during 2004 dry weather monitoring program for dry weather stations upstream of the MLS. There were dry weather exceedances for turbidity, ammonia, phosphorus, MBAS, dissolved copper, Diazinon, total and fecal coliform, and enterococcus. Of these, turbidity, total coliform, and enterococcus had average ratios of exceedance greater than 1.0. A map showing dry weather exceedances for all sites in the WMA is presented in Figure 11-3. Turbidity, fecal coliform, ammonia and copper (total during wet weather and dissolved during dry weather) were the only constituents that exceeded both in the 2004-2005 wet weather monitoring and the 2004 dry weather monitoring efforts.

Table 11-9. Pueblo San Diego 2004 Dry Weather Exceedance Matrix.

Constituent	Number of Exceedances	Number of Samples Collected	Average Ratio of Exceedance*
Turbidity	3	4	2.29
Ammonia	1	4	0.52
Phosphorus	2	4	0.75
MBAS	1	4	0.76
Dissolved Copper	1	4	0.33
Diazinon	1	4	0.78
Total Coliform	2	4	3.64
Fecal Coliform	1	4	0.29
Enterococcus	2	4	3.78

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the Water Quality Objective.

Sweetwater River

Results for conventional constituents in 2004-2005 were similar to apparent trends for previous years. Only TDS has frequently exceeded water quality objectives having results greater than 1500 mg/L during 8 of the last 12 storm events (66%).

Nutrients have been consistently at low or non-detectable levels during the past four wet weather seasons in Sweetwater River.

Fecal coliform has consistently exceeded water quality objectives, with values above the 400 MPN/100mL REC-1 standard 10 times during the last 12 storm events.

In 2004-2005, Diazinon did not exceed the WQO during any storm events. However, Diazinon did exceed water quality objectives during six out of the nine storm events prior to the 2004-2005 wet weather season and a significant decreasing trend was observed (R^2=0.34).

Total and dissolved metals have not exceeded water quality objectives at Sweetwater River during any of the monitoring events. Concentrations of the analyzed metals appear to be fairly consistent and low, with total and dissolved copper concentrations varying the greatest (total copper range = <0.005 to 0.018 mg/L and dissolved copper range = <0.005 to 0.025 mg/L).

In order to illustrate the magnitude of the water quality exceedances for 2004-2005, the ratio of water quality results to the WQOs were plotted for several of the most common constituents of concern. The results are shown in Figure 11-4. The largest single exceedance was for the *Ceriodaphnia* seven day reproduction toxicity test, which exceeded the WQO by seven times during the October 27, 2004 storm. There were also notable single exceedances for fecal coliform (3.3 times the WQO) and the *Ceriodaphnia* seven day survival test (3.1 times the WQO). The average magnitude of water quality exceedances was also determined for each constituent by calculating the mean ratio of water quality results to the WQOs from all storm events from October 2001 through April 2004. Mean ratios are illustrated in Figure 11-4. The largest average exceedance for the period of record was for turbidity (41 times the WQO). There was also a notable average exceedance ratio for fecal coliform (13 times the WQO).

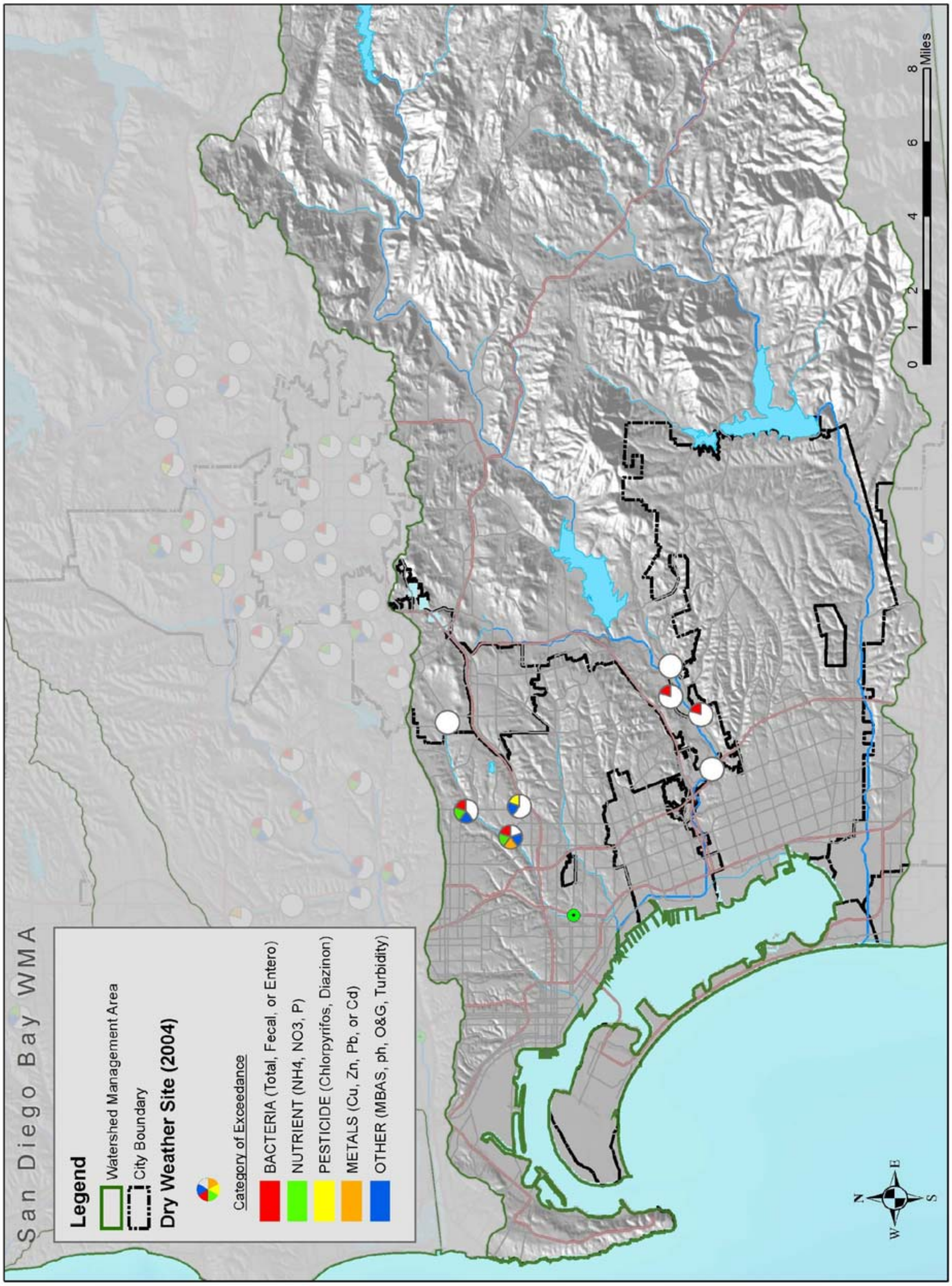

Figure 11-3. San Diego Bay WMA dry weather exceedance map.

