ES9.0 MISSION BAY WMA EXECUTIVE SUMMARY

This section summarizes the results of the 2006-2007 monitoring of the Mission Bay Watershed Management Area (WMA).

Watershed Monitoring

Wet weather and bioassessment monitoring sites within the Mission Bay WMA are depicted in Figure ES9-1 (dry weather stations are not shown). Activities included:

- Chemical and toxicity testing of storm water runoff.
- Dry weather data analysis.
- Rapid stream bioassessment.

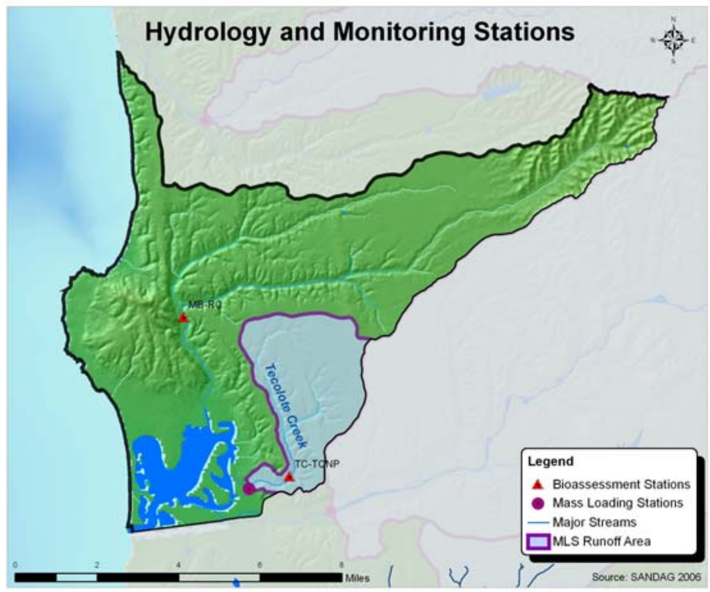


Figure ES9-1. Mission Bay WMA Monitoring Locations.

Storm Water Runoff

The Tecolote Creek (TC) mass loading station (MLS) is located along a trapezoidal, concrete-lined open channel on the east side of Morena Boulevard in San Diego (Figure ES9-2). The contributing runoff area covers over 5,992 acres, which is approximately 14% of the Mission Bay WMA. The primary land uses within the contributing runoff area are residential (44%), parks (19%) and transportation (18%) (Figure ES9-3).

Figure ES9-2. Tecolote Creek MLS Site.

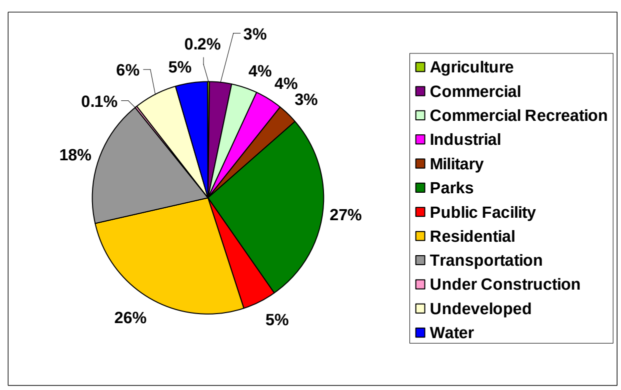


Figure ES9-3. Mission Bay Land Use Statistics

Figure ES9-4 depicts the three storm events that were monitored during the 2006-2007 wet-weather season. The figure depicts the river levels and flow rates observed during the monitoring season.

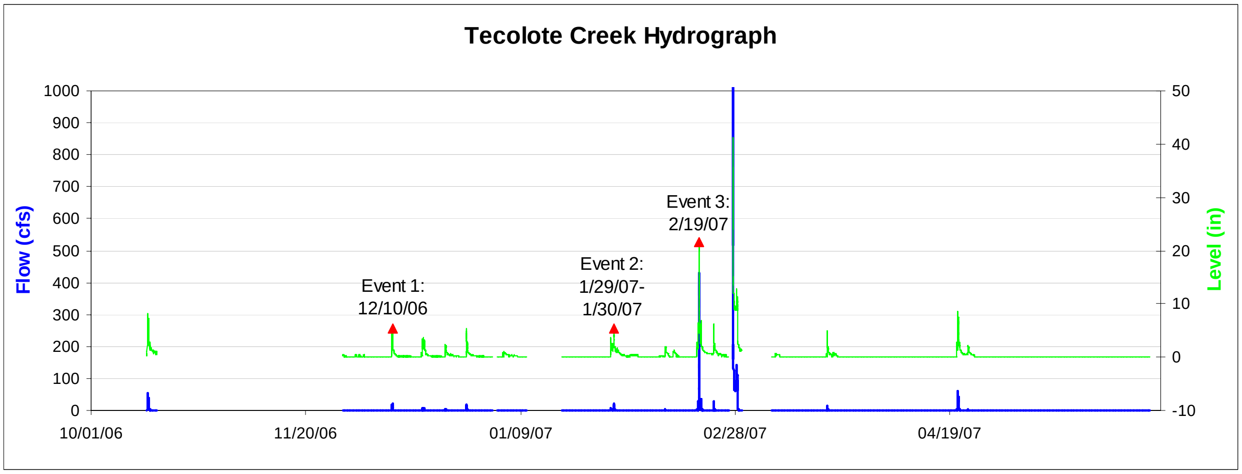


Figure ES9-4. Tecolote Creek 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.

Table ES9-1 summarizes constituents with concentrations detected at levels above the benchmark water quality objectives (WQO) which are shown in bold. Pesticides, dissolved metals, and toxicity were not detected at levels above benchmark WQOs.

Table ES9-1. Constituents With Results Above the Benchmark WQO During the 2006-2007 Monitoring Season at the Tecolote Creek MLS.

Analyte	Units	Benchmark WQO	Source	2006-2007 Storms		
				12/10/06	1/30/07	2/19/07
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	**50,000**	**5,000**	**3,000**
BOD	mg/L	30	USEPA Multi-Sector Permit	9.2	**39.7**	10.0
Un-ionized ammonia	μg/L	25	Basin Plan	34.9	**2.8**	2.0
COD	mg/L	120	USEPA Multi-Sector General Permit	89	83	**151**
TDS	mg/L	1000	Basin Plan by watershed	**1,680**	**2,310**	308
TSS	mg/L	100	USEPA Multi-Sector General Permit	**166**	65	**442**
Turbidity	NTU	20	Basin Plan	**84**	12.4	**282**
Total Cadmium	mg/L	*	40 CFR 131	0.004	<0.001	**0.012**
Total Copper	mg/L	*	40 CFR 131	0.025	0.014	**0.061**
Total Lead	mg/L	*	40 CFR 131	0.014	0.005	**0.056**
Total Zinc	mg/L	*	40 CFR 131	0.109	0.057	**0.391**

* Benchmark WQO based on water hardness

The recent monitoring year and the mean historical ratios of the benchmark WQO from three monitored storm events per year between October 2001 and April 2007 were plotted and compared to the benchmark WQO (Figure ES9-5). The highest ratios of water quality constituents above their respective benchmark WQO for the Mission Bay WMA were for turbidity, fecal coliform, total lead, total copper, TDS, and TSS. Total zinc, ammonia as N, BOD, and COD also had results that were above benchmark WQOs, but were not greater than three times the benchmark WQO.

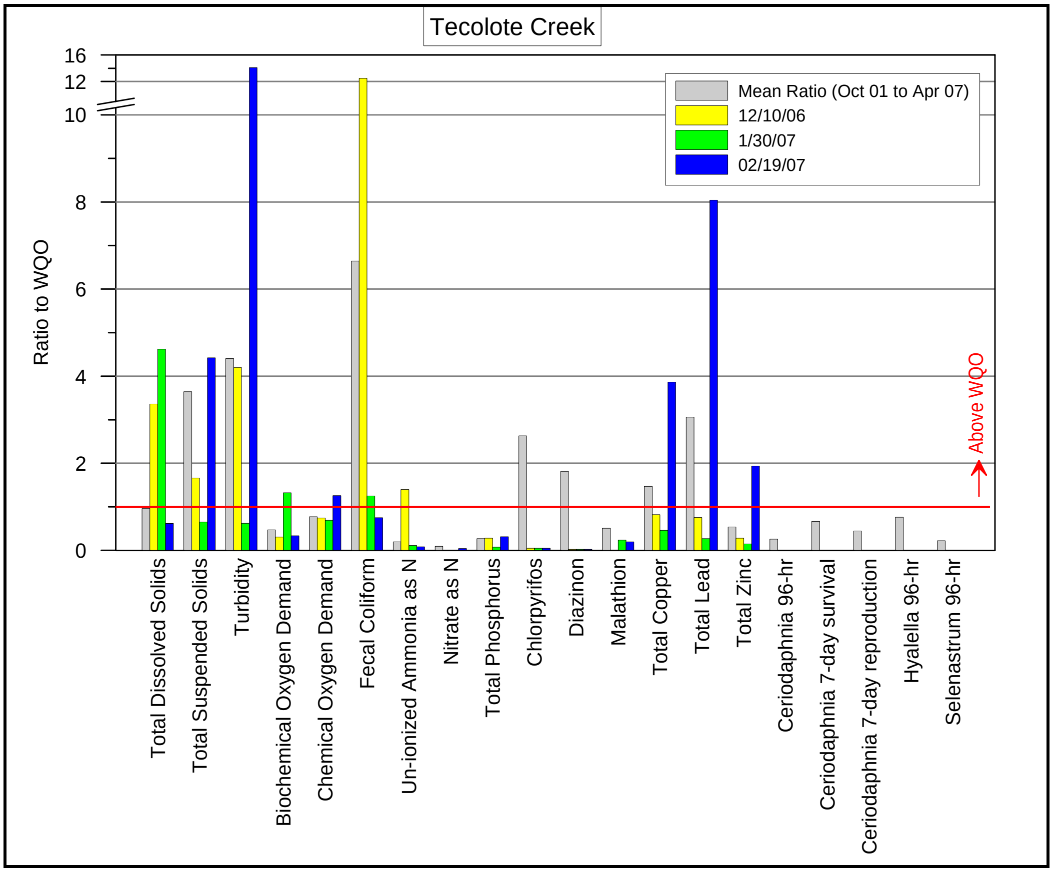


Figure ES9-5. Ratio of Results to Benchmark WQO for the Mission Bay Watershed Management Area.

Mann-Kendall trend analyses were performed to identify any long-term trends observed in the data. Statistically significant increasing trends were identified for enterococci while statistically significant decreasing trends were identified for oil and grease, BOD, Diazinon, and nitrate. Concentrations of oil and grease, BOD, Diazinon, and nitrate were all below benchmark WQOs.

Constituent Loads

Measured storm event loads were compared to loading values derived from the National Stormwater Quality Database (Pitt et al., 2004). Expected loads based on the national database were used to evaluate the magnitude of loads measured at each MLS site. Measured loads for total dissolved solids and bacterial indicators were greater than expected for a majority of the storm events sampled. Most of the constituents measured were within the expected range or lower that expected. In particular, metals consistently showed lower than expected loads for all the storms events sampled.

Dry Weather Data

A separate dry weather monitoring program is carried out by each jurisdiction. Dry weather monitoring investigations were performed at 54 sites in the Mission Bay WMA during the summer of 2006. Fourteen of these sites are located upstream of the MLS on Tecolote Creek. Constituents found to exceed dry weather action levels are depicted in Table ES9-2.

Table ES9-2. Mission Bay WMA 2006 Dry Weather Exceedances.

Analyte	Number of Action Level Exceedances	Total Samples
Conductivity	14	52
pH	3	53
Enterococcus	7	11
Fecal Coliform	2	13
Total Coliform	6	11
Ammonia (NH3-N)	4	47
Orthophosphate (PO4-P)	1	48
Turbidity	31	48

Stream Bioassessment

Stream bioassessment monitoring was conducted in October 2006 and May 2007 at two urban affected monitoring sites representing two different watersheds. One site was located in Rose Creek, downstream of the confluence with San Clemente Canyon Creek near Highway 52 (MB-RC) (Figure ES9-6). The other site was in Tecolote Creek in Tecolote Canyon Natural Park, near the downstream border of the Park (TC-TCNP) (Figure ES9-7).

Two summary indices were used to assess the benthic communities at the monitoring sites: an Index of Biotic Integrity and an O/E ratio. For these indices, higher values indicate better biotic conditions (see Table ES9-3 footnotes for scoring criteria).

Figure ES9-6. Rose Creek Monitoring Site

Figure ES9-7. Tecolote Creek in Tecolote Canyon Natural Park Monitoring Site

The Mission Bay WMA stream bioassessment sites had Index of Biotic Integrity (IBI) Ratings of Very Poor for both sites and both surveys (Table ES9-3). The observed species to expected species (O/E) ratios were in general agreement with the IBI scores, indicating degraded biotic conditions at the sites. It should be noted that these two sites had some of the highest specific conductance readings of all of the county monitoring sites.

Since the 2001survey, the Rose Creek site has had a mean IBI score of 12.5 and a mean O/E ratio of 0.58 (an estimated 42% loss in biodiversity). Tecolote Creek has had a mean IBI score of 16.2 and a mean O/E ratio of 0.52 (an estimated 48% loss in biodiversity). Both indices rated the sites impaired for all surveys.

Table ES9-3. Selected Biological Integrity Ratings and O/E Ratios for the Mission Bay WMA.

Mission Bay Watershed Management Area	Rose Creek near Highway 52 (MB-RC)		Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP)	
Survey	Oct-06	May-07	Oct-06	May-07
Index of Biotic Integrity/ Qualitative Rating*	8 Very Poor	9 Very Poor	12 Very Poor	1 Very Poor
O/E Ratio**	0.50	0.41	0.59	0.32

*IBI Score 0-13=Very Poor, 14-26=Poor, 27-40=Fair, 41-55=Good, 56-70=Very Good
**O/E ratio =observed/expected taxa ratio; value of >0.8 represents unimpacted conditions

Ambient Bay and Lagoon Monitoring

The Ambient Bay and Lagoon Monitoring Program was not conducted during the 2006-2007 monitoring period.

Watershed Management Area Assessment

The Mission Bay WMA was assessed using the interim guidance document "Watershed Data Assessment Framework" (June 2004) to comply with NPDES Order 2001-01. The following triad assessment results for the WMA are presented:

- Evidence of persistent water quality objective exceedances (turbidity); (fecal coliform and total coliform are not considered likely to induce toxic responses),
- No evidence of persistent toxicity, and
- Indications of benthic alteration.

Statistically significant long-term trends were observed for the following constituents:

- Enterococci (increasing)
- Oil and grease (decreasing)
- Diazinon (decreasing)
- BOD (decreasing)
- Nitrate (increasing)

Constituents of concern identified for the Mission Bay WMA are summarized in Table ES9-4.

Table ES9-4. Constituent of Concern Rating Table Summary for the Mission Bay WMA.

Constituents With Any Wet Weather (MLS) Benchmark WQO or Dry Weather Action Level Exceedance	Frequency of Occurrence Rating	Criterion Basis
Fecal Coliform	High	Mass loading station tests results exceed benchmark WQO in greater than or equal to 80% of samples.
Total Coliform	High	Six of the last consecutive storm samples at the MLS exceed benchmark WQO.
Turbidity	High	Less than 80% and greater than or equal to 50% of the MLS samples exceed benchmark WQO and at least one dry weather site exceedance in the past year.
TSS	Medium	Less than 80% and greater than or equal to 50% of the MLS samples exceed benchmark WQO and one or more exceedances found in last 2 years of monitoring at the MLS.
Enterococcus	Medium	
Lead	Medium	
pH	Low	Dry weather sample exceedances in 10 to 50% of the samples in the past year.
Ammonia	Low	
COD	Low	MLS exceedances found in 25% to less than or equal to 50% of the samples and at least one exceedance found in last 2 years at the MLS (with or without dry weather sample exceedances in the past year).

Recommendations

The recommendations for this watershed are to continue monitoring to gather long-term trend information, identify where data gaps exist that does not allow for informed decision making, and consider where watershed resources may be more effectively targeted to reduce heavy metals, dissolved minerals, nutrients, bacterial indicators, toxicity, and impacts to the physical stream habitats. The new permit monitoring order (R9-2007-0001) calls for two temporary watershed assessment stations (TWAS) for this watershed. The additional upstream stations will provide the ability to evaluate the distribution of heavy metals, dissolved minerals, nutrients, bacteria, and toxicity.

9.0 MISSION BAY WATERSHED MANAGEMENT AREA

This section presents the Mission Bay Watershed Management Area (WMA) monitoring data for the 2006-2007 monitoring season. The information within the following subsections is presented as follows:

- Overview of the WMA, regulatory water quality challenges, and the monitoring site descriptions used to assess the WMA
- Watershed water quality monitoring results and data analysis, wet weather pollutant loadings, dry weather data summary, and third party data
- Stream bioassessment results and data analysis
- WMA assessments, triad assessment, and LTEA priority ratings
- Summary and Recommendations

Changes from last years monitoring program include the following:

- The Ambient Bay and Lagoon Monitoring Program was completed in 2005-2006 and was not performed as part of the 2006-2007 monitoring program activities.
- LTEA water quality priority ratings remain unchanged from the previous Annual Monitoring Report as this was a five year assessment based on data collected from 2001-2006.
- Metals results over the previous two monitoring seasons were only compared to the criterion maximum concentration (CMC) or acute benchmark water quality objective (WQO) since it is believed to be representative of short term conditions. However, the metals results are now compared to both the CMC (acute) and criterion continuous concentration (CCC) or chronic benchmark WQO benchmark for comparison purposes. This change has resulted in some metals (particularly lead) being identified as a constituent of concern in some watersheds where in prior years it was not identified as a constituent of concern.