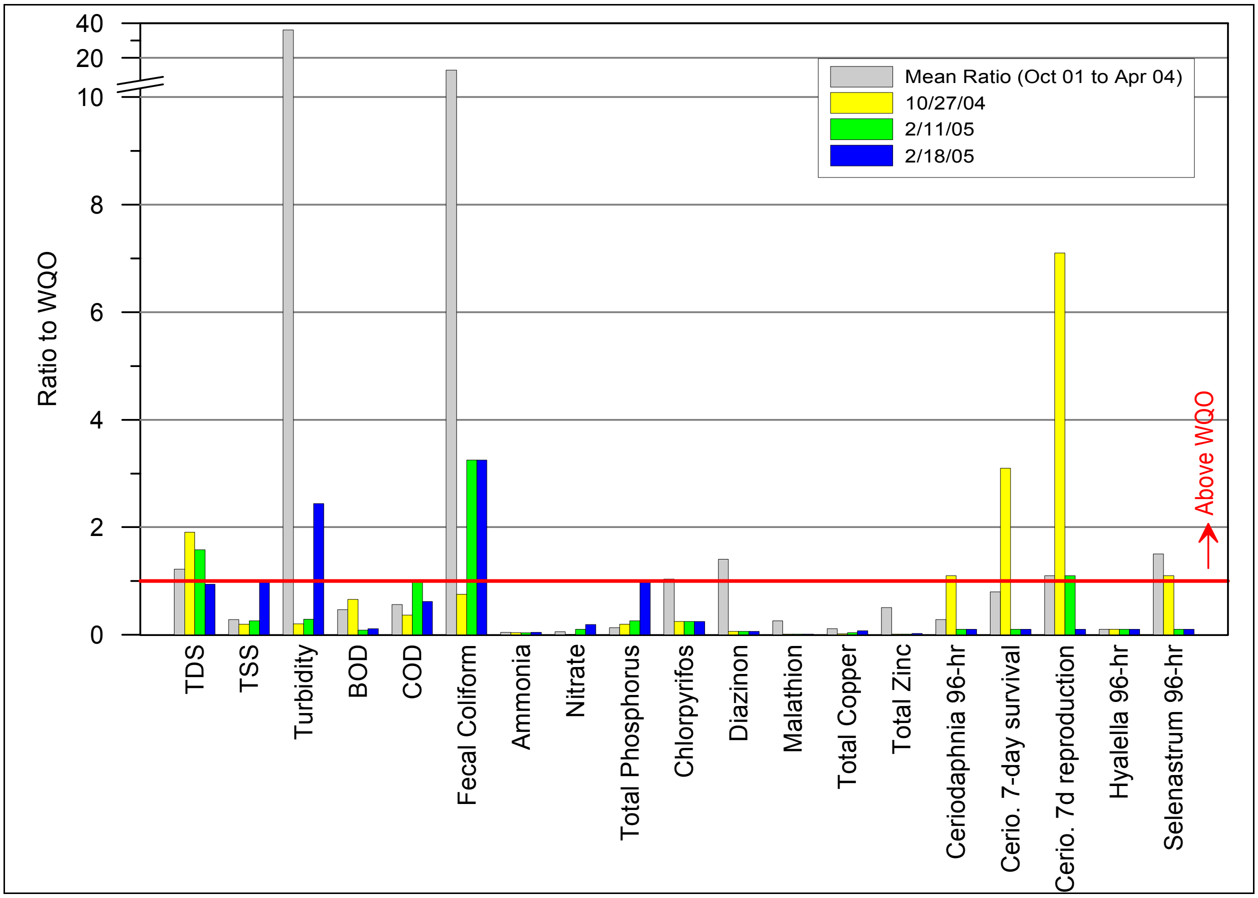

Figure 11-4. Sweetwater River water quality ratios.

In addition to the wet weather monitoring discussion above, there were a total of 34 dry weather monitoring sites in the Sweetwater River watershed. Five of these sites were located upstream of the MLS on Sweetwater River (See Section 3.4 for details on dry weather sampling).

Table 11-10 lists exceedances of dry weather action levels and the ratios of exceedance for COC that were measured during the 2004 dry weather monitoring program for dry weather stations upstream of the MLS. The only dry weather exceedances were for total and fecal coliform. A map showing dry weather exceedances for all sites in the WMA is presented in Figure 11-3. Only fecal coliform concentrations exceeded objectives during both the 2004-2005 wet weather monitoring and the 2004 dry weather monitoring efforts.

Table 11-10. Sweetwater River 2004 Dry Weather Exceedance Matrix.

Constituent	Number of Exceedances	Number of Samples Collected	Average Ratio of Exceedance*
Total Coliform	2	4	3.16
Fecal Coliform	1	4	0.28

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the Water Quality Objective.

11.2.3 TIEs

Chollas Creek and Sweetwater River were identified as potential TIE candidate sites based on toxicity to *Hyalella* and *Selenastrum*, respectively. Both stations expressed slight toxicity during one of the three storm events (October 17, 2004). The NOEC was determined to be the 50% dilution of the storm water, while the EC_{50} concentrations were calculated to be greater than 100% for Chollas Creek and 99.4% for Sweetwater River. This indicates that there was only a slight decrease in the response (survival or cell growth) of the 100% storm water sample relative to the test control treatment. TIE testing operates on the removal of certain components of the sample which may be contributing to the sample (i.e. metals, non-polar organic compounds). The toxicity of the sample should be sufficient enough to identify those procedures which effectively remove the toxicity. Since the toxicity was not consistent among events and was relatively slight, a standard TIE would not likely determine the cause.

11.2.4 Summary and Conclusions

The Chollas sub-watershed within the Pueblo San Diego watershed, the Sweetwater watershed, and the Otay watershed comprise the San Diego Bay WMA. The differences in water quality between these watersheds likely reflect the differences in land uses. The Chollas sub-watershed is highly urbanized. Water quality problems within Chollas Creek are typical of heavily residential and commercial areas with frequent water quality exceedances of turbidity, TSS, bacterial indicators, total and dissolved copper and total zinc. Aside from bacterial indicators and total dissolved solids, Sweetwater River does not have persistent water quality problems. Even though none of the pesticides analyzed had a statistically significant decreasing trend, there were not any pesticide exceedances during 2004-2005 in Chollas Creek or Sweetwater River. During the 2003-2004 monitoring season, Diazinon concentrations exceeded objectives at both MLS. Chlorpyrifos has not been detected nor exceeded the WQO in either Chollas Creek or Sweetwater over the past two monitoring seasons. The Otay watershed is one of the three least populated watersheds in the San Diego Region but has not been sampled during this monitoring program since the majority of runoff is captured in the Otay reservoir and is prevented from flowing downstream.

11.3 Stream Bioassessment

Stream bioassessment in the San Diego Bay WMA included three urban affected monitoring sites. One site was in Chollas Creek at the Federal Blvd. off-ramp from Highway 94. Two sites were in Sweetwater River; the upstream site was at the Highway 94 overcrossing in Rancho San Diego, and the downstream site was along Bonita Road, downstream of Willow Street. The Sweetwater River site at Highway 94 was not sampled in October 2004 due to dry conditions.

11.3.1 Results and Discussion

Chollas Creek at Federal Blvd.: CC-FB

The Chollas Creek monitoring site had a benthic macroinvertebrate community with an Index of Biotic Integrity rating of Poor and Very Poor in October 2004 and May 2005, respectively (Table 11-11) (See Section 3.2 for details on the sampling approach). The taxa richness was 13 and 16 different taxa per survey, and there were 2 different EPT taxa per survey. There were no organisms collected that were highly intolerant to impairment, and taxa that are highly tolerant comprised 49% and 9% of the community in October and May, respectively.

Table 11-11. Selected Biological Metrics and Physical Measures of the San Diego Bay WMA.

San Diego Bay Watershed Management Area	Chollas Creek at Federal Blvd. (CC-FB)		Sweetwater River at Highway 94 (SR-94)	Sweetwater River at Bonita Road (SR-WS)	
Survey	**Oct-04**	**May-05**	**May-05**	**Oct-04**	**May-05**
Index of Biotic Integrity/ Qualitative Rating	**17 Poor**	**10 Very Poor**	**8 Very Poor**	**1 Very Poor**	**5 Very Poor**
Metrics					
Taxa Richness	13	16	12	9	11
EPT Taxa (mayflies, stoneflies, and caddisflies)	2	2	3	1	2
% Intolerant Taxa	0%	0%	0%	0%	0%
% Tolerant Taxa	49%	9%	2%	5%	48%
Average Tolerance Value	7.1	5.4	5.5	6	6.9
% Collector Filterers +Collector Gatherers	68%	96%	98%	99%	98%
Physical Measures					
Elevation	220			40	
Physical Habitat Score	147	136	125	127	107
Riffle Velocity (ft/sec)	1.2	1.0	0.9	1.9	1.6
Substrate Composition					
Silt			32%		8%
Sand	2%	12%	66%	53%	57%
Gravel	17%	18%		20%	5%
Cobble	81%	52%			
Boulder		5%	2%		
Roots				27%	30%
Bedrock/Solid		13%			
Water Quality					
Temperature °C	20.5	22.5	21.9	16.3	19.4
pH	7.7	7.6	8.0	7.6	7.8
Specific Conductance (ms/cm)	4.635	2.382	0.757	3.830	3.523
Relative Chlorophyll (μg/L)	2.3	0.2	4.1	6.3	10.0

The physical habitat of the site was sub-optimal. The bioassessment sampling reach was located in a natural streambed and the substrate consisted primarily of smooth, layered cobble. There was little riparian canopy and the riffles were very shallow, and the bank vegetation was mostly native sage scrub. Specific conductance values were 4.635 mS/cm in October 2004 and 2.382 mS/cm in May 2005, indicating a level of total dissolved solids that would likely prevent the colonization of sensitive organisms. Values for pH were 7.7 and 7.6 in the October and May surveys, respectively.