9.1 Mission Bay Watershed Management Area Descriptions

The Mission Bay Watershed Management Area (WMA) includes the Rose and Tecolote Creek Watersheds and is the smallest watershed management area in San Diego County. The Mission Bay WMA land area is 43,238 acres (Figure 9-1). The watershed includes three hydrologic areas: Scripps (HA 906.30), Miramar (HA 906.40) and Tecolote (HA 906.50). The watershed is drained by Rose Creek which discharges into the northern portion of Mission Bay and Tecolote Creek which discharges to the southern portion of Mission Bay. In the 1940s much of the existing coastal marshland encompassed by Mission Bay was converted to a 4000-acre aquatic park and residential use area. Annual precipitation ranges from 10.5 inches near the coast to 13.5 inches in the eastern portion of the watershed. Locations of wet weather and bioassessment monitoring stations are provided in Figure 9-1 (dry weather stations are not shown).

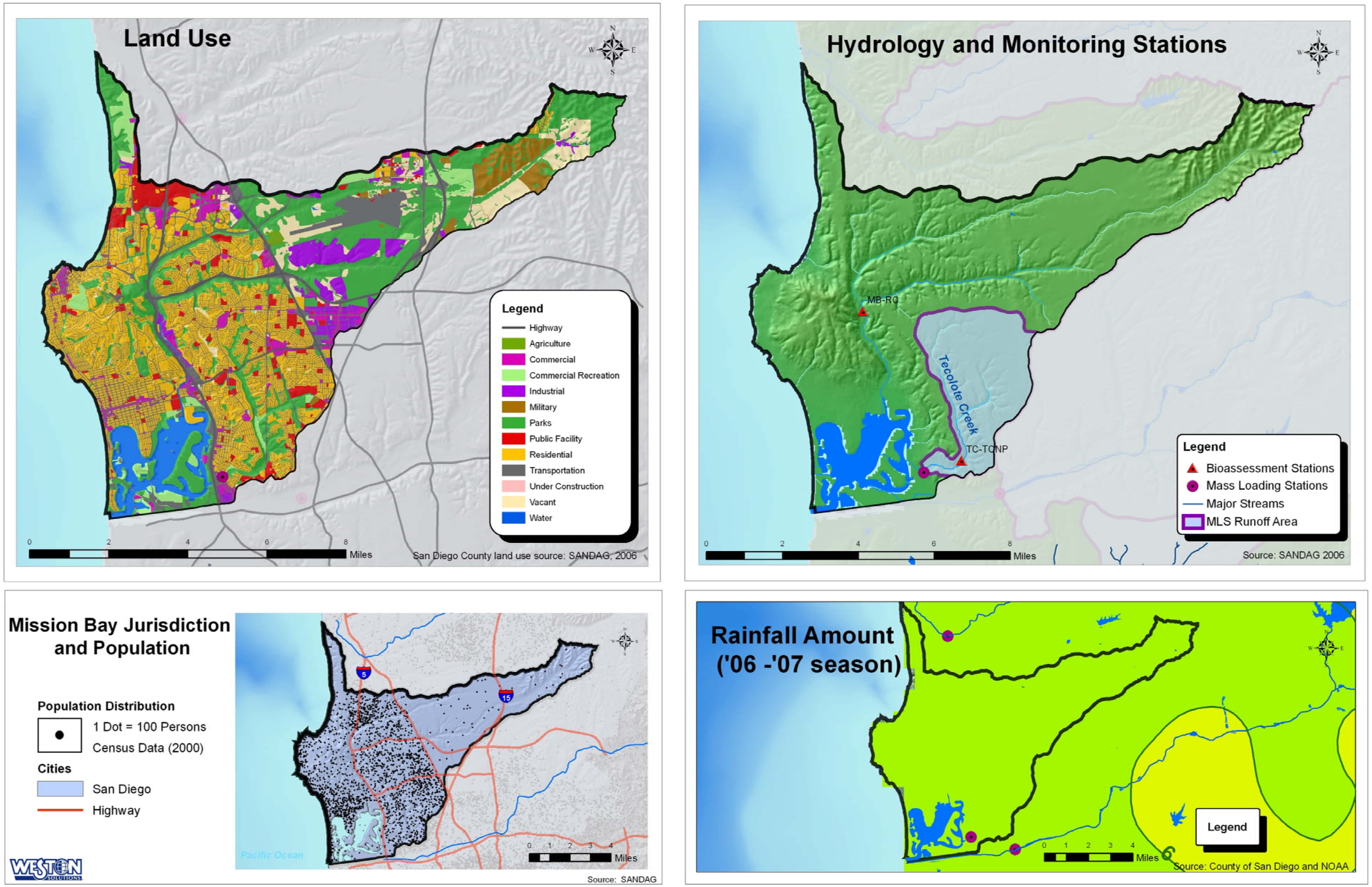


Figure 9-1. Mission Bay Watershed Management Area.

9.1.1 Land Use

The Mission Bay WMA is entirely contained within the City of San Diego. Land use within the watershed is primarily parks (26.5%) and residential (26.4%). Other uses are transportation (17.9%), public facilities/utilities (4.7%), industrial (4%), commercial (3.6%), and agriculture (0.2%), as illustrated in Figure 9-2 (SANDAG, 2006). Over 60% of the watershed is privately-owned land. The remaining portions are mostly locally-owned with a small percentage of land being state and federally-owned.

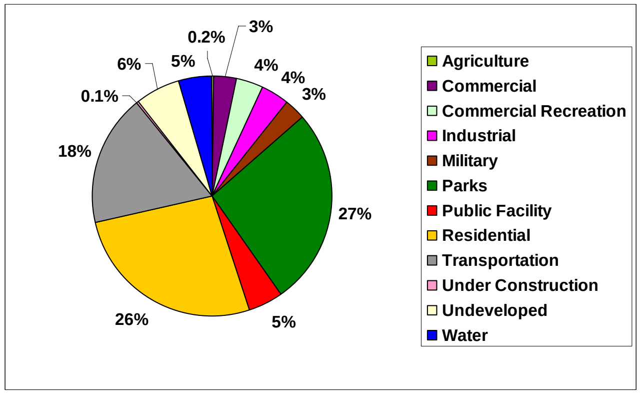


Figure 9-2. Percent Land Use for Mission Bay WMA

9.1.2 Beneficial Uses

The Mission Bay WMA supports a variety of ecosystems and provides many beneficial uses. A listing of the beneficial uses from the San Diego Basin Plan is presented in Table 9-1. Contact and non-contact recreation, cold and warm freshwater habitat and wildlife and endangered species habitat uses are supported in the inland surface waters. The coastal waters of Mission Bay support a variety of anthropogenic uses including contact and non-contact recreation as well as a variety of estuarine, wildlife, marine, and rare, threatened, and endangered species habitats, and shellfish harvesting uses. In addition to water resources the watershed contains Mission Bay Park which provides 4,235 acres of land and aquatic recreation areas.

Table 9-1. Beneficial Uses Within the Mission Bay Watershed (Rose and Tecolote Creeks).

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

● = Existing
O = Potential
[(a)] Rose Canyon and Tecolote
[(b)] Mission Bay
Note: Beneficial uses vary by hydrologic unit basin number. Please refer to the Basin Plan for individual hydrologic units.
Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5), amendments adopted through 2/8/2006.

9.1.3 Regulatory Water Quality Challenges

Major impacts to the Mission Bay WMA include surface water quality degradation, beach closures, sedimentation, habitat degradation and loss, invasive species, natural sources, and eutrophication (San Diego County, 2006). The 2006 303(d) list was adopted by the SWRCB on October 25, 2006 and finalized by the U.S. EPA on June 28, 2007. Table 9-2 presents the water bodies in the Mission Bay Watershed that have been placed on the SWRCB 303(d) list. Constituents that have been placed on the 303(d) list include bacterial indicators, eutrophic conditions, cadmium, copper, lead, zinc, phosphorus, toxicity, and turbidity.

Table 9-2. Water Bodies on the SWRCB 303(d) List in the Mission Bay Watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
Mission Bay Shoreline	Scripps	906.30	Bacteria Indicators (added by USEPA, 2006)
Mission Bay (area near the mouth of Rose Creek Only)	Miramar	906.40	Eutrophic, Lead
Mission Bay (area near the mouth of Tecolote Creek Only)	Tecolote	906.50	Eutrophic, Lead
Tecolote Creek	Tecolote	906.50	Bacterial Indicators, Cadmium, Copper, Lead, Toxicity, Zinc, Phosphorus, and Turbidity

Source: SWRCB, 2006

The San Diego Regional Water Quality Control Board is considering a Basin Plan amendment to incorporate proposed bacteria indicator TMDLs developed in "Project I - Beaches and Creeks in the San Diego Region." Project I involved calculating TMDLs for numerous surface waters throughout the San Diego Region. TMDLs are only proposed for coastal shorelines and creeks discharging to shorelines. With the exception of Chollas Creek, creeks discharging to lagoons, bays, or harbors were not included. TMDLs for the Pacific Ocean shoreline at the 14 beaches within the Mission Bay WMA have been proposed. Several municipalities have been identified as responsible parties in the bacteria TMDL, however, the City of San Diego is the only municipal discharger within the Mission Bay WMA. Interim and final goals for reducing fecal coliform and enterococcus loading over 10 years have been identified.

9.1.4 Mass Loading Station Site Description

The Tecolote Creek (TC, SD5) mass loading station (MLS) is located along a trapezoidal, concrete-lined open channel on the east side of Morena Boulevard in San Diego. The contributing runoff area covers over 5,992 acres, which is approximately 14% of the Mission Bay WMA. The primary land uses within the contributing runoff area are residential (43.8%), parks (19.1%) and transportation (17.7%).

The MLS located on Tecolote Creek maintained the same configuration as in previous years. Initial attempts to monitor in-stream flow utilizing conventional monitoring equipment failed due to the large amount of debris present at the monitoring site during storm events. Accordingly, flow is monitored at this location by utilizing an ultrasonic down-looking level sensor mounted on the West Morena Boulevard Bridge. The ultrasonic sensor measures flow and an autosampler appropriately composites a weighted sample during storm events but is limited in its ability to accurately estimate low and dry flow conditions. Further, large vegetative mats grow in the channel during the summer months during dry periods between storm events at this site. These vegetative mats often interfere with accurate flow data collection and require manual removal following the storm events. Therefore, the stream channel has also been surveyed to produce a runoff equation utilizing the Manning equation to accurately estimate flow based on stage height. Evidence of trash and paint debris is commonly observed in the channel within the vicinity of this site during equipment installations and monitoring events.

9.1.5 Stream Bioassessment Site Description

Stream bioassessment monitoring in the Mission Bay WMA has been conducted at sites in Rose Creek and Tecolote Creek. The Rose Creek site is located just downstream of the Highway 52 over-crossing. The in-stream habitat of the riffles consists of moderately stable, smooth cobble and has perennial water flow. Tecolote Creek monitoring occurred at a site within the Tecolote Canyon Natural Park located upstream of Cross St., just upstream of the channelized lower portion of the creek. The physical habitat of the site is described as a mostly undisturbed riparian corridor with primarily unconsolidated gravel riffle substrate with moderate treefall and roots within the streambed. Flow in Tecolote Creek is year-round at the lower site, but is generally low in the dry season.

9.1.6 Ambient Bay and Lagoon Monitoring Site Description

The Ambient Bay and Lagoon Monitoring (ABLM) monitoring program was not conducted in 2006.

9.2 Watershed Water Quality Monitoring

The following sub-sections include the results and analysis of chemistry, bacteria, and toxicity data collected during three storm water events and historical data at the MLS, dry weather data collected during the 2006 dry weather monitoring program, toxicity identification evaluations (TIE), and available and relevant third party data.

The triad approach is used to evaluate chemistry, toxicity, and the benthic community to perform watershed management area assessments. Analysis of watershed water quality monitoring data is one leg of the triad approach. The chemistry data provides an indication of the pollutant load and toxicity data provides an indication of the potential impacts to aquatic organisms during storm events. Dry weather chemistry data provides an indication of urban runoff pollutants. The benthic community data collected during stream bioassessment provides a more direct indication of the ecological health of the watershed in terms of the insect/benthic community abundance and diversity.

9.2.1 2006-2007 Water Quality Monitoring and Results

Annual storm water monitoring has been conducted at the Tecolote Creek MLS since the 1993-1994 wet weather monitoring season. Three storm events were monitored at the MLS during the 2006-2007 wet weather monitoring period occurring on December 10, 2006, January 30, 2007, and February 19, 2007. Rainfall statistics for each of the monitored storm events for the Tecolote Creek MLS area are presented in Table 9-3. Figure 9-3 shows the stream flow and water levels measured during the 2006-2007 wet weather period and when monitoring events occurred. Data gaps during the period of October 2006 are a function of the dry conditions and the downward looking sensor at this location. Hydrographs from each storm event are presented in Appendix A.

Table 9-3. 2006-2007 Rainfall Statistics for the Mission Bay Mass Loading Station.

Date Start	Total Rain (in)	Duration (hr)	Intensity (in/hr)	Antecedent Dry Days
12/10/2006	0.22	19	0.01	13
1/30/2007	0.27	16	0.02	34
2/19/2007	1.18	19	0.06	6

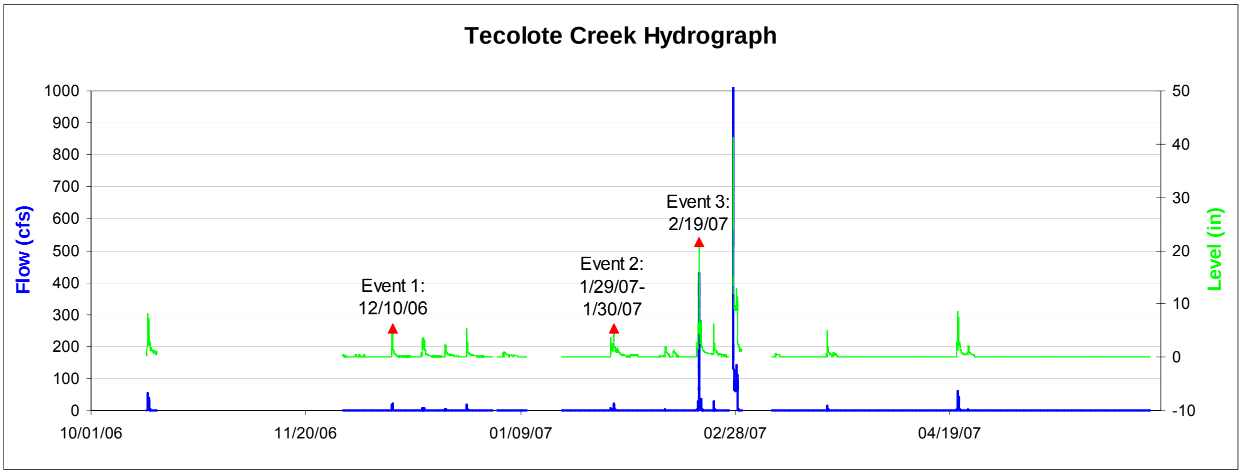


Figure 9-3. Mission Bay 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.

The first storm of the season occurred on October 14, 2006. This storm was not monitored due to equipment failure with the autosampler. The first monitored storm of the 2006-2007 wet weather monitoring season occurred on December 10, 2006. On December 9, 2006 a storm was forecast to produce moderate amounts of rain over the southern portion of San Diego County. The actual storm was larger than it was originally forecast to be, and produced 0.22" of rainfall across the Mission Bay WMA. A total of 18 one-liter composite sample aliquots were collected at a rate such that one sample was collected for every 35,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents that are not conducive to composite sampling prior to the peak of the storm hydrograph. Sampling was conducted over a 13-hour period and captured the entire duration of the runoff produced by the storm.

The second storm monitored at the Tecolote Creek MLS during the 2006-2007 wet weather monitoring season occurred on January 30, 2007. A cutoff low was forecast in the area on the 27th of January. This storm was predicted to stay to the north and provide little to no rain south of Los Angeles. However by the morning of January 29th, the forecast had changed to a 70% chance of ~ 1" of rain over most of Southern California. The forecast was once again changed the day of the 29th and the storm forecast was downgraded to little rain for the San Diego area. However, the cutoff low moved south and circulation brought what was referred to as a "blob" of rain by the National Weather Service from Baja across San Diego. The majority of the rain from this storm stayed along the coast in a south to north pattern; little rain made it to the mountains. This proved to be the largest storm of the storm season to date with totals between 0.4" to 1.8". The storm produced a total of 0.27" of rainfall at the Tecolote Creek MLS (Table 9-3). A total of 27 one-liter composite sample aliquots were collected at a rate such that one sample was collected for every 10,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents not conducive to composite sampling prior to the peak of the storm hydrograph. Sampling was conducted over a 10-hour period and captured the entire duration of the runoff produced by the storm.