In the October survey, the benthic community was dominated by Chironomid midges, Ostracods, and the snail, *Physa* (Table 11-12). In the May survey, the community was dominated by the Baetid mayflies, *Baetis* and *Fallceon quilleri*, which comprised 60 percent of the community, and the black fly, *Simulium*. In October 2004, as in October 2003, the site again supported unusually high numbers of soldier flies

(MEC-Weston 2005). Percent filterers plus collector gatherers increased from 68% of the community in October to 96% of the community in May (Table 11-11).

Table 11-12. San Diego Bay WMA Community Summary.

		Taxon	Common Name	Percent Composition	Tolerance Value	Functional Feeding Group
Chollas Creek at Federal Blvd. (CC-FB)	Oct-04	**Chironomidae**	**non-biting midges**	**31%**	**6**	**Collector Gatherer/Filterer**
		Ostracoda	seed shrimp	27%	8	Collector Gatherer
		Physa	aquatic snail	20%	8	Scraper
		Caloparyphus/ Euparyphus	soldier fly	7%	8	Collector Gatherer
		Argia	dancer damselfly	6%	7	Predator
	May-05	***Baetis***	**minnow mayfly**	**40%**	**5**	**Collector Gatherer**
		Fallceon quilleri	minnow mayfly	20%	4	Collector Gatherer
		Simulium	black fly	18%	6	Collector Filterer
		Chironomidae	non-biting midges	8%	6	Collector Gatherer/Filterer
		Physa	aquatic snail	3%	8	Scraper
Sweetwater River at Highway 94 (SR-94)	May-05	***Simulium***	**black fly**	**38%**	**6**	**Collector Filterer**
		Oligochaeta	earth worm	20%	5	Collector Gatherer
		Chironomidae	non-biting midges	20%	6	Collector Gatherer/Filterer
		Fallceon quilleri	minnow mayfly	12%	4	Collector Gatherer
		Baetis	minnow mayfly	7%	5	Collector Gatherer
Sweetwater River at Bonita Road (SR-WS)	Oct-04	***Simulium***	**black fly**	**43%**	**6**	**Collector Filterer**
		Chironomidae	non-biting midges	36%	6	Collector Gatherer/Filterer
		Oligochaeta	earth worm	15%	5	Collector Gatherer
		Ostracoda	seed shrimp	3%	8	Collector Gatherer
		Procambarus	crayfish	1%	6	Shredder
	May-05	***Simulium***	**black fly**	**38%**	**6**	**Collector Filterer**
		Ostracoda	seed shrimp	30%	8	Collector Gatherer
		Hyalella	amphipod	17%	8	Collector Gatherer
		Chironomidae	non-biting midges	9%	6	Collector Gatherer/Filterer
		Baetis	minnow mayfly	2%	5	Collector Gatherer

The Chollas Creek mass loading station was located approximately two miles downstream of the bioassessment site, and water quality measures from storm water may have contained constituents that did not affect the bioassessment site. Constituents of concern identified during storm water sampling that would have a negative impact on the biological community included total suspended solids, turbidity, and the metals copper, lead, and zinc (Table 11-12). Some toxicity to *Ceriodaphnia* and *Hyalella* from storm water has been detected at the MLS, and this may indicate that the water quality could prevent the colonization of highly sensitive organisms (*Hyalella* has a tolerance value of 8).

Sweetwater River at Highway 94: SR-94

The upstream Sweetwater River monitoring site had a benthic macroinvertebrate community with an Index of Biotic Integrity rating of Very Poor for the May 2005 survey (Table 11-11). The taxa richness was relatively low, with 12 different taxa collected and with 3 different EPT. There were no organisms collected that are highly intolerant to impairment, and there were few taxa that are highly tolerant, which comprised 2% of the community.

The physical habitat of the site was marginal. The substrate was primarily consolidated fine particulate clay/sand, with some treefall and a small amount of rock from the rip rap lined bridge abutment of Highway 94. The site had a dense willow riparian canopy, but the low gradient of the reach made for flat riffles with slow current velocity. Water quality measures indicated slightly better conditions than in the past, with specific conductance of 0.757 ms/cm and a pH of 8.0.

The benthic community was dominated by the black fly, *Simulium*; Oligochaete earthworms, and Chironomid midges (Table 11-12). Baetid mayflies comprised 19% of the community.

The Sweetwater River mass loading station was too spatially disconnected from the Highway 94 site to correlate any of the storm water information with the benthic community.

Sweetwater River along Bonita Road: SR-WS

The downstream Sweetwater River monitoring site had a benthic macroinvertebrate community with an Index of Biotic Integrity rating of Very Poor for both the October 2004 and May 2005 surveys, and was the lowest rated site in the county in the October Survey (Table 11-11). The taxa richness was low, with 9 and 11 different taxa per survey, and there was 1 EPT taxon in October, and 2 EPT taxa in May. There were no organisms collected that were highly intolerant to impairment, and taxa that are highly tolerant comprised 5% of the community in October 2004 and 48% of the community in May 2005.

The in-stream habitat of the site was marginal, although the site had a dense willow riparian zone with good canopy cover over the stream. The substrate was primarily unconsolidated gravel and sand, with some emergent vegetation and tree roots providing additional stable substrate. Water quality measures indicated an increase in total dissolved solids from the upstream site, with specific conductance values of 3.830 ms/cm in October and 3.523 ms/cm in May. The high specific conductance in May was in contrast to most of the county sites, which tended to have lower than usual conductance values (MEC-Weston 2005). Relative chlorophyll values were slightly higher than most sites in the region, with 6.3 and 10.0 µg/L, and values for pH were 7.6 and 7.8 for the October and May surveys, respectively.

The benthic community was dominated by the black fly, *Simulium,* in both surveys (Table 11-12). Chironomid midges and Oligochaetes were also abundant in October, and Ostracods and the amphipod, *Hyalella,* were abundant in May. Collector filterers plus collector gatherers heavily dominated both surveys comprising 99% of the community in October 2004 and 98% of the community in May 2005.

The Sweetwater River mass loading station was located less than one mile upstream of the bioassessment site with little additional urban runoff sources, and water quality measures may be correlated with the site. Constituents of concern identified during storm water sampling that would have a negative impact on the biological community included total dissolved solids and turbidity (Table 11-8). Metals were generally not detected. Toxicity to *Ceriodaphnia* and *Hyalella* from storm water has been an issue at the site, and this may indicate that the water quality could prevent the colonization of highly sensitive organisms.

11.3.2 Summary and Conclusions

Three monitoring sites were sampled in the San Diego Bay WMA. One site was in Chollas Creek at Federal Blvd., and two sites were in Sweetwater River, at Highway 94 in Rancho San Diego and along Bonita Road. Chollas Creek had Index of Biotic Integrity ratings of Poor and Very Poor, and was rated higher than many of the urban sites in the county. Both Sweetwater River sites were rated Very Poor during both surveys. The Sweetwater River monitoring sites were low-gradient, depositional reaches of the river, and the specific conductance increased substantially between the upstream and downstream site. These characteristics likely had negative affects on the IBI scores.