The third storm monitored at the Tecolote Creek MLS during the 2006-2007 wet weather monitoring season occurred on February 19, 2007. A cut off low pressure formed off the coast and moved directly over Orange County area putting San Diego County in a favorable position for rain. Rain was forecast to begin falling on the morning of February 20th, however, it began falling the night of February 19th. This storm consisted mainly of fast moving showers and dropped a substantial amount of rainfall in San Diego

County. This was the largest storm of the season to date despite the marginal forecast. The storm produced a total of 1.18" of rainfall at the Tecolote Creek MLS (Table 9-3). A total of 64 one-liter composite sample aliquots were collected initially at a rate such that one sample was collected for every 20,000 cubic feet of water that passed by the monitoring station. During the peak flow of the storm, aliquots were collected at a rate of one sample for every 150,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents that are not conducive to composite sampling prior to the peak of the storm hydrograph. Sampling was conducted over a 19-hour period which captured the entire duration of the runoff produced by the storm.

Analytical results from these events are presented with the historical results for the Tecolote Creek MLS in Table 9-4. Sample results are compared to the benchmark water quality objectives (WQOs) that are provided in the table. These benchmark WQO were selected by the Copermittee Monitoring Workgroup from the sources provided in the results table. A description of the benchmark WQO sources and the technical reasoning of how the results are compared to the benchmark WQO are provided in Section 3.4. Discussion of sample results occur in groups; conventional parameters, bacteriological, pesticides, metals, and toxicity. A comparison of these results to previous monitoring data is presented in Section 9.2.2.

Several conventional constituent results were above their respective benchmark WQOs during the 2006-2007 monitoring period. Un-ionized ammonia as N, biochemical oxygen demand, chemical oxygen demand, total dissolved solids (TDS), total suspended solids (TSS) and turbidity were above their respective benchmark WQO on various events. Un-ionized ammonia as N, TDS, TSS, and turbidity were above the benchmark WQO during the December 10, 2006 monitoring event. Biochemical oxygen demand (BOD) and TDS were above the benchmark WQO during the January 30, 2007 monitoring event. Chemical oxygen demand (COD), TSS and turbidity were above the benchmark WQO during the February 19, 2007 monitoring event. All other constituents were below their respective benchmark WQO.

Fecal coliform is the only bacterial indicator with a benchmark WQO for wet weather monitoring. Fecal coliform results were above the REC-1 benchmark WQO of 400 MPN/100 mL during all three monitoring events. Results for fecal coliform were 50,000 MPN/100 mL for the December 10, 2006 monitoring event, 5,000 MPN/100 mL for the January 30, 2007 monitoring event and 3,000 MPN/100 mL for the February 19, 2007 event. Total coliform and enterococci results were also elevated, though these bacterial indicators do not have a benchmark WQO.

The pesticides Chlorpyrifos and Diazinon were not detected in any samples during the 2006-2007 wet weather monitoring season. The pesticide Malathion was detected in two of the three storm events (0.101 μg/L on January 30, 2007 and 0.084 μg/L on February 19, 2007), but was below the benchmark WQO of 0.43 μg/L in all three samples (Table 9-5). Several synthetic pyrethroids were also detected. Bifenthrin was detected in all three monitored storm events (concentrations ranged from 0.013 μg/L to 0.210 μg/L), while cyfluthrin and cypermethrin were detected in the first and third storm events. Prallethrin (0.183 μg/L) was detected in the December 10, 2006 storm event only.

Table 9-4. Analytes Measured at the Tecolote Creek Mass Loading Station.

ANALYTE	UNITS	WQO[1]	SOURCE	1993-1994		1994-1995				1995-1996			1996-1997		1997-1998		
				12/11/93	1/25/94	11/10/94	12/25/94	1/11/95	2/14/95	11/1/95	1/22/96	1/31/96	10/30/96	11/21/96	11/10/97	12/6/97	3/25/98
General / Physical / Organic																	
Electrical Conductivity	umhos/cm					3220	393	414	185	1040	989		2220	53.5	1130	1690	726
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	1.96	3.1	1.2	1.28	0.82	1.55	11.4	2.4		2.5	2.4	3.6	1.6	0.6
pH	pH Units	6.5-8.5	Basin Plan			7.4	7.4	7.4	**9.1**		7.8						
Bacteriological																	
Enterococci	MPN/100 mL																
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	2,400	<30	**11,000**	**17,000**	**>160,000**	**160,000**	**>16,000**	**16,000**		**8,000**	**16,000**	**160,000**	3,640	**8,850**
Total Coliform	MPN/100 mL			240,000	240,000	50,000	>160,000	>160,000	>160,000	>16,000			160,000	24,000	160,000	20,000	20,000
Wet Chemistry																	
Ammonia As Nitrogen	mg/L				1.1	1.2	0.3	0.3	0.4	0.41	<0.2	<0.2	0.44	0.32	0.56	0.57	0.6
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan														
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit		20	20	23.3	<3	9.5	12.8	<5	<5	13.4	12.9	**33**	**43**	22
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit		**280**	100	**150**	91	74	**126**	**132**	69	56	35	89	20	22
Dissolved Organic Carbon	mg/L																
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit		0.2	0.4	<0.05	0.5	0.3	0.1	0.8	0.4	0.2	0.2	<0.1	0.1	0.12
Nitrate As N	mg/L	10	Basin Plan		4.2	<0.1	0.8	0.8	0.8				1.1	1	1.7	0.54	0.5
Nitrite As N	mg/L	1	Basin Plan		0.15	<0.05	<0.05	<0.05	<0.05							0.06	0.05
Surfactants (MBAS)	mg/L	0.5	Basin Plan		0.31	**0.77**	**0.52**	0.23	0.17	0.26	0.14	<0.1	<0.1	<0.1	<0.1	0.05	0.2
Total Dissolved Solids	mg/L	1000	Basin Plan	400	750	2300	260	370	680	1270	842	256	546	362	1730	447	318
Total Kjeldahl Nitrogen	mg/L				10	3.7	3.7	2.3	3.6	3.9	2.6	0.89	2.9	2.7	1.6	<1	1.1
Total Organic Carbon	mg/L																
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit		0.3	0.5	<0.05	1.1	0.4	0.5	<0.2	<0.2	0.8	0.5	0.7	0.12	0.23
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	**880**	**1500**	**140**	**300**	76	**130**	**140**	**244**	92	**348**	**104**	**410**	**503**	**2024**
Turbidity	NTU	20	Basin Plan		8	**36**	**43**	**66**	**39**	**79.6**	17.4	12.1	**120**	**131**	**160**	**27**	**96**
Pesticides																	
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game														
Diazinon	µg/L	0.08	CA Dept. of Fish & Game														
Malathion	µg/L	0.43	CA Dept. of Fish & Game														
Hardness																	
Total Hardness	mg CaCO3/L			210	550	1100	140	120	340	547	363	111	268	253	694	186	124
Total Metals																	
Antimony	mg/L	0.006	Basin Plan	0.0014	0.0012	0.0019	<0.001	<0.001	0.0012	<0.0015			<0.003	0.003	<0.0015	<32*	<32*
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.0069	0.013	<0.005	0.0089	<0.005	<0.005	0.008			0.009	0.007	0.001	<0.053*	<0.053*
Cadmium	mg/L	(b)	40 CFR 131	0.0023	0.0027	0.0003	0.0008	0.0003	0.0003	0.0009			0.0016	0.0019	<0.00025	<0.004	<0.004
Chromium	mg/L	(b)	CTR (Cr VI)	0.0017	0.006	0.0028	0.0019	0.0028	0.0051	<0.005			0.010	<0.010	<0.005	<0.007	0.019
Copper	mg/L	(b)	40 CFR 131	**0.030**	**0.054**	0.0068	**0.025**	0.010	0.012	**0.033**			**0.050**	0.020	0.009	**0.056**	**0.146**
Lead	mg/L	(b)	40 CFR 131	**0.140**	**0.200**	0.003	**0.035**	**0.019**	0.013	0.0173			**0.050**	**0.026**	<0.001	<0.042*	<0.042*
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.022	0.018	0.016	0.0065	<0.005	0.005	0.014			<0.010	<0.010	<0.005	<0.015	<0.015
Selenium	mg/L	0.02	40 CFR 131	<0.0005	0.0006	<0.0005	0.0012	0.0006	0.0005	0.0023			0.002	0.003	<0.001	<0.075*	<0.075*
Zinc	mg/L	(b)	40 CFR 131	**0.780**	**0.490**	0.034	**0.170**	0.059	0.062	0.137			0.230	0.120	0.069	0.068	0.130
Dissolved Metals																	
Antimony	mg/L	(e)	40 CFR 131			0.0019	0.001	<0.001	<0.001		<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		0.005	0.003	0.002	0.002			
Cadmium	mg/L	(b)	40 CFR 131			0.0003	<0.0002	<0.0002	<0.0002		<0.00025	<0.00025	<0.0005	0.0005			
Chromium	mg/L	(b)	40 CFR 131			0.0019	<0.001	0.0014	<0.001		<0.005	<0.005	<0.010	<0.010			
Copper	mg/L	(b)	40 CFR 131			0.0059	<0.005	0.005	0.0059		<0.008	0.006	0.010	<0.010			
Lead	mg/L	(b)	40 CFR 131			0.0015	<0.001	<0.001	0.0019		0.002	<0.001	<0.002	<0.002			
Nickel	mg/L	(b)	40 CFR 131			0.0150	<0.005	<0.005	<0.005		<0.005	<0.005	<0.010	<0.010			
Selenium	mg/L	0.02 (d)	40 CFR 131			<0.0005	<0.0005	<0.0005	<0.0005		<0.001	<0.001	<0.002	<0.003			
Zinc	mg/L	(b)	40 CFR 131			0.039	0.013	0.017	0.016		0.026	<0.025	0.230	<0.050			
Toxicity																	
Ceriodaphnia 96-hr	LC50 (%)	100															
Ceriodaphnia 7-day survival	NOEC (%)	100															
Ceriodaphnia 7-day reproduction	NOEC (%)	100															
Hyalella 96-hr	NOEC (%)	100															
Selenastrum 96-hr	NOEC (%)	100															

See last page for footnotes and source references

Table 9-4. Analytes Measured at the Tecolote Creek Mass Loading Station.

ANALYTE	UNITS	WQO[1]	SOURCE	1998-1999			1999-2000			2000-2001			2001-2002			2002-2003		
				11/8/98	1/25/99	3/15/99	2/12/00	3/5/00	4/17/00	10/27/00	1/8/01	2/13/01	11/29/01	2/17/02	3/8/02	11/8/02	12/16/02	2/11/03
General / Physical / Organic																		
Electrical Conductivity	umhos/cm			6070	629	542	746	823	792	2950	2350	338	3300	5090	3650	1694	311	322
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	0.7	<0.5	<0.5	4.16	1.56	2.96	4	1	1	<1	<1	2	2.00	1.69	3.16
pH	pH Units	6.5-8.5	Basin Plan										7.7	7.4	7.7	6.67	7.61	7.55
Bacteriological																		
Enterococci	MPN/100 mL									9,000	17,000	5,000	7,000	7,000	3,000	35,000	23,000	14,000
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	1,600	1,600	1,600	<2	1,600	<2	**50,000**	**21,000**	1,300	3,000	**5,000**	**7,000**	**110,000**	**13,000**	2,200
Total Coliform	MPN/100 mL			241,900	125,900	613,000	240	1,600	900	170,000	220,000	8,000	5,000	22,000	11,000	300,000	50,000	30,000
Wet Chemistry																		
Ammonia As Nitrogen	mg/L			0.6	0.57	0.51	1.57	<0.1	<0.1	0.91	0.5	0.4	0.9	0.19	0.28	0.44	0.34	0.26
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan													0.64	3.79	2.4
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	30	5	9	11.7	2.38	5.7	14	13.2	<2	3.6	4.5	4.6	6.75	22.4	25.4
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	61	33	33	74	60	36	**122**	118	88	60	**155**	57	79	67	**125**
Dissolved Organic Carbon	mg/L															8.3	13.2	15.9
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.52	0.15	0.1	<0.1	0.13	<0.1	0.14	0.28	0.27	0.11	0.4	0.13	0.16	0.32	0.82
Nitrate As N	mg/L	10	Basin Plan	0.52	0.7	0.53	3.3	0.6	2.3	1	0.7	0.6	0.4	0.5	0.4	0.81	0.84	0.90
Nitrite As N	mg/L	1	Basin Plan	0.1	<0.05	0.05	0.065	<0.05	<0.05	0.09	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.06
Surfactants (MBAS)	mg/L	0.5	Basin Plan	**0.51**	0.08	<0.05	0.48	0.24	0.2	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.1	<0.1	<0.1
Total Dissolved Solids	mg/L	1000	Basin Plan	1492	563	660	279	304	302	440	2320	250	1890	2200	2490	757	220	373
Total Kjeldahl Nitrogen	mg/L			0.12	2.93	1.85	2.1	0.77	1.83	2.15	6.5	0.67	2.2	2	0.39	2.1	1.4	3.7
Total Organic Carbon	mg/L															21.9	27.0	15.4
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.61	0.16	0.16	0.21	0.34	0.4	0.5	0.32	0.38	0.24	0.65	0.22	0.6	1.84	1.03
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	**913**	**540**	55	**478**	80	87	**103**	75	**179**	34	68	33	**158**	**346**	**301**
Turbidity	NTU	20	Basin Plan	**84**	**45**	17	17	**63**	**60**	**73.8**	**63**	**85**	**21.3**	8.99	10.7	**102**	**200**	**200**
Pesticides																		
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.05*		<0.5*	<0.5*	<0.5*	<0.5*	<0.05*	<0.5*	**0.03**	<0.03*	<0.03*	<0.03*	<0.03*	**0.087**	<0.03*
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	**0.4**	**0.28**	**0.41**	<0.5*	<0.5*	**0.18**	**0.47**	<0.5*	**0.16**	**0.22**	**0.19**	**0.09**	**0.185**	**0.095**	**0.155**
Malathion	µg/L	0.43	CA Dept. of Fish & Game							**1.8**	<0.5*	<0.1				<0.10	<0.10	**0.87**
Hardness																		
Total Hardness	mg CaCO3/L			148	218	277	216	126	105	209	1070	107	962	1180	1350	344	245	298
Total Metals																		
Antimony	mg/L	0.006	Basin Plan	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.006	**0.009**
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.004	0.0015	0.002	<0.001	0.006	0.009	0.007	0.007	0.005	0.001	0.004	0.004	0.008	0.015	0.013
Cadmium	mg/L	(b)	40 CFR 131	**0.004**	<0.00025	<0.00025	<0.00025	0.001	<0.00025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	(b)	CTR (Cr VI)	<0.005	0.009	0.056	<0.005	<0.005	<0.005	0.006	<0.005	0.006	0.006	0.006	<0.005	<0.005	0.02	0.018
Copper	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	**0.036**	**0.017**	<0.005	**0.023**	0.012	**0.016**	0.008	0.009	0.009	**0.03**	**0.050**	**0.038**
Lead	mg/L	(b)	40 CFR 131	**0.040**	0.003	**0.023**	**0.027**	<0.001	<0.001	**0.015**	0.008	**0.018**	0.004	0.004	<0.002	**0.018**	**0.052**	**0.040**
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.020	<0.005	0.009	<0.005	<0.005	<0.005	0.011	0.009	0.005	0.005	0.006	0.006	0.008	0.011	0.012
Selenium	mg/L	0.02	40 CFR 131	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.006	<0.002	<0.002	0.003	0.002	<0.004	<0.004	<0.004
Zinc	mg/L	(b)	40 CFR 131	<0.025	<0.025	0.071	0.160	0.012	0.050	0.080	0.040	0.080	0.022	0.028	0.034	0.096	0.208	0.235
Dissolved Metals																		
Antimony	mg/L	(e)	40 CFR 131				<0.0015	<0.0015	<0.0015	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.002
Arsenic	mg/L	0.34 (c)	40 CFR 131				<0.001	<0.001	<0.001	0.003	0.003	0.002	0.001	0.001	0.002	0.003	0.004	0.003
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
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
Copper	mg/L	(b)	40 CFR 131				<0.005	<0.005	<0.005	0.010	0.006	<0.005	0.006	<0.005	<0.005	0.008	0.006	**0.042**
Lead	mg/L	(b)	40 CFR 131				<0.005	<0.001	<0.001	<0.002	<0.002	**0.003**	<0.002	<0.002	<0.002	<0.002	0.005	<0.002
Nickel	mg/L	(b)	40 CFR 131				<0.005	<0.005	<0.005	0.009	0.008	0.002	0.004	0.005	0.005	0.004	<0.002	0.003
Selenium	mg/L	0.02 (d)	40 CFR 131				<0.001	<0.001	<0.001	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004
Zinc	mg/L	(b)	40 CFR 131				0.016	0.012	<0.001	0.050	0.030	<0.020	<0.020	0.029	<0.020	0.021	0.039	0.144
Toxicity																		
Ceriodaphnia 96-hr	LC50 (%)	100								**25**	100	100	>100	>100	>100	>100	>100	**70.71**
Ceriodaphnia 7-day survival	NOEC (%)	100								**12.5**	**50**	100	**50**	100	100	100	100	**50**
Ceriodaphnia 7-day reproduction	NOEC (%)	100											**50**	100	100	100	100	**50**
Hyalella 96-hr	NOEC (%)	100								100	**25**	**12.5**	100	100	100	100	100	100
Selenastrum 96-hr	NOEC (%)	100											100	**25**	100	100	100	100

See last page for footnotes and source references

Table 9-4. Analytes Measured at the Tecolote Creek Mass Loading Station.