11.4 Ambient Bay and Lagoon Monitoring Program

11.4.1 Results and Discussion

11.4.1.1 Phase I Results and Discussion

Sediment samples were collected in Sweetwater River Estuary for the ABLM Program on June 2, 2004 (See Section 3.3 for details on the sampling approach). The nine sites sampled as part of the Phase I assessment are shown in Figure 11-5. The median grain size of sediments sampled in Sweetwater River Estuary was extremely variable, ranging from 5.1μm to 167.13μm (Table 11-13). However, the mean percentage of fine grained sediments (55.58%) was the third highest of the sites sampled in Phase I, following Buena Vista Lagoon (58.27%) and Los Peñasquitos Lagoon (55.73%). There were no strong differences in grain size distribution between the inner, middle, and outer strata. Sediments at most of the sites had a fairly even distribution between the sand, silt, and clay fractions with the inner stratum sites having a slightly higher content of sand.

Figure 11-5. Map of Phase I site locations in Sweetwater River Estuary. Sites with yellow triangles were selected for Phase II assessment.

TOC values were also fairly similar among the sites, ranging from 0.57% to 1.48% (Table 11-13). The three sites that ranked highest in the Phase I assessment were found in each of the three strata (1M-1, 2L-1, and 3R-1).

Table 11-13. Results of Phase I sediment analyses and subsequent ranking for Phase II site selection at Sweetwater River Estuary.

Sampling Site	TOC and Grain Size Distribution in Phase I								Ranking for Phase II				
	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Median (µm)	Mean (µm)	Fines (%)	TOC (%)	Fines Rank	TOC Rank	Rank Sum	Highest Rank	Phase II
SRE-1L-1	0.01	42.0	44.5	13.5	50.2	30.5	58.02	0.64	6	2	8		
SRE-1M-1	0.00	19.0	37.2	43.9	8.5	NC	81.05	1.17	8	6	14	*	Yes
SRE-1R-1	1.51	45.7	28.3	24.5	51.44	13.80	52.80	0.73	5	3	8		
SRE-2L-1	0.07	17.5	34.8	47.7	5.1	NC	82.42	1.48	9	9	18	*	Yes
SRE-2M-2	0.00	23.5	41.7	34.8	18.52	4.98	76.52	1.04	7	4	11		
SRE-2R-1	0.88	57.5	22.3	19.2	77.4	16.50	41.57	1.05	3	5	8		
SRE-3L-1	0.27	61.4	19.5	18.8	96.3	23.2	38.34	1.29	2	7	9		
SRE-3M-1	0.00	82.96	7.4	9.6	167.13	123.95	17.04	0.57	1	1	2		
SRE-3R-1	0.04	47.5	18.4	34.1	38.5	8.38	52.48	1.30	4	8	12	*	Yes
Mean of all Sites	0.31	44.11	28.23	27.35	57.02	31.61	55.58	1.03					

NC = Not calculable (%silt + %clay > 84%)

11.4.1.2 Phase II Results and Discussion

The three sites selected in Sweetwater River Estuary as part of Phase I were sampled in Phase II on July 13, 2004. Sediments from sites 1M-1, 2L-1 and 3R-1 were composited and analyzed for chemistry, toxicity, and benthic community structure. The results are summarized in Table 11-14.

Table 11-14. Summary of chemistry, toxicity, and benthic community structure in Sweetwater River Estuary.

CHEMISTRY*					TOXICITY*	BENTHIC COMMUNITY					
Analyte	ERL	ERM	Result	ERM-Q	Percent Survival	Index	1M-1	2L-1	3R-1	Mean	Total
METALS (mg/kg)					**79 %** Not Significantly different from Control	Abundance	483	1189	1168	947	2840
Antimony	NA	NA	<1.74	NA		Richness	36	43	34	38	73
Arsenic	8.2	70	4.67	0.067		Diversity	2.51	2.30	2.15	2.32	--
Cadmium	1.2	9.6	<0.174	NA		Evenness	0.70	0.61	0.61	0.64	--
Chromium	81	370	24.5	0.066		Dominance	6	4	5	5	--
Copper	34	270	33.1	0.123							
Lead	46.7	218	22.9	0.105							
Nickel	20.9	51.6	8.57	0.166							
Selenium	NA	NA	<1.74	NA							
Zinc	150	410	129	0.315							
Mean ERM-Q				**0.140**							

* Analysis performed on composite samples from the three sites.
NA-Not applicable
Bold – exceeds ERL or ERM value

Sediment Chemistry. Sediments from each of the 12 coastal embayments in the ABLM Program were analyzed for four basic constituents: metals, PCBs, PAHs, and pesticides. Of these, six metals were detected above the detection limit in Sweetwater River Estuary: arsenic, chromium, copper, lead, nickel, and zinc (Table 11-14). All of these metals were also found in all the other embayments assessed in the ABLM Program.

Concentrations of metals were low and none exceeded their respective ERL or ERM values. The same metals were detected during the 2003 ABLM program with the addition of cadmium. None of these metals exceeded their respective ERL or ERM values in 2003. There were no PAHs, PCBs, or pesticides found above the detection limit in Sweetwater River Estuary during the 2004 program.

The mean ERM quotient, which is a measure of the cumulative effects of the COC for which ERMs are available, was 0.140. This value exceeded the threshold of 0.10. This is similar to the 2003 results where the mean ERM quotient was 0.198. Sediments with mean ERM-Q values above this threshold have a higher probability of producing adverse biological effects than those with mean ERM-Qs below the threshold (Long et al. 1998).

Toxicity. The percent survival of *E. estuarius* exposed to Sweetwater River Estuary sediments in a 10-day acute toxicity test was 79 % (Table 11-14).This suggests that Sweetwater River Estuary sediments were not toxic to the test organisms. During the 2003 ABLM program toxicity was observed, but the source of toxicity was unknown.

Benthic Community Structure. A total of 2,840 organisms were collected from Sweetwater River Estuary, representing 73 taxa (Table 11-14). Total taxa abundance and richness were very high, third only to Mission Bay and Oceanside Harbor. This is similar to the 2003 ABLM program where Sweetwater River Estuary was among the top two sites for taxa richness and abundance with 1,927 organisms collected, representing 57 taxa. Site 2L-1 in the middle stratum had greater abundance and taxa richness than Sites 1M-1 and 3R-1. However, diversity, evenness, and dominance were greatest at Site 1M-1, near the mouth of the River. Based on these indices, the benthic community structure in Sweetwater River had a rank of 3, where 1 represents the healthiest community with the lowest combined index score and 12 the least-healthy community.

As in 2003, the barley snail, *Barleeia* sp., dominated the benthic community in Sweetwater River Estuary during the 2004 ABLM program, accounting for 27.7% (39.2% in 2003) of all the animals collected (Table 11-15). The polychaete worm, *Mediomastus* sp., was the second most abundant, accounting for 13.2% of the total abundance. The third most abundant species were the Nematodes with 11.9% of the population.

Table 11-15. Dominant infaunal species found in the Sweetwater River Estuary during the 2004 ABLM Program.

Embayment	Taxa (Species)	Higher Taxa	Abundance	Percent Composition
SRE	*Barleeia sp*	Mollusca	786	27.7
	Mediomastus sp	Polychaeta	376	13.2
	Nematoda	Minor Phyla	338	11.9

* Values were calculated from the total of all sites assessed.

Relative Ranking. The results of the chemistry, toxicity, and benthic community assessments for Sweetwater River Estuary were ranked against the same parameters for the other embayments monitored in the ABLM Program (see Section 3.3.5 for a complete discussion). For chemistry, a rank of 1 represents the lowest ERM-Q and 12 represents the highest. For toxicity, a rank of 1 represents the highest percent survival of test organisms and 12 represents the lowest. For benthos, a rank of 1 represents the highest species diversity, abundance and richness and a rank of 12 represents the lowest species diversity, abundance and richness. The results are presented in Figure 11-6. For Sweetwater River Estuary, the relative ranks were eight for chemistry, nine for toxicity, and three for benthic community structure.