ANALYTE	UNITS	WQO[1]	SOURCE	2003-2004			2004-2005			2005-2006			2006-2007			Frequency Above WQO	Mean Ratio to WQO
				11/1/03	11/12/03	2/3/04	10/27/04	02/11/05	02/18/05	10/17/05	2/19/06	2/28/06	12/10/06	1/30/07	2/19/07		
General / Physical / Organic																	
Electrical Conductivity	umhos/cm			4740	4490	850	167	473	199	7260	549	472	1840	3770	211		
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	1.05	<1	<1	<1	1.32	<1	<1	<1	<1	<5	<5	<5	0%	0.12
pH	pH Units	6.5-8.5	Basin Plan	7.67	7.73	6.85	6.78	6.90	7.14	7.71	8.13	7.88	8.23	7.59	6.75	4%	0.05
Bacteriological																	
Enterococci	MPN/100 mL			11,000	8,000	80,000	300,000	50,000	30,000	17,000	50,000	13,000	30,000	14,000	23,000		
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	**50,000**	**17,000**	**13,000**	**70,000**	**13,000**	**17,000**	**9,000**	**13,000**	**5,000**	**50,000**	**5,000**	3,000	68%	6.64
Total Coliform	MPN/100 mL			230,000	50,000	50,000	800,000	130,000	130,000	170,000	110,000	80,000	500,000	11,000	23,000		
Wet Chemistry																	
Ammonia As Nitrogen	mg/L			0.38	<0.1	0.14	0.39	0.35	<0.1	0.16	0.51	0.13	0.65	0.42	1.56		
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan	5.19	0.79	0.24	0.6	0.1	0.5	2.5	14.8	2.6	**34.9**	2.8	2.0	7%	0.20
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	22.9	4.19	**68.4**	7.45	7.75	3.65	5.62	5.36	4.41	9.2	**39.7**	10	10%	0.47
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	**211**	99	**148**	**173**	88	25	71	115	40	89	83	**151**	28%	0.77
Dissolved Organic Carbon	mg/L			26.1	20.5	6.46	34	7.8	4.44	11.4	19.5	11.4	13.8	19.7	9.75		
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.47	0.27	0.06	0.89	0.46	<0.05	0.2	0.16	0.24	<0.05	<0.05	0.13	0%	0.12
Nitrate As N	mg/L	10	Basin Plan	1.84	0.95	0.55	0.53	0.5	0.42	1.11	1.11	0.51	<0.05	<0.05	0.41	0%	0.09
Nitrite As N	mg/L	1	Basin Plan	0.07	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	0%	0.03
Surfactants (MBAS)	mg/L	0.5	Basin Plan	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	<0.5*	8%	0.45
Total Dissolved Solids	mg/L	1000	Basin Plan	2660	1070	1190	174	627	285	3190	404	377	**1680**	**2310**	308	34%	0.96
Total Kjeldahl Nitrogen	mg/L			3	1.8	3.4	6	1	6.2	1.6	7.9	1.2	2.5	2.1	5.8		
Total Organic Carbon	mg/L			35.5	20	18.8	36.4	12.1	8.27	25.1	32.2	23.3	19.4	22.9	10.7		
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	1.14	0.34	0.58	**2.87**	0.47	0.5	0.24	0.75	0.37	0.56	0.15	0.63	3%	0.27
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	**102**	<20	<20	**2180**	**229**	**245**	47	**1020**	76	**166**	65	**442**	66%	3.64
Turbidity	NTU	20	Basin Plan	**34.7**	13.5	**201**	**540**	**44.7**	**67.4**	19.9	**321**	16.5	**84**	12.4	**282**	73%	4.40
Pesticides																	
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.002	<0.002	<0.002	14%	2.63
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	**0.116**	0.073	0.053	<0.01	0.051	<0.01	0.044	<0.02	<0.02	<0.004	<0.004	<0.004	54%	1.82
Malathion	µg/L	0.43	CA Dept. of Fish & Game	<0.01	0.269	0.085	<0.01	0.063	<0.01	0.052	0.086	0.125	<0.006	0.101	0.084	12%	0.50
Hardness																	
Total Hardness	mg CaCO3/L			1470	1300	591	126	330	152	1700	272	195	1000	1400	185		
Total Metals																	
Antimony	mg/L	0.006	Basin Plan	**0.007**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	0.003	0.005	5%	0.33
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.009	0.006	0.016	0.006	0.009	<0.002	0.01	0.006	0.003	<0.001	0.002	0.012	0%	0.12
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	0.004	<0.001	**0.012**	5%	0.26
Chromium	mg/L	(b)	CTR (Cr VI)	0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	0%	0.02
Copper	mg/L	(b)	40 CFR 131	0.011	0.009	**0.044**	**0.038**	0.018	0.010	0.01	**0.054**	0.010	0.025	0.014	**0.061**	46%	1.47
Lead	mg/L	(b)	40 CFR 131	0.006	0.003	**0.034**	**0.065**	**0.019**	**0.011**	0.003	**0.038**	0.002	0.014	0.005	**0.056**	54%	3.06
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.007	0.005	0.012	0.012	0.005	0.003	0.008	0.012	0.003	0.008	0.005	0.015	0%	0.07
Selenium	mg/L	0.02	40 CFR 131	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.004	<0.004	0%	0.09
Zinc	mg/L	(b)	40 CFR 131	0.047	0.033	0.206	**0.237**	0.086	0.065	0.066	**0.329**	<0.02	0.109	0.057	**0.391**	15%	0.54
Dissolved Metals																	
Antimony	mg/L	(e)	40 CFR 131	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.002		
Arsenic	mg/L	0.34 (c)	40 CFR 131	0.004	0.003	0.003	<0.002	<0.002	<0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.01
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%	0.08
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%	0.02
Copper	mg/L	(b)	40 CFR 131	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.006	0.006	0.006	0.004	0.007	0.003	3%	0.30
Lead	mg/L	(b)	40 CFR 131	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	3%	0.20
Nickel	mg/L	(b)	40 CFR 131	0.005	0.003	0.003	<0.002	0.003	<0.002	0.004	0.003	0.002	0.003	0.004	0.002	0%	0.03
Selenium	mg/L	0.02 (d)	40 CFR 131	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.004	<0.004	0%	0.01
Zinc	mg/L	(b)	40 CFR 131	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.052	0.024	<0.02	<0.02	<0.02	<0.02	0%	0.11
Toxicity																	
Ceriodaphnia 96-hr	LC50 (%)	100		>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	10%	0.26
Ceriodaphnia 7-day survival	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	19%	0.67
Ceriodaphnia 7-day reproduction	NOEC (%)	100		**50**	100	100	100	100	100	**50**	100	100	100	100	100	22%	0.44
Hyalella 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	**25**	100	100	100	100	14%	0.76
Selenastrum 96-hr	NOEC (%)	100		100	100	100	100	100	100	100**	100	100	100	100	100	6%	0.22

See last page for footnotes and source references

Table 9-4. Analytes Measured at the Tecolote Creek Mass Loading Station.

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

[1] The Water Quality Objectives (WQO) are benchmarks for comparison of storm water results and were selected by the Copermittee Monitoring Workgroup for this 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 $\mu g/L$.
(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 – bold values are above the **CCC** water quality objective and bold/underlined results are above the **CMC** water quality objective.

* Indicates detection limit above water quality objective, and not included in frequency above water quality objective calculation.
** Indicates results should be interpreted with care due to method protocol descrepancy.

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 9-5. Pesticides and Pyrethroid Results Collected at the Tecolote Creek Mass Loading Station.

ANALYTE	UNITS	TC 12/10/2006	TC 1/30/2007	TC 2/19/2007
Organophosphorus Pesticides				
Bolstar (sulprofos)	µg/L	<0.004	<0.004	<0.004
Chlorpyrifos	µg/L	<0.002	<0.002	<0.002
Demeton	µg/L	<0.002	<0.002	<0.002
Diazinon	µg/L	<0.004	<0.004	<0.004
Dichlorvos	µg/L	<0.006	<0.006	<0.006
Dimethoate	µg/L	<0.006	<0.006	<0.006
Disulfoton	µg/L	<0.002	<0.002	<0.002
Ethoprop (ethoprofos)	µg/L	<0.002	<0.002	<0.002
Fenchlorphos (ronnel)	µg/L	<0.004	<0.004	<0.004
Fensulfothion	µg/L	<0.002	<0.002	<0.002
Fenthion	µg/L	<0.004	<0.004	<0.004
Malathion	µg/L	<0.006	**0.101**	**0.084**
Merphos	µg/L	<0.002	<0.002	<0.002
Methyl parathion	µg/L	<0.002	<0.002	<0.002
Mevinphos (phosdrin)	µg/L	<0.016	<0.016	<0.016
Phorate	µg/L	<0.012	<0.012	<0.012
Tetrachlorvinphos (stirofos)	µg/L	<0.004	<0.004	<0.004
Tokuthion	µg/L	<0.006	<0.006	<0.006
Trichloronate	µg/L	<0.002	<0.002	<0.002
Synthetic Pyrethroids				
Allethrin	µg/L	<0.002	<0.002	<0.002
Bifenthrin	µg/L	**0.013**	**0.123**	**0.210**
Cyfluthrin	µg/L	**0.106**	<0.002	**0.103**
Cypermethrin	µg/L	**0.242**	<0.002	**0.049**
Danitol	µg/L	<0.002	<0.002	<0.002
Deltamethrin	µg/L	<0.002	<0.002	<0.002
Esfenvalerate	µg/L	<0.002	<0.002	<0.002
Fenvalerate	µg/L	<0.002	<0.002	<0.002
L-cyhalothrin	µg/L	<0.002	<0.002	<0.002
Permethrin	µg/L	<0.002	<0.002	<0.002
Prallethrin	µg/L	**0.183**	<0.002	<0.002

Bold and shaded – concentrations detected above the water quality objective
Bold – concentrations detected and bolded for ease of viewing.
No WQO benchmark exists for synthetic pyrethroids.

Several total metals were detected in storm water samples collected during the 2006-2007 wet weather monitoring season. The total metals copper, lead, nickel and zinc were detected in all three monitoring events. The total metals antimony, arsenic, chromium and selenium were all detected during storm water monitoring events but were below their respective hardness-based benchmark WQO. The total metals cadmium (0.012 mg/L), copper (0.061 mg/L), lead (0.056 mg/L) and zinc (0.391 mg/L) were above their respective acute (CMC) benchmark WQOs during the February 19, 2007 monitoring event. Total lead was above the chronic (CCC) benchmark WQO but below the CMC benchmark WQO.

The dissolved metals copper and nickel were detected in all three storm water samples collected during the 2006-2007 wet weather monitoring season but were below their respective hardness-based benchmark WQO. Dissolved antimony was detected in the monitoring event on February 19, 2007 (0.002 mg/L) but was below the hardness based benchmark WQO. Dissolved selenium was only detected in the monitoring event on January 30, 2007 (0.004 mg/L) but was below the hardness based benchmark WQO. All dissolved metals were below their respective hardness based benchmark WQO for both the CCC and the CMC benchmark WQO.

Toxicity in storm water was not observed for the *Ceriodaphnia dubia*, *Hyalella azteca* or *Selenastrum capricornutum* species during any of the 2006-2007 wet weather season monitoring events.

9.2.2 Monitoring Results: Comparison to Benchmarks/Statistical Analyses/Trends

An evaluation of storm water monitoring data collected at the Tecolote Creek MLS over the past fourteen years was performed. This evaluation compares the frequency of constituents measured above benchmark WQOs, statistical trend analyses, and comparison of the magnitude of values above benchmark WQOs.

9.2.2.1 Comparison to Benchmarks

Several constituents have consistently had analytical results measured above their respective benchmark WQO. Fecal coliform, TSS, turbidity, and total lead have all had results above their respective benchmark WQO in greater than 50% of the monitoring events. Turbidity has most frequently exceeded the benchmark WQO (71% of monitoring events).

Conventional constituents that have had results measured above their respective benchmark WQO, but less frequently include the following:

- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Surfactants (MBAS)
- Un-ionized ammonia.

Total coliform and enterococcus have had consistently elevated levels in storm water monitoring events. Visual inspection of the bacteriological results indicate results for the first storm of each monitoring season have tended to be higher than results for storms that have occurred later in the monitoring season.

Chlorpyrifos and Diazinon were not detected during any storm events monitored during the 2006-2007 monitoring season. Malathion was detected in two storm events during the 2006-2007 monitoring season; however in both instances, concentrations were below the benchmark WQO of 0.43 μg/L.

Chlorpyrifos results were above the benchmark WQO during the 2000-2001 and 2002-2003 monitoring seasons. However, Chlorpyrifos has not been detected over the past three monitoring seasons. Diazinon results were above the benchmark WQO during the 1998-1999, 1999-2001, 2000-2001, 2001-2002, and 2002-2003 wet weather monitoring seasons. However, Diazinon results have not exceeded the benchmark WQO and have decreased in detected concentration over the past three years of monitoring.

During the 14 years of monitoring, five total metals (antimony, cadmium, copper, lead, and zinc) had results above their respective benchmark WQO. Antimony was detected above the acute and chronic benchmark WQO during a storm event in both the 2002-2003 and 2003-2004 monitoring seasons. In the 2002-2003 monitoring season the results for copper and lead were above the benchmark WQO during all three monitored storm events. Across all monitored storm events, copper was above either the acute or chronic benchmark WQO 18 of 39 times (46%), while lead was above the acute or chronic benchmark WQO 20 of 37 times (54%), and zinc was above both the acute and chronic benchmark WQO 6 of 39 times (15%).

In the past 11 years, only twice have dissolved metal concentrations been above their respective hardness based acute or chronic benchmark WQO. Copper was above the acute and chronic benchmark WQO for an event in the 2002-2003 monitoring season, while lead was above the acute benchmark WQO for an event during the 2000-2001 monitoring season.

Toxicity was not observed to any organism during the 2006-2007 monitoring season at the Tecolote Creek MLS. Toxicity has been observed in 9 of 21 monitoring events over the past seven years of monitoring at the Tecolote Creek MLS. Toxicity was observed for the *Ceriodaphnia dubia* acute endpoint in 2 of 21 events (10%). Toxicity to the *Ceriodaphnia dubia* chronic survival endpoint has occurred in 4 of 21 events (19%), while toxicity to the *C. dubia* chronic reproduction endpoint has occurred in 4 of 18 events (22%). Toxicity to either acute or chronic endpoints for *C. dubia,* however, has only been observed once over the past three monitoring seasons. Toxicity to *Hyalella azteca* has been observed in 3 of 21 (14%) monitored storm events, while toxicity to *Selenastrum capricornutum* has been observed in 1 of 18 monitored storm events (6%).

9.2.2.2 Trends

A non-parametric trend analysis was conducted using the Mann-Kendall trend test to evaluate the presence or absence of significant trends using all available monitoring data. This test is often employed for analysis of environmental time series data. The test does not assume any single distribution for the data being tested, which is an advantage when analyzing environmental data. This test does not incorporate magnitude, but instead calculates the number of positive and negative differences between samples. The number of positive and negative differences is summed to calculate the S statistic, which is compared to a table value to determine significance.

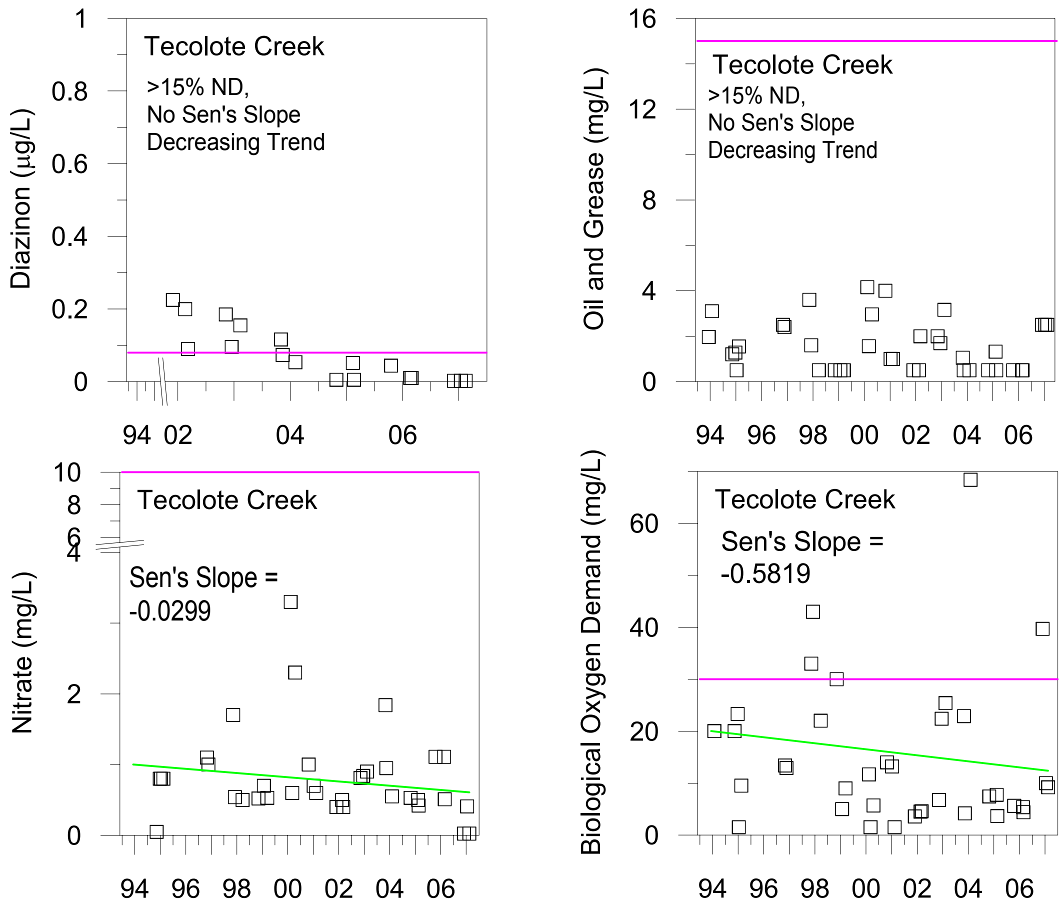
Sen's estimate of slope is shown on the graphs to illustrate the median trend of the data per constituent unit per year. This is not a predictive slope, but rather an estimate of the median true slope showing the median change in concentration over time.