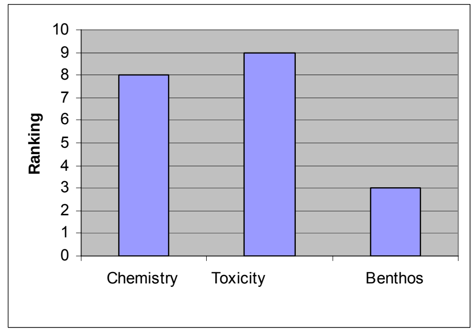

Figure 11-6. Relative rankings for sediment in Sweetwater River.

11.4.1.3 Summary and Conclusions

Sediments in Sweetwater River Estuary were monitored as part of the 2004 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COC were most likely to be found (i.e., those with the highest TOC and smallest grains size). These sites included Site 1M-1 in the outer Stratum, 2L-1 in the middle stratum, and 3R-1 in the inner stratum. In Phase II of the assessment, sediments from these three sites were composited and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that six of the nine metals assessed were found in Sweetwater River sediments, including arsenic, chromium, copper, lead, nickel, and zinc. The mean ERM-Q for Sweetwater River Estuary was the fourth highest of any embayment assessed in the ABLM Program. No ERL or ERMs were exceeded. There were no PAHs, PCBs, or pesticides found above the detection limit in Sweetwater River Estuary during the 2004 program.

The percent survival of test organisms exposed to Sweetwater River Estuary sediments was the third lowest (i.e., highest toxicity) of any of the embayments assessed although not significantly different from that of the Control. The benthic community indices suggested that the biotic community in the Sweetwater River Estuary had a rank of 3 (where a value of 1 represents the lowest combined index score and 12 the highest). The infaunal community was dominated by a genus of barley snail, followed by polychaete worms and Nematodes. The relative ranks for the Sweetwater River Estuary compared to the other embayments of the ABLM Program were eight for chemistry, nine for toxicity and three for benthic community structure. Compared to the other embayments in the 2004 ABLM program, Sweetwater River Estuary had an overall rank of eight. During the 2003 ABLM program the Sweetwater River Estuary had an overall rank of ten. A decrease in overall ranking indicates an increase in relative quality compared with last year's ranking. More data will need to be collected before any definitive trends can be identified.

11.5 WMA Assessment

The San Diego Bay WMA is comprised of multiple watersheds which are monitored as part of the San Diego County Urban Runoff Program. Among these are the Chollas sub-watershed within the Pueblo San Diego watershed and the Sweetwater watershed. Each of these watersheds is assessed separately.

Chollas Sub-watershed

The Chollas sub-watershed was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS on Chollas Creek, chemistry data collected from four dry weather monitoring sites upstream of the MLS, and IBI scores generated at one bioassessment site. The watershed management area assessment methods presented in Section 3.4 (Table 3-17) were applied to these data to determine which constituents were of concern and to develop a high, medium, or low frequency of occurrence. The results of this assessment are presented in Table 11-16.

For the Pueblo San Diego watershed, eight constituents were found to have a high frequency of occurrence and are listed below as constituents of concern. All of these constituents received a rating of three diamonds based on Criterion No. 1 with the exception of Diazinon and dissolved copper which were based on Criteria No. 3. These include:

- Total Coliform
- Fecal Coliform
- Enterococcus
- Turbidity
- Total copper
- Total zinc
- Diazinon
- Dissolved copper

Two constituents were found to have a medium frequency of occurrence and received two diamonds based on Criterion No. 6. These constituents include:

- COD
- Total suspended solids

Five constituents were found to have a low frequency of occurrence and received one diamond. These constituents include:

- Ammonia,
- Orthophosphate
- MBAS
- BOD
- Total lead

Ammonia, MBAS and orthophosphate received one diamond based on Criterion No. 8, while BOD and total lead received one diamond based on Criterion No. 9.

BOD and COD are unique among the COC assessed in the storm water program because they provide an indirect measure of the total oxidizable material available in the water column due to other factors, including anthropogenic contaminants as well as natural processes (as opposed to other methods which only provide results for the specific analyte tested). The presence of BOD or COD above their respective water quality criteria indicate the presence of other contaminants that may have caused the exceedance. Thus, management actions aimed at reducing BOD or COD may be most effective if the source or sources of the elevated levels are addressed directly. In this way, a reduction in BOD or COD levels would be a by-product of actions taken against more easily rectified COC.

Table 11-16. Constituent exceedances in the Chollas sub-watershed.

Constituents With Any Wet Weather (MLS) WQO or Dry Weather Action Level Exceedance	MLS (Wet Weather) Results										Dry Weather Results *		Frequency of Occurrence	Criterion No.
	2001/2002		2002/2003		2003/2004		2004/2005		CUMULATIVE		2004			
	#/3	%	#/3	%	#/3	%	#/3	%	#/12	%	#	%		
Conventional Parameters														
pH	0	0	0	0	0	0	1	33	1	8	0	0	-	-
BOD	1	33	1	33	2	67	1	33	5	42	NA	NA	♦	9
COD	2	67	1	33	2	67	1	33	6	50	NA	NA	♦♦	6
Surfactants (MBAS)	1	33	0	0	0	0	0	0	1	8	1	25	♦	8
Total Dissolved Solids	0	0	0	0	0	0	1	33	1	8	NA	NA	-	-
Total Suspended Solids	2	67	2	67	1	33	3	100	8	67	NA	NA	♦♦	6
Turbidity	3	100	3	100	3	100	3	100	12	100	3	75	♦♦♦	1
Nutrients														
Ammonia	0	0	0	0	0	0	0	0	0	0	1	25	♦	8
Orthophosphate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	50	♦	8
Total Phosphorus	1	33	0	0	0	0	0	0	1	8	NA	NA	-	-
Bacteriological														
Total Coliform	3	100	3	100	3	100	3	100	12	100	2	50	♦♦♦	1
Fecal Coliform	3	100	2	67	3	100	3	100	11	92	1	25	♦♦♦	1
Enterococcus	3	100	3	100	3	100	3	100	12	100	2	50	♦♦♦	1
Pesticides														
Chlorpyrifos	3	100	2	67	0	0	0	0	5	42	0	0	-	-
Diazinon	3	100	3	100	3	100	0	0	9	75	1	25	♦♦♦	3
Malathion	NA	NA	0	0	0	0	1	33	1	8	NA	NA	-	-
Total Metals														
Copper	3	100	3	100	3	100	3	100	12	100	NA	NA	♦♦♦	1
Lead	0	0	0	0	3	100	0	0	3	25	NA	NA	♦	9
Zinc	3	100	3	100	3	100	2	67	11	92	NA	NA	♦♦♦	1
Dissolved Metals														
Copper	3	100	3	100	0	0	0	0	6	50	1	25	♦♦♦	3
Zinc	0	0	2	67	0	0	1	33	3	25	0	0	-	-
Toxicity													**EVIDENCE OF PERSISTENT TOXICITY?**	
Ceriodaphnia 96-hour	3	100	1	33	0	0	0	0	4	33	NA	NA	No	
Ceriodaphnia 7-day survival	3	100	2	67	0	0	0	0	5	42	NA	NA	No	
Ceriodaphnia 7-day reproduction	3	100	1	33	0	0	1	33	5	42	NA	NA	No	
Hyalella 96-hour	2	67	1	33	2	67	1	33	6	50	NA	NA	Yes	
Bioassessment													**EVIDENCE OF BENTHIC ALTERATION?**	
Chollas Creek (DS)	NA		Poor		Very Poor		Poor		Poor		NA		Yes	

* = Total number of observations varied among constituents.
NA = Not assessed
\- = Constituent results are below the defined requirements for a Low Frequency of Occurrence rating.
♦ = Low Frequency of Occurrence rating.
♦♦ = Medium Frequency of Occurrence rating.
♦♦♦ = High Frequency of Occurrence rating.
DS = Downstream of MLS

The watershed assessment process does not indicate cadmium as a COC, which has previously been considered a potential COC primarily because of its inclusion on the SWRCB 303(d) list. It is expected that cadmium will be removed from the 303(d) list as it has been recommended for delisting by the SWRCB in September, 2005.

The triad decision matrix for evidence of persistent toxicity is based on greater than 50% of the bioassay tests conducted on any species showing NOEC values less than 100%. Although *Ceriodaphnia dubia* 7-day reproduction did show toxicity in one event during the 2004-2005 monitoring season it did not indicate persistent toxicity as in previous years based on the methods in Section 3.4. The species, *Hyalella azteca*, was found to have a frequency of occurrence of exactly 50%. To be conservative, Chollas Creek was listed as showing evidence of persistent toxicity based on the *Hyalella* 96-hour toxicity test.

IBI scores resulting from bioassessment monitoring on Chollas Creek varied between poor and very poor throughout the monitoring period. Conservatively, this indicates there is evidence of benthic alteration.

Figure 11-7 summarizes the number of occurrences of water quality exceedances for six categories of constituents. Categories include conventionals, nutrients, bacteria, pesticides, metals, and toxicity. The stacked bars were developed using the number of exceedances found from values in Table 11-16 for each constituent category. The overall number of exceedances of the water quality objectives at the Chollas sub-watershed exhibit a continued reduction in the overall number of exceedances since 2001. It appears that a reduction in toxic effects has contributed the greatest to this reduction, and nutrients are no longer a contributing source in this assessment technique.

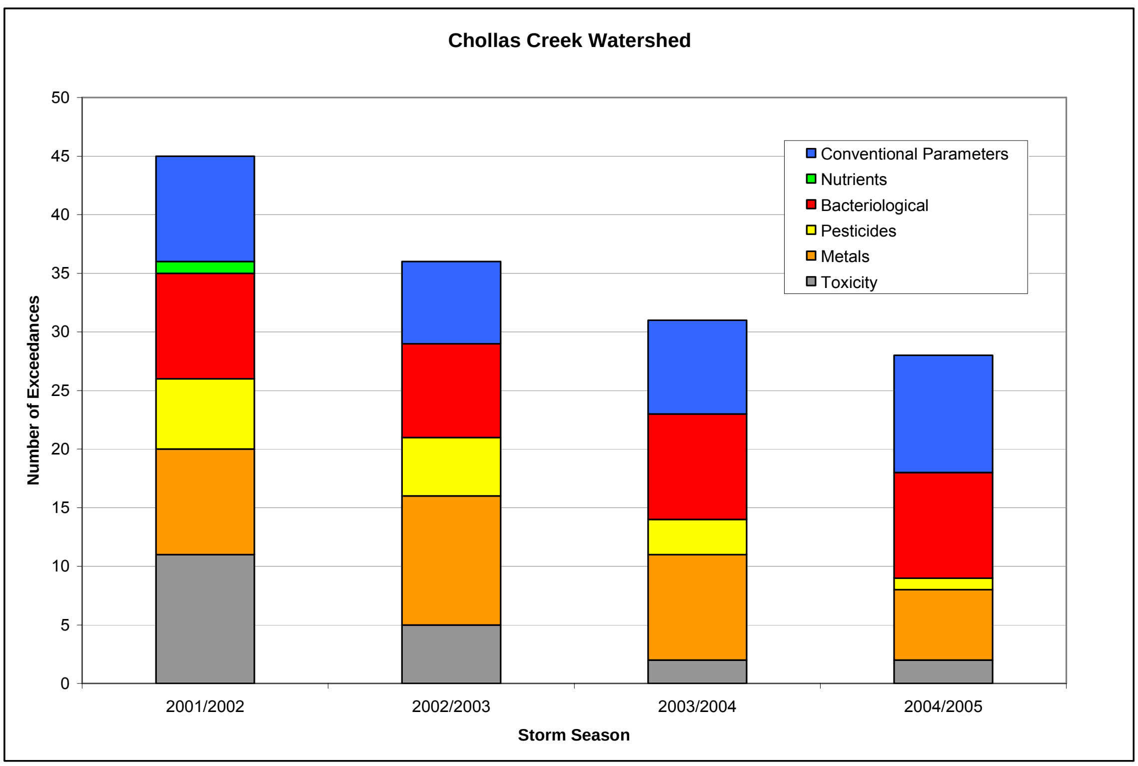

Figure 11-7. Stacked bar chart of the number of wet weather exceedances of constituent groups in Chollas Creek.

Evaluation of long-term scatterplots for Chollas Creek presented in Appendix C indicate a statistically significant increasing trend for turbidity (R^2=0.12) which is listed as a high frequency COC and is also an indicator of BMP concern. Although nitrite has not exceeded the water quality objective during the past four monitoring seasons, a slight but statistically significant increasing trend (R^2=0.15) is evident, yet well below the WQO. Nitrite should continue to be monitored to ensure the parameter does not become a COC. A statistically significant decreasing trend was evident for total lead (R^2=0.14) although there were three exceedances of the water quality objective during the 2003-2004 monitoring season.

Sweetwater Watershed

The Sweetwater watershed was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS, chemistry data collected from five dry weather monitoring sites upstream of the MLS, and IBI scores generated at two bioassessment sites. The watershed management area assessment methods presented in Section 3.4 (Table 3-17) were applied to these data to determine constituents of concern and to develop a high, medium, or low frequency of occurrence and the applicable criteria for these constituents. The results of this assessment are presented in Table 11-17.

For the Sweetwater watershed, one constituent was found to have a high frequency of occurrence and was given three diamonds based on Criteria No. 1. This constituent was:

- Fecal coliform

One constituent was found to have a medium frequency of occurrence and was assigned two diamonds based on Criteria No. 6. This constituent was:

- Total dissolved solids

Four constituents were found to have a low frequency of occurrence and were assigned one diamond. These constituents include:

- Total coliform
- Turbidity
- Enterococcus
- Diazinon

Toxicity tests conducted on *Selenastrum* have shown evidence of toxicity in 50% of the cumulative sampling events. Conservatively, there is evidence of persistent toxicity in the Sweetwater watershed.

IBI scores resulting from bioassessment monitoring at the Sweetwater River Bonita Rd. site have consistently indicated a rating of Very Poor. The cumulative IBI score from the Hwy 94 site was Very Poor as well. Therefore, there is evidence of benthic alteration within the Sweetwater watershed.

Figure 11-8 summarizes the number of water quality exceedances for six categories of constituents. Categories include conventionals, nutrients, bacteria, pesticides, metals and toxicity. The stacked bars were developed using number of exceedances from values in Table 11-17 for each constituent category. The overall number of exceedances of the water quality objectives in the Sweetwater watershed has slightly declined over the last four monitoring seasons, and although pesticides and bacteriological groups declined since the previous year, toxicity and conventional exceedances increased.

Evaluation of scatterplots for Sweetwater River presented in Appendix C indicate a statistically significant decreasing trend for Diazinon (R^2=0.34). There were no statistically significant increasing trends evident for any of the parameters monitored at the Sweetwater River MLS, although COD and TSS exceeded their respective water quality objectives for the first time during the 2004-2005 monitoring season.

Table 11-17. Constituent exceedances in the Sweetwater watershed.