Any change in observed trends from prior years' data to 2006-2007 is likely affected by the new use of methodology in trend analysis. The 2006-2007 data set analysis utilized the Mann-Kendall method for trend analysis which is insensitive to outliers (see Methods Section 3.5). Only the scatterplots showing significant trends are shown in this WMA section (Figure 9-4). All other scatterplots can be found in

Appendix C. A table of trend results including the S values and critical S values is also included in Appendix C.

Mann-Kendall trend analysis indicates that a statistically significant trend exists for biological oxygen demand (BOD). BOD was determined to have a decreasing trend (S=-123; Sen's slope=-0.582). Decreasing trends were also determined for Diazinon (S=-221), nitrate (S=-142) (Sen's slope=-0.029), and oil and grease (S=-174). The Mann-Kendall test does not allow the calculation of Sen's slope for datasets with greater than 15% non-detect values. As a result, Sen's slope is not reported for Diazinon and oil and grease.

Enterococci was determined to have a statistically significant increasing trend (S=65; Sen's slope= 0.0789) at the Tecolote Creek MLS.



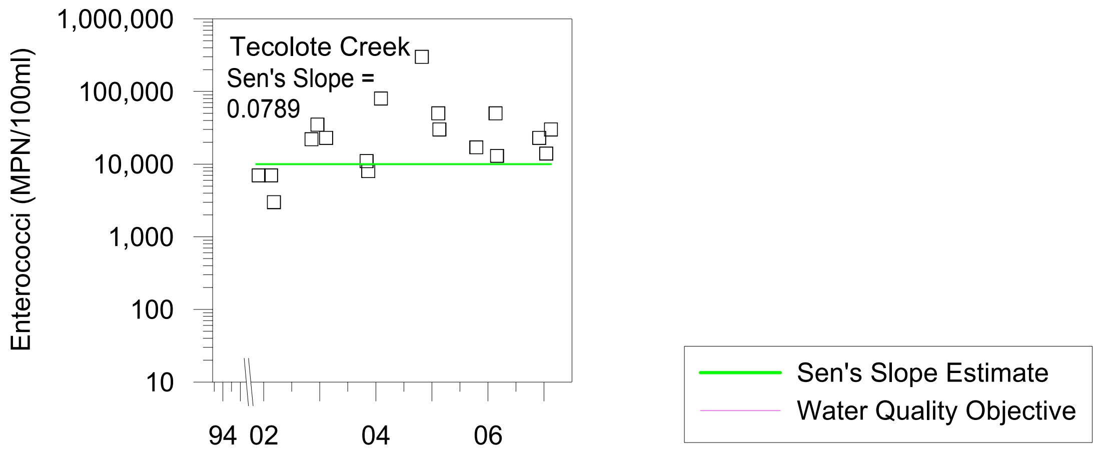


Figure 9-4. Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope.

9.2.2.3 Magnitude of Exceedance

In order to illustrate the magnitude and frequency that constituents were detected above benchmark WQOs for the 2006-2007 wet weather monitoring season, the ratio of water quality results to the benchmark WQOs were plotted for common constituents of concern (Figure 9-5). The average magnitude of the value above the benchmark WQO was also determined for each constituent by calculating the mean ratio of water quality results to the benchmark WQOs from all storm events from October 2002 through April 2006.

The conventional constituents, turbidity, total dissolved solids and total suspended solids, were above benchmark WQOs in two of the three monitored storm events in 2006-2007. Fecal coliform was above the benchmark WQO during the first two monitoring events for the 2006-2007 monitoring season. Over the past 5 years, fecal coliform concentrations have been greater than the benchmark WQO (4000 MPN/100 mL) in 13 out of 15 monitoring events at the Tecolote Creek MLS, and have averaged 26,000 MPN/100 mL. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) each were above the benchmark WQO for the storm events of January 30, 2007, and February 19, 2007, respectively. Each of these, however, was less than two times the benchmark WQO, and the mean ratio from 10/01 to 4/07 for both BOD and COD was below the benchmark WQO.

The pesticides Chlorpyrifos, Diazinon, and Malathion were not detected in water samples collected during the 2006-2007 monitoring season. For the monitoring events conducted between October 2002 through April 2006 at the Tecolote Creek MLS, Diazinon concentrations have, on average, decreased from above the benchmark WQO in 2002-2003 to below laboratory detection limits in 2006-2007. There has only been one pesticide measured above the benchmark WQO (Diazinon during the event on November 1, 2003) in the past four monitoring seasons.

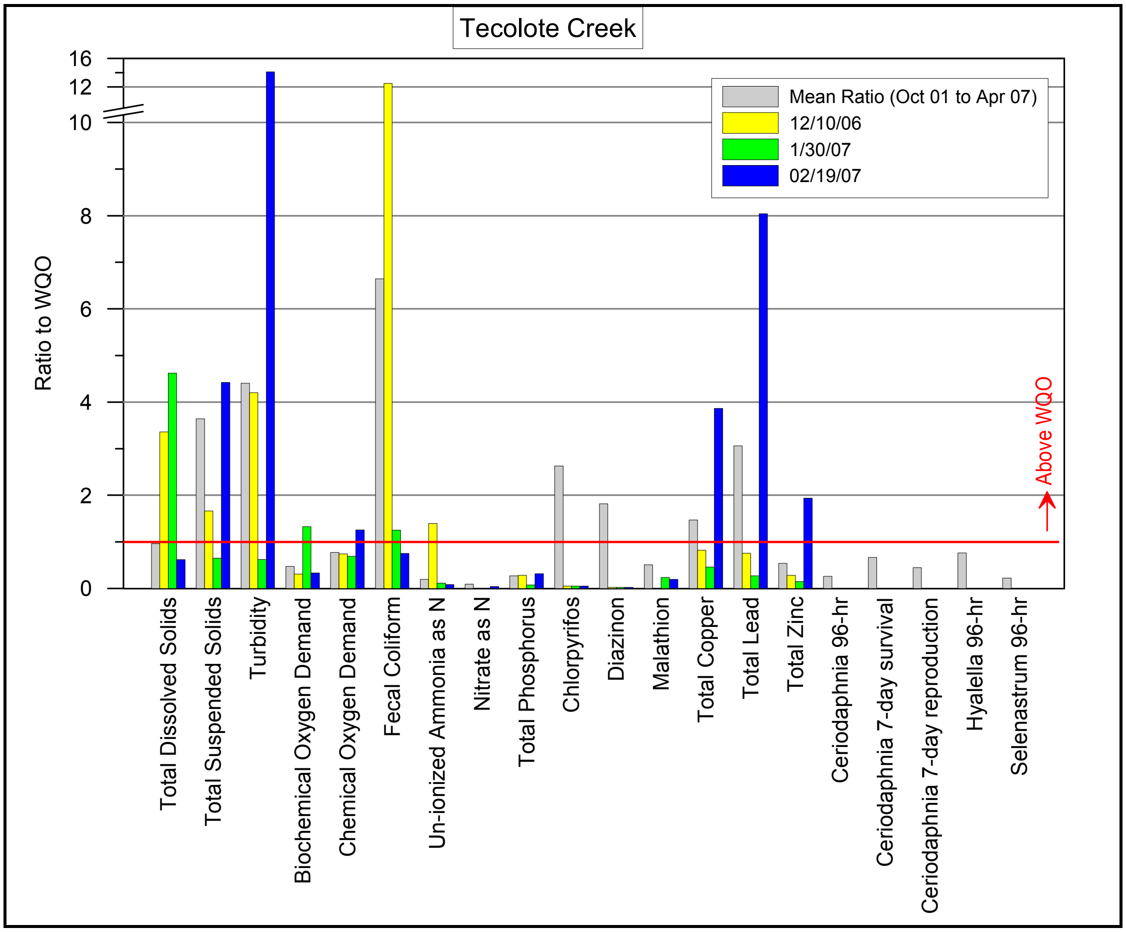


Figure 9-5. Mission Bay Water Quality Ratios.

The total metals cadmium, copper, lead and zinc were above the benchmark WQO during the monitoring event on February 19, 2007. Copper, zinc, and cadmium concentrations in this storm event were higher than in any other monitored storm event in the past five years. In the first two monitored storm events of the 2006-2007 season, none of the analyzed metals were above the benchmark WQOs. November 1998, was the last time that cadmium was measured above the benchmark WQO. The observed magnitude of exceedance for total copper and total lead was greater on 1/30/07 than the historical magnitude of exceedance for lead for monitoring events at the Tecolote Creek MLS from October 2001 through April 2007. Historically, total zinc has been above the benchmark WQO in six out of 39 monitored storm events over 13 years at the Tecolote Creek MLS.

No toxicity was observed in toxicity testing with *Ceriodaphnia dubia, Hyalella azteca,* and *Selenastrum capricornutum* during the 2006-2007 monitoring season. The mean ratios for each of the aforementioned bioassay tests were all below benchmark WQOs for the time period from October 2001 through April 2007.

9.2.3 Wet Weather Constituent Loading Analysis

As discussed in the methods section, measured storm event loads may not represent the entire duration of the storm event due to monitoring constraints related to safety, autosampler pacings, and the unpredictable nature of rainfall events in general. For example, rain events can be scattered throughout the watershed and flow can stop and start again for any given storm event. Weston makes every attempt and uses best professional judgment to make decisions on cessation of sample collection. Modeled storm event loads represent the entire volume of runoff from the entire rainfall volume of the event. In order to compare the measured loads with the modeled loads, the proportion of the storm volume sampled must be determined. This proportion can be expressed as the ratio of the modeled volume of runoff for the storm event to the volume of water that passes by the MLS during sample compositing. This ratio is then used to estimate what the measured load would be if the entire event runoff were sampled. The estimation of the full storm load allows the comparison to expected loading based on land use and rainfall event modeling.

Measured loading values for each constituent sampled were derived using the event mean concentration (EMC) values obtained from composite samples collected at the Tecolote Creek MLS site and the recorded volume of water discharged during the sampling period. The entire runoff for each storm event was derived using the "Simple Method" (Schueler, 1987) based on event rainfall amounts and impervious areas in the MLS catchment. Entire storm event loads were estimated from measured loads using the proportion of runoff estimated through modeling to that runoff measured during sample compositing. The Simple Method is limited in that it makes assumptions regarding rainfall across an entire watershed. The Simple Method does not account for storage, evaporative loses, or retardation which more complex models can handle. Additionally, rainfall may vary throughout a watershed in intensity, duration, and volume.

Measured storm event loads were compared to loading values derived from the National Stormwater Quality Database (NSQD) (Pitt et al., 2004). For each land use, the 25th percentile and the 75th percentile EMC from the NSQD were used to derive area weighted EMC values for each MLS catchment. The interquartile range (between the 25th and 75th percentiles) of these area-weighted loads can be used as expected loads based on the national database. One can evaluate the degree of measured loading in terms of the range of expected loads.

Measured loads (estimated for the entire storm event) were compared to the 25th and 75th percentile loads estimated through land use and rainfall modeling (Table 9-6). Measured loading values that were above the range of expected loads are identified in Table 9-6 with a "+" symbol. Measured loading values that were below the range of expected loads are identified with a "-" symbol. Measured loading values within the range of expected loads are shown with a "0" symbol.

Table 9-6. Modeled Loading Values Compared to Measured Loading Values for Tecolote Creek (TC) Mass Loading Station.

MLS Station - Event	TC-Event 1	TC-Event 2	TC-Event 3
Event Date	10-Dec-2006	30-Jan-2007	19-Feb-2007
Composite Duration (hours)	13.0	10.1	13.5
Modeled to Composite Runoff Ratio	18	46	4
Conventional Constituents			
Oil & Grease	0	0	0
Total Dissolved Solids	+	+	+
Total Suspended Solids	+	0	+
Biochemical Oxygen Demand, 5-day	0	+	0
Chemical Oxygen Demand	0	0	+
Nutrients			
Ammonia	0	0	+
Nitrate+Nitrite	–	–	0
Total Kjeldahl Nitrogen	0	0	+
Dissolved Phosphorus	–	–	0
Total Phosphorus	+	–	+
Metals			
Cadmium, Total	+	0	+
Cadmium, Dissolved	0	0	0
Chromium, Total	–	–	+
Chromium, Dissolved	0	0	0
Copper, Total	0	0	+
Copper, Dissolved	–	0	–
Lead, Total	0	–	+
Lead, Dissolved	–	–	–
Nickel, Total	0	–	0
Nickel, Dissolved	0	0	–
Zinc, Total	0	–	+
Zinc, Dissolved	–	–	–
Bacterial Indicators			
Fecal Coliform	+	+	+
Total Coliform	+	+	+

+ Loading is greater than expected
- Loading is less than expected
0 Loading is within the expected range

The comparison of the sampled runoff to the total runoff shows a difference between events. The amount of runoff ranged between 4 and 46 times more that that sampled. This variation represents differences in the duration of composite sampling times between storm events which ranged from 10.1 hours to 13.5 hours and due to the limitations of the Simple Method.

Measured loads for total dissolved solids and bacterial indicators were greater than expected for a majority of the storm events sampled. Most of the constituents measured were within the expected range or lower than expected. In particular, several metals consistently showed lower than expected loads for all the storms events sampled.

9.2.4 2006 Dry Weather Monitoring Data Evaluation

In addition to the wet weather monitoring discussed above, a separate dry weather monitoring program is carried out by each jurisdiction. Dry weather monitoring reports are provided separately by each jurisdiction in its Jurisdictional Urban Runoff Management Program (JURMP) Annual Report. Dry weather data are also provided in a regional data sharing format which is used for the watershed management area assessments and regional comparisons in this report as described in Section 3.5. Dry weather monitoring sites with field parameter and chemistry results are presented in this section and are shown on Figure 9-6.

Water quality monitoring was performed at 54 locations in the Mission Bay WMA during the 2006 dry weather monitoring program. The total number of samples collected for each analyte may differ from the number of sample locations due to multiple sample analysis at each location. Of these, 14 sites are located upstream of the mass loading station on Tecolote Creek. A summary of the 2006 dry weather monitoring results for the Mission Bay WMA is presented in Table 9-7.

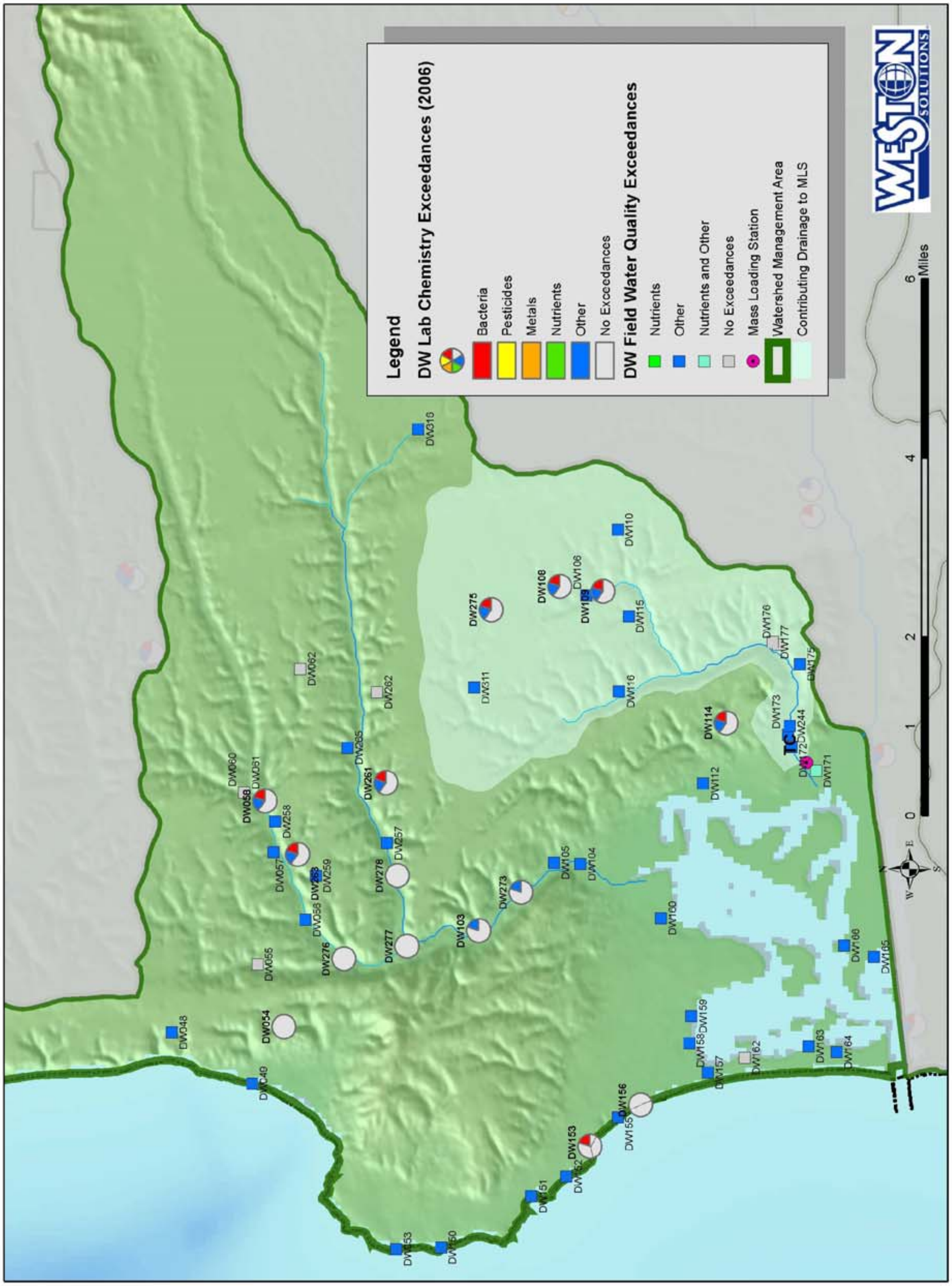


Figure 9-6. Mission Bay WMA Dry Weather Exceedance Map.

Table 9-7. Summary of the 2006 Dry Weather Monitoring Results in the Mission Bay WMA.

Analyte	Units	DW Action Level	Number of Samples	RESULTS		
				Minimum	Mean	Maximum
Conductivity*	µS/cm	5,000	52	36	4,235	20,000
Oil & Grease	mg/L	15	13	1.43	2.26	3.32
pH	pH units	6.5-9	53	3.30	7.69	9.20
Enterococcus	MPN/100mL	10,000	11	3,200	20,618	70,000
Fecal Coliform	MPN/100mL	20,000	13	10	19,140	170,000
Total Coliform	MPN/100mL	50,000	11	8,000	158,545	500,000
Ammonia (NH3-N)	mg/L	1	47	0	0.32	2
Orthophosphate (PO4-P)	mg/L	2	48	0	0.51	2.86
Nitrate (NO3-N)	mg/L	10	52	0.03	0.62	3.40
MBAS	mg/L	1	11	0.08	0.18	0.36
Turbidity**	NTU	20	48	0.87	106.33	1000
Chlorpyrifos	µg/L	0.5	15	0	0	0
Diazinon	µg/L	0.5	13	0.03	0.03	0.03
Hardness	mg CaCO3/L		11	245	1303	3650
Cadmium Dissolved	µg/L	(a)	11	0.48	2.32	2.50
Copper Dissolved	µg/L	(a)	11	0.98	8.27	20.10
Lead Dissolved	µg/L	(a)	11	2.50	2.50	2.50
Zinc Dissolved	µg/L	(a)	11	8.63	19.09	58.50

* Action Levels were adopted by the Dry Weather Working Group (Table 3-8) and are based on best professional judgment (BPJ).

** For Action Level the Basin Plan benchmark WQO was used instead of BPJ when comparing with MLS data.

Mean values are calculated including non-detect results at half the reporting limit. If the mean value was less than the reporting limit, then the mean was not included in the table.

(a) Dry weather action level for dissolved metal fraction based on total hardness and calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000. If Total Hardness was greater than 400 mg/L, then 400 mg/L was used to calculate dissolved metals water quality objectives.

Table 9-8 summarizes the constituents that were analyzed during the 2006 Dry Weather Program. Constituent results that were above the dry weather action level at the dry weather monitoring sites include conductivity, pH, enterococcus, fecal and total coliform, ammonia, orthophosphate, and turbidity.

Table 9-8. Mission Bay WMA 2006 Dry Weather Exceedance Matrix.

Analyte	Category	Total	Number of Exceedances	Average Ratio of Exceedance*	St. Dev. Ratio of Exceedance
Conductivity	Other	52	14	0.85	1.06
pH	Other	53	3	0.11	0.28
Enterococcus	Bacteria	11	7	2.06	1.99
Fecal Coliform	Bacteria	13	2	0.96	2.30
Total Coliform	Bacteria	11	6	3.17	3.17
Ammonia (NH3-N)	Other	47	4	0.32	0.45
Orthophosphate (PO4-P)	Nutrients	48	1	0.26	0.28
Turbidity	Other	48	31	5.32	12.31
Mission Bay Total		**431**	**68**	**0.96**	**4.47**

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the dry weather action level.

Constituents with average ratios that are above the action level and standard deviations greater than 1.0 indicate that action levels were surpassed with a higher frequency. Constituents with average ratios of exceedance and standard deviations less than one indicate exceedances that occur on a more random and infrequent basis. In the Mission Bay WMA, enterococcus, fecal coliform, total coliform, conductivity, and turbidity had average ratios of exceedance greater than one.

Figure 9-6 depicts the 2006 dry weather program monitoring sample locations. Locations shown with circles have both field parameters and laboratory sample results. Locations shown as squares have field parameter results only. Pie symbols appear at dry weather stations that have had action level exceedances. The colored slices of the pie show the different constituent groups that contributed to the exceedances.

9.2.5 Third Party Data

No new third party data have been provided for the Mission Bay WMA. Third party data were collected from the Mission Bay WMA under the Surface Water Ambient Monitoring Program (SWAMP) in March, April, June, and September 2002 (Appendix H). These data meet the acceptability for assessment under this program since it is collected under the SWAMP QA program. Additional third party data may be considered for future assessments upon determination of meeting the QA acceptance criteria as provided in Section 3.1.1 of the Watershed Data Assessment Framework (MEC-Weston, 2004).

A full suite of constituents were analyzed including organochlorine pesticides, triazine herbicides, PAHs, and PCBs in addition to metals, inorganics, and physical measurements. Two sites were sampled within the Mission Bay Watershed, one in Tecolote Creek near the mass loading station and the other in Rose Canyon Creek. Constituents with results above the benchmark WQO include sulfate, manganese and toxicity at the Tecolote Creek site. Constituents with results above the benchmark WQO at Rose Canyon Creek included sulfate, manganese, turbidity, pH, Diazinon and toxicity.

9.2.6 TIEs

Toxicity identification evaluation (TIE) testing was not performed on Tecolote Creek samples. This mass loading station has not been identified as a TIE candidate site based upon past Triad Decision Matrix evaluations. No toxicity was observed for the survival or reproductive endpoints (NOEC=50%) for *C. dubia* or to *H. azteca* during any of the three monitored storm events.

9.2.7 Watershed Water Quality Monitoring Summary

Turbidity, total suspended solids, total lead, and elevated levels of bacterial indicators, specifically fecal coliform, appear to be the primary water quality concerns within the watershed. Based on the period of record, there is a significant downward trend in BOD, nitrate, oil and grease and Diazinon concentrations at the MLS and a significant increasing trend in enterococci concentrations at the MLS.

9.3 Stream Bioassessment

Stream bioassessment in the Mission Bay WMA included two urban affected monitoring sites representing two different watersheds. One site was in Rose Creek, downstream of the confluence of San Clemente Canyon Creek near Highway 52 (MB-RC). The other site was in Tecolote Creek in Tecolote Canyon Natural Park, near the downstream border of the Park (TC-TCNP).

To assess the quality of the benthic macroinvertebrate communities at each site, biological metrics were calculated as well as two summary indices. The summary indices included a multi-metric Index of Biotic Integrity (IBI) and an Observed to Expected ratio (O/E), both of which are specific to Southern California ecological conditions.

The IBI is the cumulative score (0-70) of seven biological metrics, with the final score divided into five quality rating categories ranging from Very Poor to Very Good. An IBI score above 26 is presumed to represent unimpacted conditions. O/E is the ratio of organisms observed at a site (O) to the organisms expected to occur at a site (E). An O/E ratio of greater than 0.8 indicates unimpacted conditions, and represents a 20 percent loss of expected taxa (i.e. 0.8 is 20 percent below 1.0). These indices are described in greater detail in Methods Section 3.2.7. While the IBI and O/E ratio are very useful at broadly identifying impairment, analysis of individual taxa present (often in low numbers) may provide signals of benthic community quality that are too weak to be represented by summary indices.

An additional analysis was performed to assess macroinvertebrate community quality trends since the beginning of this monitoring program in 2001. The analysis was performed separately for the two summary indices described above, the IBI and O/E ratios.

9.3.1 Stream Bioassessment Results and Discussion

Rose Creek near Highway 52: MB-RC

The Rose Creek monitoring site had a benthic macroinvertebrate community with an Index of Biotic Integrity rating of Very Poor for both the October 2006 and May 2007 surveys, with IBI scores of 8 and 9, respectively (Table 9-9). Results of the O/E analysis show that the Rose Creek monitoring site had O/E ratios of 0.50 for the October survey and 0.41 for the May survey. This implies that the benthic community has lost an estimated 50 to 59 percent of the biodiversity expected to occur at the site.

Table 9-9. Selected Biological Metrics and Physical Measures of the Mission Bay Watershed Management Area.

Mission Bay Watershed Management Area	Rose Creek near Highway 52 (MB-RC)		Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP)	
Survey	**Oct-06**	**May-07**	**Oct-06**	**May-07**
Index of Biotic Integrity/ Qualitative Rating	**8** **Very Poor**	**9** **Very Poor**	**12** **Very Poor**	**1** **Very Poor**
O/E Ratio	**0.50**	**0.41**	**0.59**	**0.32**
Metrics				
Taxa Richness	13	12	17	10
EPT Taxa (mayflies, stoneflies, and caddisflies)	3	4	1	1
% Intolerant Taxa	0.0%	0.0%	0.0%	0.0%
% Tolerant Taxa	40.7%	10.1%	46.3%	38.6%
Average Tolerance Value	6.7	5.8	6.9	6.8
% Collector Filterers +Collector Gatherers	83%	97%	74%	95%
Physical Measures				
Elevation	65		55	
Physical Habitat Score	140	140	121	133
Riffle Velocity (ft/sec)	1.0	0.5	0.6	0.2
Substrate Composition				
Silt	3%	3%	2%	3%
Sand	8%	10%	13%	20%
Gravel	24%	36%	25%	20%
Cobble	52%	41%	57%	35%
Boulder				
Roots	13%	10%		22%
Bedrock/solid			3%	
Water Quality				
Temperature (°C)	18.5	20.1	17.4	16.1
pH	8.0	8.7	7.7	7.7
Specific Conductance (mS/cm)	3.915	6.145	7.925	4.689
Dissolved Oxygen (mg/L)	11.45	8.94	7.69	5.86

*IBI Score 0-13=Very Poor, 14-26=Poor, 27-40=Fair, 41-55=Good, 56-70=Very Good
**O/E ratio of >0.8 represents unimpacted conditions

There were 13 different taxa collected in October, and 12 different taxa in May, with three and four EPT (Ephemeroptera + Plecoptera + Trichoptera) taxa collected per survey. There were no organisms collected that are highly intolerant (sensitive) to impairment, and organisms highly tolerant to impairment comprised about 41 and 10 percent of the benthic community in October and May, respectively. Collector Gatherers plus Collector Filterers dominated the community in both surveys, accounting for 83 to 97 percent of the organisms collected. Predators decreased from 11 percent in October to one percent in May, primarily due to the absence of the damselfly, *Argia* in May (Appendix B.5-1, B.5-2).

In October 2006, the benthic community was dominated by the amphipod, *Hyalella* and chironomid midges (Table 9-10). The black fly, *Simulium* and the damselfly, *Argia* each comprised about 10 percent of the community. In May, the site was dominated by *Simulium* and chironomid midges. Baetid mayflies were relatively abundant in both surveys, represented by *Fallceon quilleri* in October and *Baetis* in May. Historically, this site has supported a high diversity of dipteran taxa (true flies), but this characteristic of the benthic community was not apparent this year (Appendix B.2-1, B.2-2).

Table 9-10. Macroinvertebrate Community Summary: Five Most Abundant Taxa for Mission Bay Watershed Management Area

		Taxon	Common Name	Percent Composition	Tolerance Value	Functional Feeding Group
Rose Creek near Highway 52 (MB-RC)	Oct-06	***Hyalella***	**amphipod**	**38%**	**8**	**Collector Gatherer**
		Chironomidae	non-biting midges	23%	6	Collector Gatherer/Filterer
		Simulium	black fly	11%	6	Collector Filterer
		Argia	dancer damselfly	10%	7	Predator
		Fallceon quilleri	minnow mayfly	8%	4	Collector Gatherer
	May-07	***Simulium***	**black fly**	**29%**	**6**	**Collector Filterer**
		Chironomidae	non-biting midges	25%	6	Collector Gatherer/Filterer
		Baetis	minnow mayfly	16%	5	Collector Gatherer
		Oligochaeta	earth worm	15%	5	Collector Gatherer
		Ostracoda	seed shrimp	8%	8	Collector Gatherer
Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP)	Oct-06	***Hyalella***	**amphipod**	**37%**	**8**	**Collector Gatherer**
		Chironomidae	non-biting midges	18%	6	Collector Gatherer/Filterer
		Dasyhelea	biting midges	11%	6	Collector Gatherer
		Ceratopogonidae	biting midges	6%	6	Predator
		Ostracoda	seed shrimp	5%	8	Collector Gatherer
	May-07	***Simulium***	**black fly**	**39%**	**6**	**Collector Filterer**
		Ostracoda	seed shrimp	29%	8	Collector Gatherer
		Chironomidae	non-biting midges	19%	6	Collector Gatherer/Filterer
		Hyalella	amphipod	6%	8	Collector Gatherer
		Physa	aquatic snail	3%	8	Scraper

The physical habitat of the reach was optimal, with a substrate of layered cobble, tree roots, and emergent vegetation providing a variety of stable niche space for macroinvertebrate colonization. The live oak and sycamore riparian zone was mostly undisturbed, and the stream had good canopy cover throughout most of the reach. Water quality was somewhat impaired, with high specific conductance values of 3.915 and 6.145 mS/cm. Values for pH were 8.0 and 8.7.

The Mission Bay mass loading station sampled runoff from a separate drainage from Rose Creek and storm water information cannot be correlated with the bioassessment site.

Summary Indices Results Over Time

The Rose Creek site has been sampled ten times since October of 2002. The mean IBI scores have shown consistent and sometimes significant seasonal variation, with mean values of 17.2 for October surveys and 7.8 for May surveys, with higher scores in October for every year of sampling (Figure 9-7). IBI scores have ranged from 3 (May 2006) to 21 (October 2003, 2004).

The mean O/E ratios for the Rose Creek site were 0.72 for October surveys and 0.46 for May surveys (Figure 9-8). The October surveys of 2002 and 2005 had O/E ratios indicating unimpaired benthic communities while the May surveys all indicated impairment. The mean IBI scores and the O/E ratios both showed a large disparity between the October and May surveys, although for the 2003 and 2006 surveys, the May and October O/E ratios were very similar.

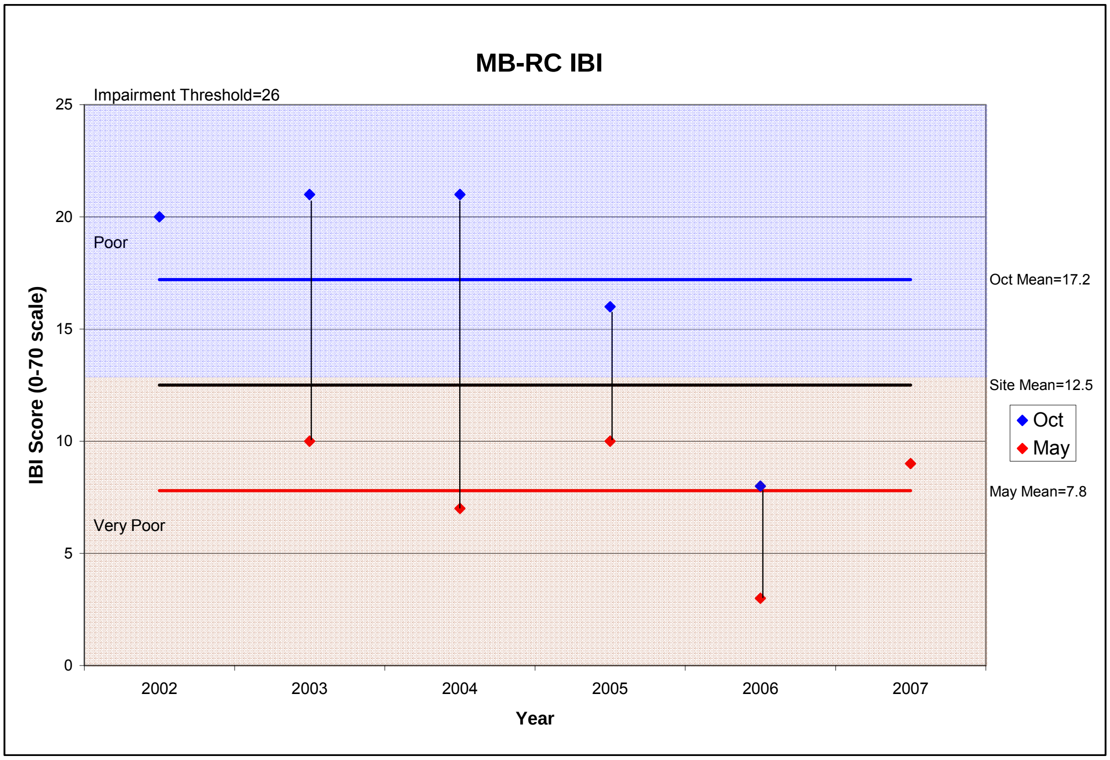


Figure 9-7. Index of Biotic Integrity for Rose Creek Near Highway 52 (MB-RC).