Constituents With Any Wet Weather (MLS) WQO or Dry Weather Action Level Exceedance	MLS (Wet Weather) Results										Dry Weather Results *		Frequency of Occurrence	Criterion No.
	2001/2002		2002/2003		2003/2004		2004/2005		CUMULATIVE		2004			
	#/3	%	#/3	%	#/3	%	#/3	%	#/12	%	#	%		
Conventional Parameters														
BOD	0	0	0	0	1	33	0	0	1	8	NA	NA	-	-
COD	0	0	0	0	0	0	1	33	1	8	NA	NA	-	-
Total Dissolved Solids	2	67	1	33	3	100	2	67	8	67	NA	NA	♦♦	6
Total Suspended Solids	0	0	0	0	0	0	1	33	1	8	NA	NA	-	-
Turbidity	1	33	2	67	0	0	1	33	4	33	0	0	♦	9
Bacteriological														
Total Coliform	1	33	1	33	3	100	0	0	5	42	2	50	♦	8
Fecal Coliform	2	67	3	100	3	100	2	67	10	83	1	25	♦♦♦	1
Enterococcus	1	33	2	67	2	67	1	33	6	50	0	0	♦	9
Pesticides														
Chlorpyrifos	1	33	2	67	0	0	0	0	3	25	0	0	-	-
Diazinon	2	67	3	100	1	33	0	0	6	50	0	0	♦	9
Toxicity													**EVIDENCE OF PERSISTENT TOXICITY?**	
Ceriodaphnia 96-hour	1	33	1	33	0	0	1	33	3	25	NA	NA	No	
Ceriodaphnia 7-day survival	1	33	1	33	0	0	1	33	3	25	NA	NA	No	
Ceriodaphnia 7-day reproduction	2	67	1	33	0	0	2	67	5	42	NA	NA	No	
Selenastrum 96-hour	3	100	1	33	1	33	1	33	6	50	NA	NA	Yes	
Bioassessment	IBI Rating												**EVIDENCE OF BENTHIC ALTERATION?**	
Sweetwater River, at HWY 94	Poor		NA		Very Poor		Very Poor		Very Poor		NA		Yes	
Sweetwater River, at Bonita Rd. (DS)	Very Poor		Very Poor		Very Poor		Very Poor		Very Poor		NA			

* = Total number of observations varied among constituents.
NA = Not assessed
- = Constituent results are below the defined requirements for a Low Frequency of Occurrence rating.
♦ = Low Frequency of Occurrence rating.
♦♦ = Medium Frequency of Occurrence rating.
♦♦♦ = High Frequency of Occurrence rating.
DS = Downstream of MLS

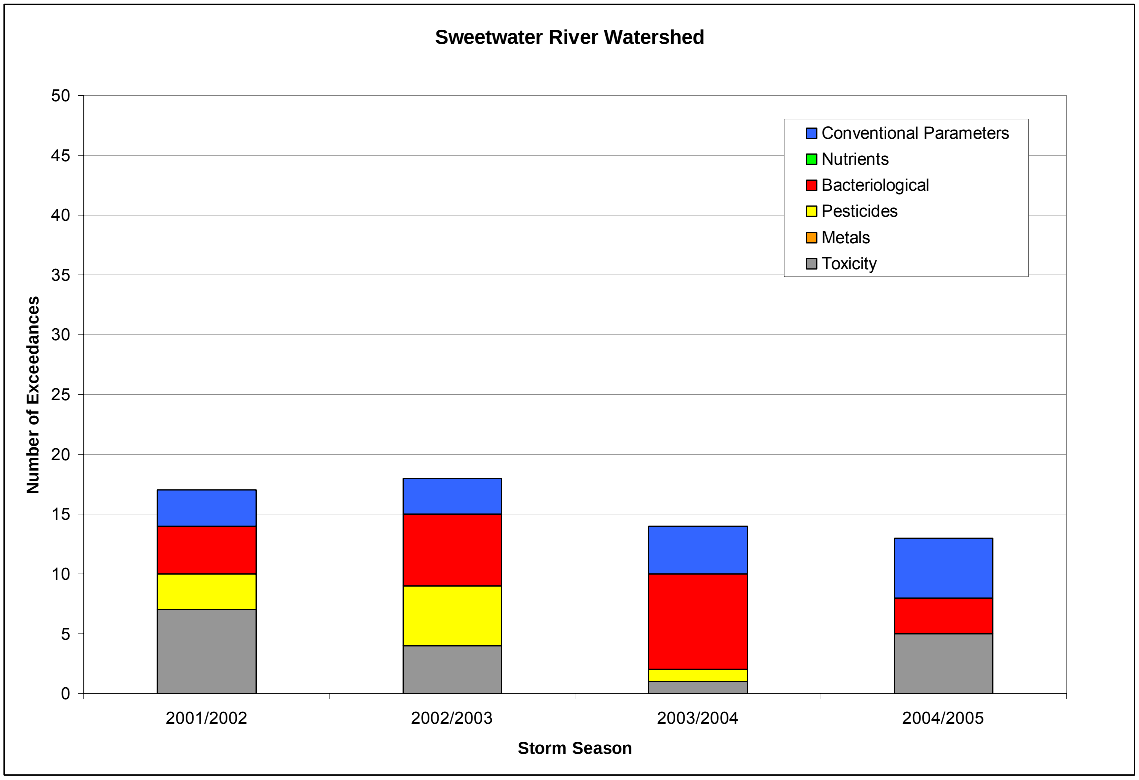

Figure 11-8. Stacked bar chart of the number of wet weather exceedances of constituent groups in Sweetwater watershed.

Triad Decision Matrix

The triad decision matrix combines the occurrence of COCs determined from the wet weather MLS monitoring and dry weather monitoring upstream of the MLS with the toxicity and bioassessment results to determine possible conclusions about the condition of the watershed and provide possible actions for future monitoring or assessment. The triad decision matrix is presented separately for the Chollas sub-watershed and the Sweetwater watershed in the following sections.

<u>Chollas Sub-watershed</u>

Table 11-18 summarizes the results of the watershed assessment and concludes that degradation of Chollas Creek is occurring due to pollutant loading even though the total number of COC exceedances has been declining. The high frequency COCs in Chollas Creek are bacterial indicators, Diazinon, turbidity, total and dissolved copper, and total zinc. However, bacterial indicators are not considered in the triad decision making process because they are not believed to influence toxicity responses in bioassay test organisms. Chollas Creek is in a TMDL for Diazinon and with the banned retail sale of Diazinon going into effect on January 1, 2005 the continued decreasing trend should continue to the point that Diazinon may not be a COC in future monitoring events. With the eventual implementation of the copper, lead, and zinc TMDL in Chollas Creek these COCs will continue to be monitored and will eventually be addressed under the new permit. Toxicity identification evaluations should be considered if continued toxicity is observed in future monitoring events to determine the contaminant(s) most likely responsible for toxicity effects.

Table 11-18. Decision matrix results for the Chollas Sub-watershed.

Chemistry	Toxicity	Benthic Community	Possible Conclusion(s)	Possible Actions or Decisions
Persistent exceedance of water quality objectives	Evidence of persistent toxicity (conservative at 50%)	Indications of alteration	Evidence of current pollution-induced degradation	1) Continue to perform TIE to identify contaminant(s) of concern based on TIE metric. 2) Continue monitoring to gather long-term trend information.

Sweetwater Watershed

Only fecal coliform was identified as having a high frequency of occurrence. However, bacterial indicators are not considered in the triad decision making process because they are not believed to influence toxicity responses in bioassay test organisms. Analyses have shown evidence of persistent toxicity and indications of benthic alteration in the Sweetwater WMA. A TIE was not performed during the 2004-2005 monitoring season. TIEs should be continued (as recommended in Table 11-19) to identify the source or sources of toxicity and should be initiated at the time the bioassay analyses are started.

Table 11-19. Decision matrix results for the Sweetwater Watershed.

Chemistry	Toxicity	Benthic Community	Possible Conclusion(s)	Possible Actions or Decisions
No persistent exceedance of water quality objectives	Evidence of persistent toxicity (conservative at 50%)	Indications of benthic alteration	Toxicity may be caused by contaminants not currently monitored for or synergistic effects of multiple constituents at low levels. The benthic alterations may be due to physical habitat disturbances.	1) Continue to perform TIE to identify contaminant(s) of concern based on TIE metric. 2) Continue monitoring to gather long-term trend information.

Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Diego Bay WMA

The water quality priority ratings presented in Table 11-20 are based on the methodology presented in the BLTEA report (WESTON, MOE, & LWA 2005) and are presented in the Methods Section 3.4. Constituent groups and stressor groups are given a ranking from A to D with A being the highest priority rating and D the lowest priority rating. Items ranked with a D indicate that the constituent group or stressor is a low priority or does not have sufficient data to support a higher ranking. The ratings were based on current results presented in this 2004-2005 annual report and data from the following programs:

- Storm water Mass Loading Monitoring (MLS) – Wet Weather Data
- Co-permittee Dry Weather Data Monitoring
- Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring (ABLM)
- Urban Stream Bioassessment Monitoring
- Triad Assessment – Toxicity Testing of Storm water
- 303d Listing

Table 11-20. Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Diego Bay WMA

Watersheds/ Sub-watersheds	Percentage of Total Area	Priority Ratings*									
		Constituent Groups								Stressor Groups	
		Heavy Metals	Organics	Oil and Grease	Sediments	Pesticides	Nutrients	Gross Pollutants	Bacteria/ Pathogens	Benthic Alterations	Toxicity
San Diego Bay WMA	**100%**	**C**	**D**	**D**	**A**	**B**	**C**	**C**	**B**	**B**	**C**
Point Loma HA (908.10)	2%	A	D	D	D	B	D	D	A	A	A
San Diego Mesa HA (908.20)	9%	A	A	D	A	A	D	B	A	A	A
National City HA (908.30)	2%	C	D	C	D	A	C	B	A	A	A
Lower Sweetwater HA (909.10)	11%	C	D	D	A	B	D	D	A	A	C
Middle Sweetwater HA (909.20)	19%	D	D	D	B	B	D	D	B	B	C
Upper Sweetwater HA (909.30)	22%	D	D	D	B	B	C	D	B	B	C
Coronado HA (910.10)	2%	C	D	D	D	B	C	D	A	D	D
Otay Valley HA (910.20)	10%	B	D	C	D	A	C	B	A	D	D
Dulzura HA (910.30)	22%	D	D	D	D	D	B	D	D	D	D

Notes:
**** = Rating Calculated Based on Area Weighted Averages of Score Value from the sub-watershed areas.***
***** = Priority Level (Highest-A to Lowest-D)***

The purpose of the BLTEA ratings is to identify water quality priorities within a watershed based on weighted averages of the sub-watershed ratings. Because it is a weighted average, larger sub-watersheds will have a greater influence in the overall watershed rating.

Sediment was rated as the highest priority constituent (A) for the San Diego Bay WMA followed by pesticides, bacteria, and benthic alterations which were given B ratings. All other constituents were given either a C or D rating.

The Point Loma sub-watershed, which accounts for only 2% of the San Diego Bay WMA, had high priority (A) ratings for heavy metals, bacteria, benthic alteration, and toxicity.

The San Diego Mesa HA, which includes the Chollas Creek sub-watershed and accounts for 9% of the San Diego Bay WMA, had high priority (A) ratings for heavy metals, organics, sediments, pesticides, bacteria, benthic alteration, and toxicity. The National City sub-watershed, which accounts for only 2% of the San Diego Bay WMA, had high priority (A) ratings for pesticides, bacteria, benthic alteration, and toxicity.

The Lower Sweetwater sub-watershed, which accounts for 11% of the San Diego Bay WMA, had high priority (A) ratings for sediments, bacteria, and benthic alteration. The Coronado sub-watershed, which accounts for only 2% of the San Diego Bay WMA, had a high priority (A) rating only for bacteria. The Otay Valley sub-watershed, which accounts for 10% of the San Diego Bay WMA, had high priority (A) ratings for pesticides and bacteria. The Middle Sweetwater sub-watershed, which accounts for 19% of the San Diego Bay WMA, and the Upper Sweetwater sub-watershed, which accounts for 22% of the San Diego Bay WMA, each had only B priority ratings for sediments, pesticides, bacteria, and benthic alteration. The Dulzura sub-watershed accounts for 22% of the San Diego Bay WMA and had a B priority rating only for nutrients.

A regional evaluation and description of the BLTEA is presented in the Regional Assessment Section 13. The complete tables used to calculate the ratings are presented in Appendix G.

11.6 Conclusions and Recommendations

Chollas Sub-watershed

The Chollas sub-watershed within the Pueblo San Diego watershed drains a very densely populated, urban area. Nearly 65% of the drainage area is residential and another 17% is commercial. Turbidity, all three indicator bacteria, Diazinon, total and dissolved copper, and total zinc were identified as high frequency of occurrence COC. Medium frequency of occurrence COC were identified for COD, and TSS, followed by BOD, MBAS, ammonia, orthophosphate, and total lead which were identified as low frequency of occurrence COC. The benthic community impacts and stream habitat impairments may be a result of elevated COC or physical alterations to the riparian corridor.

Since the EPA has banned the retail sale of Diazinon and Chlorpyrifos, and with the increased public outreach and education regarding the handling of pesticides in general, a decreasing trend for these compounds should continue. Continued monitoring of the organophosphate compounds should show an overall decrease in the number of WQO exceedances and concentrations over time with the expectation that residual public supply and use will eventually be exhausted. However, the pesticide manufacturer's shift to synthetic pyrethroids does warrant concern and monitoring should be considered for these analytes. The recommendations for the Chollas Sub-watershed are to continue monitoring to gather long-term trend information and to perform TIEs to determine the likely source of toxicity in Chollas Creek.

Sweetwater watershed

The Sweetwater watershed drainage area consists of 50% vacant or undeveloped land, 30% residential and only 10% commercial. The contrast in land use compared to Chollas Creek may likely be the reason for better observed (based on data assessed) water quality in Sweetwater River. Only fecal coliform was identified as a high frequency of occurrence COC within Sweetwater River. TDS was identified as a medium frequency of occurrence COC, followed by turbidity, total coliform, enterococcus, and Diazinon, which were identified as low frequency of occurrence COC. The bioassessment monitoring identified Sweetwater River as having a Very Poor IBI score and was the lowest rated site in the county in the October Survey. In the ABLM program, the results of the chemistry assessment indicated that six of the nine metals assessed were found in Sweetwater River sediments. None of the six metals detected above the reporting limit exceeded its respective ERL or ERM value. The mean ERM quotient was 0.140 which exceeded the threshold value of 0.10. Sweetwater River Estuary ranked eight for chemistry, nine for toxicity, and three for benthic community structure relative to the other embayments assessed.

Compared to the other embayments in the 2004 ABLM program, Sweetwater River Estuary had an overall rank of eight. The relative quality in the Sweetwater River Estuary increased in 2004 compared with the 2003 ranking.

The recommendations for the Sweetwater watershed are to continue monitoring to gather long-term trend information and conduct TIEs in parallel to toxicity tests to determine the likely source of toxicity in Sweetwater River.

BLTEA ratings for the San Diego Bay WMA

For the San Diego Bay WMA, sediment was given a high priority (A) rating based on the BLTEA rating method followed by pesticides, bacteria, and benthic alterations which were given a B rating.

The BLTEA findings are similar to the WMA assessments for both Chollas Creek and Sweetwater River. Turbidity, bacteria and Diazinon had a high frequency of occurrence in Chollas Creek, while bacteria had a high frequency of occurrence in Sweetwater River. There was evidence of benthic alteration in both sub-watersheds.

The information provided from the triad matrix results used in conjunction with the BLTEA ratings can assist the jurisdictions in making informed decisions in developing their WURMP programs. The two reports also allow for an evaluation of where data gaps exist and where efforts should be targeted.

Utilizing the BLTEA rating methods for future data evaluations would also allow for long term BMP effectiveness assessment. Incorporation of additional useable data from other third party sources such as the San Diego Coastkeeper, other non-profit organizations, and other POTWs would also help to increase the confidence of the BLTEA ratings and overall WMA assessments.