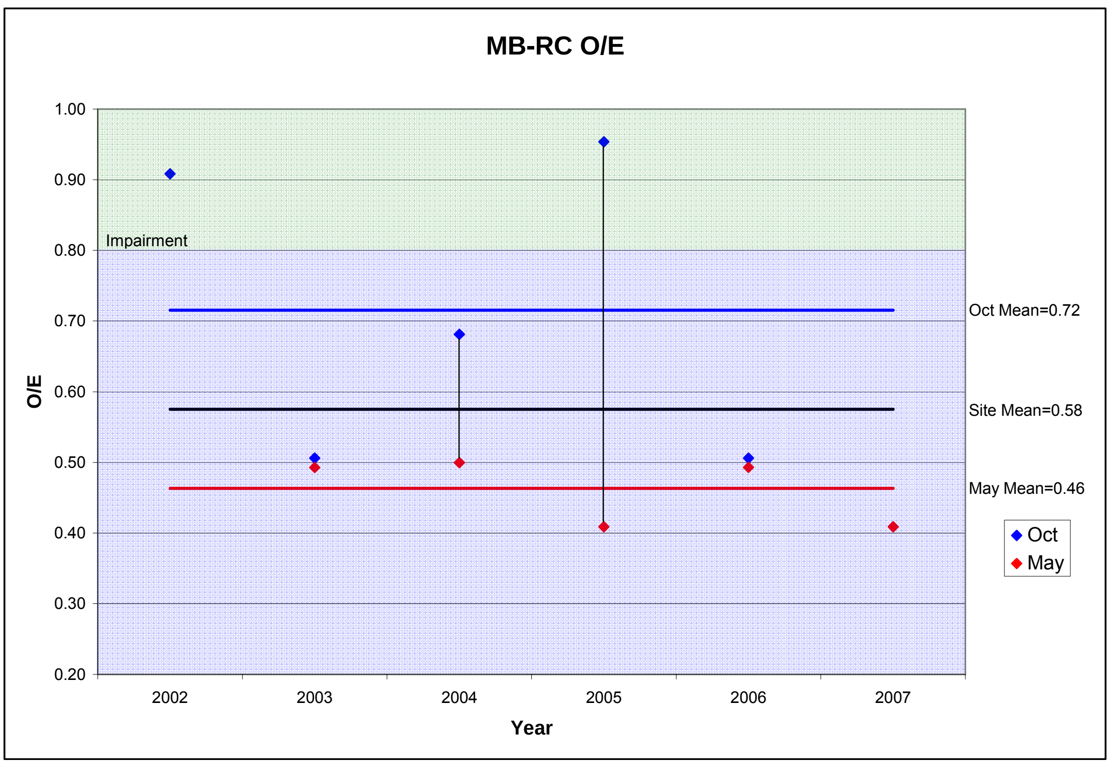


Figure 9-8. O/E Ratio for Rose Creek Near Highway 52 (MB-RC).

Tecolote Creek in Tecolote Canyon Natural Park: TC-TCNP

The Tecolote Creek monitoring site had a benthic macroinvertebrate community with Index of Biotic Integrity ratings of Very Poor for both the October 2006 and May 2007 surveys, with IBI scores ranging from 12 in October to 1 in May, respectively (Table 9-9). The results of the O/E analysis show that the Tecolote Creek monitoring site had O/E ratios ranging from 0.59 to 0.32. This implies that the benthic community has lost an estimated 41 to 68 percent of the biodiversity expected to occur at the site.

There were 17 different taxa collected in October, and 10 different taxa in May. One EPT taxon was collected in each survey, represented by the microcaddisfly, *Hydroptila* which was collected in very low numbers (Appendix B.2-1, B.2-2). There were no organisms collected that are highly intolerant (sensitive) to impairment, and organisms highly tolerant to impairment comprised about 46 and 39 percent of the benthic community in October and May, respectively.

The benthic community was dominated by the amphipod, *Hyalella* in October and by the black fly *Simulium* in May. Chironomid midges comprised similar proportions of the community, comprising nearly 20 percent of the individuals in each survey. Biting midges (Ceratopogonidae; *Dasyhelea* and *Bezzia/Palpomyia*) were quite variable seasonally, comprising a combined total of 20 percent of the community in October while they were absent in May. This was likely a natural seasonal variance, as this pattern was observed throughout the county (Appendix B.2-1, B.2-2). The damselfly, *Argia* also exhibited the same pattern of fall abundance.

The physical habitat of the reach was near optimal, with a substrate primarily of unconsolidated gravel and small cobble, with tree roots and emergent vegetation providing additional niche space. The riparian zone consisted of a narrow band of mostly undisturbed, mature live oak, and the stream had good canopy cover. Water quality measures detected the highest specific conductance value of any site in the San Diego County program in the October survey with a value of 7.925 mS/cm. This has been a consistent issue with this monitoring site. Specific conductance for the May survey was 4.689 mS/cm and values for pH were 7.7 in each survey.

The Tecolote Creek mass loading station was located several thousand feet downstream of the bioassessment station. Water quality measures may be correlated with the site although a limited amount of urban runoff enters the stream below 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, and turbidity (Table 9-4). Although historically total dissolved solids, pesticides, and toxicity to *Ceriodaphnia dubia*, *Hyalella azteca* and *Selenastrum capricornutum* have occurred, no toxicity was evident in 2006-2007 for *Ceriodaphnia, Hyalella,* or *Selenastrum*. Total metals including cadmium, copper, lead, and zinc were detected at levels that could prevent the colonization of highly sensitive organisms.

Summary Indices Results Over Time

The Tecolote Creek site has been sampled in every survey since October 2001. The mean IBI scores have shown considerable seasonal variation, with mean values of 16.2 for October surveys and 4.0 for May surveys (Figure 9-9). There were higher scores in October for every year of sampling except 2003. IBI scores have ranged from 0 (May 2002) to 20 (October 2004).

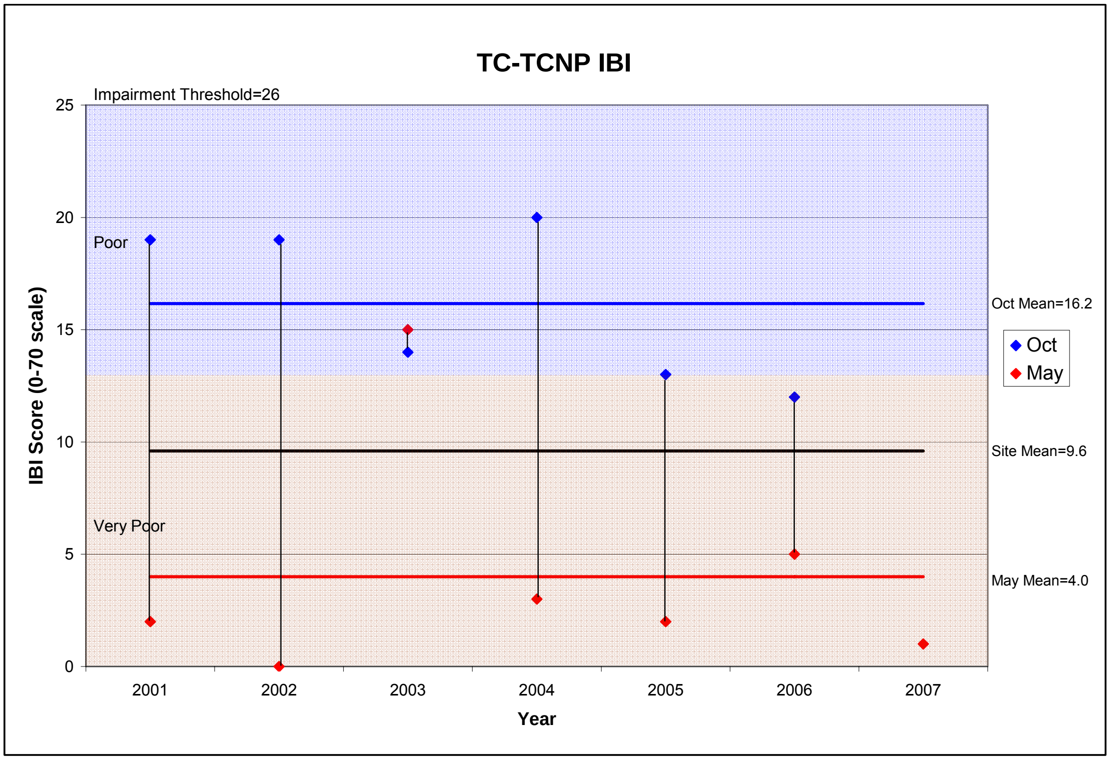


Figure 9-9. Index of Biotic Integrity for Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP).

The mean O/E ratios for Tecolote Creek were 0.63 for October surveys and 0.43 for May surveys (Figure 9-10). The October 2005 survey had an O/E ratio very near the impairment threshold while all of the May surveys indicated impairment. Both the IBI scores and the O/E ratios indicated the site supports a moderately degraded biological community in October and a highly degraded community in May.

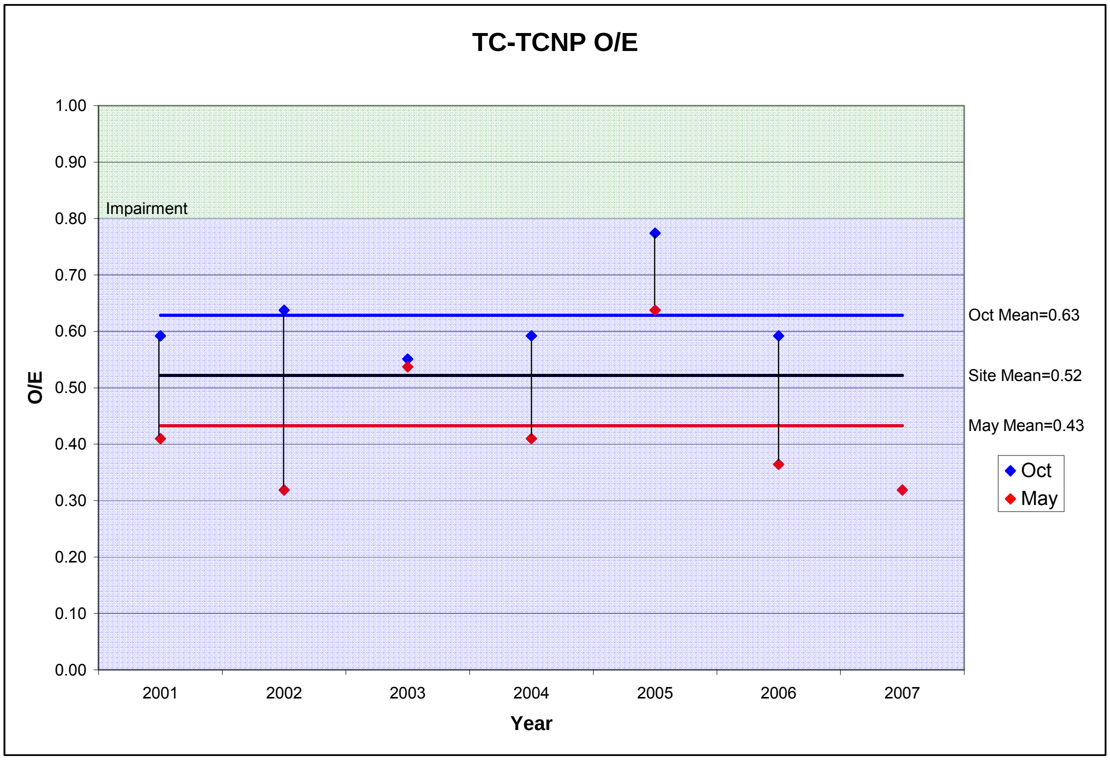


Figure 9-10. O/E Ratio Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP).

9.3.2 Stream Bioassessment Summary

The Mission Bay WMA was sampled at two sites. One site was in Rose Creek, downstream of Highway 52, and the other site was in Tecolote Creek in the lower reach of Tecolote Canyon Natural Park. The macroinvertebrate community of both sites had Index of Biotic Integrity ratings of Very Poor in the October and May surveys. The O/E ratios were in general agreement with the IBI scores, indicating degraded biotic conditions at the sites. The Tecolote Creek site had substantial seasonal variation in the total IBI score, which was even more pronounced with the O/E ratio, a pattern that has been consistent for this site throughout the duration of the program. These two sites also had some of the highest specific conductance readings of all of the county monitoring sites.

Since the beginning of the program, the Rose Creek site has had a mean IBI score of 12.5 and a mean O/E ratio of 0.58. The O/E rated the site unimpaired for the October 2002 and October 2005 surveys. Tecolote Creek has had a mean IBI score of 16.2 and a mean O/E ratio of 0.52. Both indices rated the site impaired for all surveys.

9.4 Ambient Bay and Lagoon Monitoring Program

The Ambient Bay and Lagoon Monitoring Program was not conducted in 2006.

9.5 Mission Bay WMA Assessment

The Mission Bay WMA was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS, field and chemistry data collected from up to 14 dry weather monitoring sites upstream of the MLS, and IBI scores generated at three bioassessment sites (Table 9-11). The watershed management area assessment methods presented in Section 3.4 were applied to these data to determine which constituents were of concern and to develop a high, medium, or low frequency of occurrence for these constituents. The results of this assessment are presented in Table 9-12.

Table 9-11. Watershed Assessment Data Set

Program Data Set	Data Collection Period	Constituents Assessed
Mass Loading Stations (MLS) Storm Event Monitoring	December 11, 1993 - February 19, 2007	Toxicity, Chemistry
Rapid Stream Bioassessments	October 2006 and May 2007	Benthic Macroinvertebrates
Dry Weather Monitoring (DWM)	May 2006 – September 30, 2006	Chemistry

9.5.1 Mission Bay WMA Criterion Assessment

Three constituents were found to have a high frequency of occurrence in the Mission Bay WMA and are listed below:

- Total Coliform
- Fecal Coliform
- Turbidity

Fecal coliform received a three diamond rating based on Criterion No. 1. Criterion No. 1 is when mass loading station tests results exceed benchmark WQO in greater than or equal to 80% of samples. Fecal coliform was above the benchmark WQO in 83% of all monitored wet-weather events. Total coliform received a three diamond rating based on Criterion No. 2. Criterion No. 2 is when six of the last consecutive storm samples at the MLS are above the benchmark WQO. Turbidity received a three diamond rating based on Criterion No. 3. Criterion No. 3 is when less than 80% and greater than or equal to 50% of the MLS samples exceed benchmark WQO and at least one dry weather site exceedance is found in the past year. Turbidity was above the benchmark WQO in 67% of the monitored wet-weather events and was above the dry weather action level in 71% of samples collected during the 2006 dry weather monitoring season.

Three constituents were found to have a medium frequency of occurrence and are listed below:

- Total Suspended Solids (TSS)
- Enterococcus
- Total Lead

Table 9-12. Wet Weather Constituent Exceedances in the Mission Bay WMA.

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		2005/2006		2006/2007		CUMULATIVE		2006			
	#/3	%	#/3	%	#/3	%	#/3	%	#/3	%	#/3	%	#/18	%	#	%		
Conventional Parameters																		
pH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	21	♦	8
Ammonia[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	18	♦	8
BOD	0	0	0	0	1	33	0	0	0	0	1	33	2	11	NA	NA	-	-
COD	1	33	1	33	2	67	1	33	0	0	1	33	6	33	NA	NA	♦	9
Total Suspended Solids	0	0	3	100	1	33	3	100	1	33	2	67	10	56	NA	NA	♦♦	6
Total Dissolved Solids	0	0	0	0	0	0	0	0	0	0	2	67	2	11	NA	NA	-	-
Turbidity	1	33	3	100	2	67	3	100	1	33	2	67	12	67	10	71	♦♦♦	3
Nutrients																		
Total Phosphorus	0	0	0	0	0	0	1	33	0	0	0	0	1	6	NA	NA	-	-
Bacteriological																		
Total Coliform	0	0	2	67	3	100	3	100	3	100	3	100	14	78	2	67	♦♦♦	2
Fecal Coliform	2	67	2	67	3	100	3	100	3	100	2	67	15	83	1	20	♦♦♦	1
Enterococcus	0	0	3	100	2	67	3	100	3	100	1	33	12	67	3	100	♦♦	6
Pesticides																		
Chlorpyrifos	0	0	1	33	0	0	0	0	0	0	0	0	1	6	0	0	-	-
Diazinon	3	100	3	100	1	33	0	0	0	0	0	0	7	39	0	0	-	-
Malthion	NA	NA	1	33	0	0	0	0	0	0	0	0	1	6	NA	NA	-	-
Total Metals																		
Antimony	0	0	1	33	1	33	0	0	0	0	0	0	2	11	NA	NA	-	-
Cadmium	0	0	0	0	0	0	0	0	0	0	1	33	1	6	NA	NA	-	-
Copper	0	0	3	100	1	33	1	33	1	33	1	33	7	39	NA	NA	-	-
Lead	0	0	3	100	1	33	3	100	1	33	1	33	9	50	NA	NA	♦♦	6
Zinc	0	0	0	0	0	0	1	33	1	33	1	33	3	17	NA	NA	-	-
Dissolved Metals																		
Copper	0	0	1	33	0	0	0	0	0	0	0	0	1	6	0	0	-	-
Toxicity																	**EVIDENCE OF PERSISTENT TOXICITY?**	
Ceriodaphnia 96-hour	0	0	1	33	0	0	0	0	0	0	0	0	1	6	NA	NA	No	
Ceriodaphnia 7-day survival	1	33	1	33	0	0	0	0	0	0	0	0	2	11	NA	NA	No	
Ceriodaphnia 7-day reproduction	1	33	1	33	1	33	0	0	1	33	0	0	4	22	NA	NA	No	
Hyalella 96-hr	0	0	0	0	0	0	0	0	1	33	0	0	1	6	NA	NA	No	
Selenastrum 96-hour	1	33	0	0	0	0	0	0	0	0	0	0	1	6	NA	NA		
Bioassessment	IBI Rating																**EVIDENCE OF BENTHIC ALTERATION?**	
Rose Creek	NA		Very Poor		Poor		Poor		Very Poor		Very Poor		Very Poor		NA		Yes	
Tecolote Creek	Very Poor		Poor		Very Poor		Very Poor		Very Poor		Very Poor		Very Poor		NA			

* = Total number of observations varied among constituents.
NA = Not assessed.
[1] Wet weather data is compared to the Basin Plan WQO for un-ionized ammonia, dry weather data is compared to the dry weather action levels.
- = 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.

Total suspended solids received a two diamond rating based on Criterion No. 6. Criterion No. 6 is when less than 80% and greater than or equal to 50% of the MLS samples exceed the benchmark WQO and one or more exceedances are found in the last two years of monitoring at the MLS (generally applies to historical datasets). Total suspended solids met this criterion by wet weather MLS samples exceeding the benchmark WQO in 56% of all the monitored events. Enterococcus received a two diamond rating based on Criterion 6. Enterococcus was above the benchmark WQO in 67% of all the monitored events and was above the benchmark WQO 5 times in the last two years. Total lead received a two diamond rating based on Criterion No. 6. Total lead was above the benchmark WQO in 50% of all the monitored events and was above the benchmark WQO in two events within the last two years.

Chemical Oxygen Demand (COD), ammonia, and pH were found to have low frequencies of occurrence and received one diamond ratings. Ammonia and pH received one diamond based on Criterion No. 8. Criterion No. 8 is when DWS exceedances are found in 10 to 50% of the samples in the past year. COD received one diamond based on Criterion No. 9. Criterion No. 9 is when MLS exceedances are found in 25% to less than or equal to 50% of the samples and at least one exceedance found in the last two years at the MLS (with or without dry weather site exceedances in the past year).

Enterococci was the only constituent with a significant trend (increasing) for constituents receiving diamond ratings for High, Medium, and Low frequencies of occurrence in the Mission Bay WMA.

Toxicity tests have shown evidence of toxicity at least once in all five types of toxicity tests during the 18 monitored storm events since 2001-2002. However, the most frequently observed toxicity to any test organism occurred in only 4 of the 18 (22%) tests performed over this period. During the 2006-2007 monitoring season, no toxicity was observed for any of the test species in exposures to water collected for Tecolote Creek during storm events. Therefore, there was no evidence of persistent toxicity in the Mission Bay WMA.

IBI scores resulting from bioassessment monitoring on Mission Bay WMA have consistently received a rating of either Poor or Very Poor at the Tecolote and Rose Creek bioassessment sites. The Rose Creek site received a rating of Poor in the 2003-2004 and 2004-2005 monitoring seasons and a rating of Very Poor in the 2002-2003, 2005-2006, and 2006-2007 monitoring seasons. The Tecolote Creek site received a rating of Poor in the 2002-2003 monitoring season and a rating of Very Poor in the 2003-2004, 2004-2005, 2005-2006, and 2006-2007 monitoring seasons. Therefore, there were indications of benthic alteration within the Mission Bay WMA.

Figure 9-11 summarizes the number of times water quality parameters were above benchmark WQOs for six categories of constituents. The categories include conventional, nutrients, bacteria, pesticides, metals and toxicity. The stacked bars represent the number of instances that water quality parameters were above benchmark WQOs using values from the wet weather MLS results in Table 9-12 for each constituent category. In the past five years of monitoring, conventional, nutrient, bacteriological, pesticide, metals, and toxicity parameters have all been measured above their respective benchmark WQOs. Conventional, bacteriological, and metals parameters were measured above their benchmark WQOs more frequently than pesticides, nutrients, and toxicity.

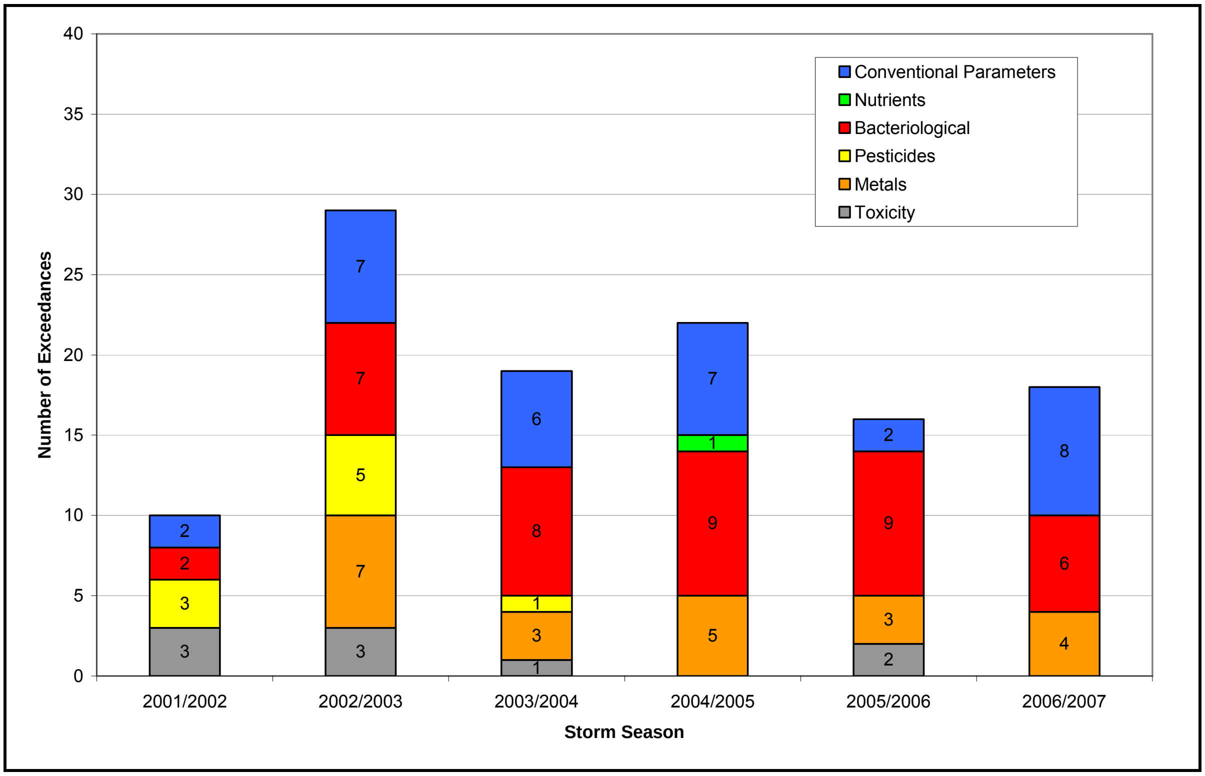


Figure 9-11. Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Mission Bay WMA.

9.5.2 Triad Decision Matrix

The triad decision matrix combines toxicity and bioassessment data with COC occurrence to draw potential conclusions about the watershed and provide possible actions for future monitoring or assessment. Table 9-13 summarizes the results and lists possible conclusions and actions.

Table 9-13. Triad Decision Matrix Results for the Mission Bay WMA.

Chemistry	Toxicity	Benthic Alteration	Possible Conclusion(s)	Possible Actions or Decisions
Persistent exceedances of benchmark WQOs (high frequency COC identified)	No evidence of persistent toxicity	Indications of alteration	Benthic impact due to habitat disturbance, not toxicity. Test organisms not sensitive to problem pollutants.	1) Continue monitoring to gather long-term trend information. 2) Evaluate upstream source identification as a high priority. 3) Consider whether different test organisms should be evaluated. 4) Consider potential role of physical habitat disturbance. 5) TIE would not provide useful information with no evidence of toxicity.

Based on the triad decision matrix, there was evidence of persistent exceedances of benchmark WQO (turbidity), no evidence of persistent toxicity, and evidence of benthic alteration. An investigation of possible upstream sources that may cause increased turbidity was recommended. It is possible that land use activities may contribute to higher turbidity concentrations. Continued monitoring to gather long-term trend information and a consideration of the potential role of physical habitat disturbance as a factor influencing benthic alteration is also recommended.

9.5.3 Water Quality Priority Ratings for the Mission Bay WMA

The baseline water quality priority ratings presented in the 2005-2006 Urban Runoff Monitoring Report are also presented in this report in Table 9-14. These tables are tools that assist managers in prioritizing watershed activities or are used for identifying data gaps. The priority ratings are based on the methodology presented in the BLTEA report (WESTON, MOE, & LWA, 2005) and are summarized in the Methods Section 3.4.

Table 9-14. Updated Water Quality Priority Ratings for the Mission Bay WMA

Watersheds/Sub-watersheds	Percentage of Total Area	Priority Ratings*										
		Constituent Groups									Stressor Groups	
		Heavy Metals	Dissolved Minerals	Organics	Oil and Grease	Sediments	Pesticides	Nutrients	Gross Pollutants	Bacteria/ Pathogens	Benthic Alterations	Toxicity
Mission Bay WMA	**100%**	***A***	***A***	***D***	***D***	***B***	***D***	***A***	***B***	***A***	***D***	***A***
Scripps HA (906.30)	15%	*C*	*D*	*D*	*D*	*B*	*D*	*A*	*B*	*A*	*D*	*D*
Miramar HA (906.4)	64%	*A*	*A*	*D*	*D*	*B*	*D*	*A*	*B*	*A*	*D*	*A*
Tecolote HA (906.5)	21%	*A*	*A*	*D*	*D*	*A*	*C*	*D*	*B*	*A*	*A*	*A*
2006-07 High[1] Frequency of Occurrence Ratings						♦♦♦				♦♦♦		
Constituents of Concern						Turbidity				Total Coliform Fecal Coliform		

1. High frequency of occurrence ratings are derived from the constituent exceedances tables and are provided for comparison purposes.

Notes:

** = Rating Calculated Based on Area Weighted Averages of Score Value from the sub-watershed areas.*

*** = Priority Level (Highest-A to Lowest-D)*

High Priority Level Based on Data

303d listing

The LTEA ratings are used to guide long term programmatic watershed activities and are performed on a 5-year cycle. The WMA assessments are used to guide annual water quality monitoring activities and to evaluate annual differences or changes through time. The WMA constituents of concern are compared to the LTEA ratings to evaluate if activities are showing improvements or impairments through the 5-year cycle.

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 priority ratings were based on the data record from 2001-2006 from the following programs and will be updated on a 5-year cycle:

- Storm Water Mass Loading Monitoring (MLS) – Wet Weather Data (2000-2006)
- Co-permittee Dry Weather Data Monitoring (2003-2005)
- Available Third Party Data (SWAMP, 2002)
- Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring (2003-2005)
- Urban Stream Bioassessment Monitoring (2000-2006)
- Triad Assessment – Toxicity Testing of Storm Water (2000-2006)
- 303(d) Listing (2003)

For the overall Mission Bay WMA, heavy metals, dissolved minerals, nutrients, bacteria, and toxicity were identified as high priority (A) rated constituents. The dissolved minerals category did not exist in the BLTEA report and was created to address constituents that did not apply to the other constituent categories and to better assess the sediment category. Categories receiving a B priority rating include sediments and gross pollutants. All other categories received a D rating. The complete tables used to calculate the ratings are presented in Appendix G.

High frequency of occurrence ratings from the WMA criterion assessments were included in the water quality priority rating summary table above. High frequency of occurrence ratings were determined for turbidity, total and fecal coliform, and enterococcus for the Mission Bay WMA. In comparison, the water quality priority ratings found high priority (A) ratings for the heavy metals, dissolved minerals, nutrients, bacteria, and toxicity categories and a B rating for the sediments category.

The high priority (A) rating for metals was primarily due to the 303(d) listings for metals in the Miramar and Tecolote sub-watershed and which account for a combined 85% of the overall WMA area, and due to noted metals exceedances in the Tecolote sub-watershed. Because it was a weighted average, larger sub-watersheds will have a greater influence in the overall watershed rating. The high priority (A) rating for dissolved minerals was primarily due to the exceedances of manganese and sulfate from the limited third party SWAMP data. The high priority (A) rating for nutrients was primarily due to the 303(d) listing for eutrophic conditions in the Miramar sub-watershed and due to less frequent dry weather exceedances. The high priority (A) rating for bacteria was primarily due to the 303(d) listing for bacteria in all sub-watersheds, frequent wet weather exceedances, and less frequent dry weather exceedances. The high priority (A) rating for toxicity is primarily due to the limited third party SWAMP data which showed toxicity to *Hyalella* and *Ceriodaphnia* in the Miramar sub-watershed, and the 303(d) listing for toxicity and wet weather data showing toxicity towards *Hyalella* in the Tecolote sub-watershed.

A list of potential likely or unknown sources for the nutrients and bacteria category in the Mission Bay WMA that are based on the threat to water quality inventory ratings tables can be found in the BLTEA report (WESTON, MOE, & LWA, 2005).

9.6 Conclusions and Recommendations

The Mission Bay WMA is the smallest watershed in San Diego County. The contributing runoff area to the Tecolote Creek MLS is approximately 14% of the Mission Bay Watershed land area. The major land uses within the contributing runoff area residential (44%), parks (19%) and transportation (18%).

For the Mission Bay WMA, turbidity, total coliform, fecal coliform were identified as high frequency of occurrence COCs; while TSS, enterococcus, and total lead, were identified as a medium frequency of occurrence COCs. A review of the scatterplots and trends indicate significant downward trends for BOD, Diazinon, nitrate, and oil and grease concentrations. A significant increasing trend for enterococcus concentrations was also observed. Third party data collected under the SWAMP program in 2002 were collected at two sites within the Mission Bay Watershed, one in Tecolote Creek near the mass loading station and the other in Rose Canyon Creek. At Tecolote Creek, sulfate, manganese, and toxicity were measured above their respective benchmark WQOs. Constituents with results above the benchmark WQO at Rose Canyon Creek included sulfate, manganese, turbidity, pH, Diazinon and toxicity. However, Diazinon has not been detected above the benchmark WQO at the Tecolote MLS during the past three monitoring seasons.

Measured storm event loads were compared to loading values derived from the National Stormwater Quality Database (NSQD) (Pitt et al., 2004). Measured loads for total dissolved solids and bacterial indicators were greater than expected for a majority of the storm events sampled. Most of the constituents measured were within the expected range or lower that expected. In particular, several metals consistently showed lower than expected loads for all the storms events sampled.

Two stream bioassessment monitoring sites were sampled in the Mission Bay WMA. One site was in Rose Creek, downstream of Highway 52, and the other site was in Tecolote Creek in the lower reach of Tecolote Canyon Natural Park. The macroinvertebrate community of both sites had Index of Biotic Integrity ratings of Very Poor in the October and May surveys. The O/E ratios were in general agreement with the IBI scores, indicating degraded biotic conditions at the sites. The Tecolote Creek site had substantial seasonal variation in the total IBI score, which was even more pronounced with the O/E ratio, a pattern that has been consistent for this site throughout the duration of the program. These two sites also had some of the highest specific conductance readings of all of the county monitoring sites. Though synthetic pyrethroids were detected during all three monitoring events, *Hyalella azteca*, a species sensitive to synthetic pyrethroids, were found to be the most abundant species during the October surveys.

Since the beginning of the program, the Rose Creek site had a mean IBI score of 12.5 and a mean O/E ratio of 0.58. The O/E rated the site above the impairment threshold for the October 2002 and October 2005 surveys. Tecolote Creek had a mean IBI score of 16.2 and a mean O/E ratio of 0.52. Both indices rated the site below the impairment threshold for all surveys.

In addition to the WMA assessment findings, the water quality priority ratings found high priority (A) ratings for the heavy metals, dissolved minerals, nutrients, bacteria, and toxicity categories and found a B priority rating for the sediments category.

The information provided from the triad matrix results used in conjunction with the water quality priority ratings can assist the City of San Diego 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 usable data from other third party sources such as POTWs and non-profit organizations would also help to increase the confidence of the water quality priority ratings and overall WMA assessments.

The recommendations for this watershed are to continue monitoring to gather long-term trend information, identify where data gaps exist and do not allow for informed decision making, and consider where watershed resources may be more effectively targeted to reduce heavy metals, dissolved minerals, nutrients, bacterial indicators, toxicity, and impacts to the physical stream habitats. The implementation of the new monitoring permit cycle will allow for assessing the watershed during both dry weather and wet weather conditions. Monitoring at two temporary watershed assessment stations (TWAS) (Rose Canyon and Tecolote Creek) will begin during the 2009-2010 season. These two stations will assist in addressing the spatial distribution of heavy metals, dissolved minerals, nutrients, bacteria, and toxicity. Future monitoring stations associated with the outfall monitoring and source identification studies should be located with respect to assessing the spatial distribution of constituents of concern and with respect to watershed priority activities.