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12.0 CONCLUSIONS AND RECOMMENDATIONS

12.1 Conclusions

This report provides a summary of the 2007–2008 Receiving Waters Monitoring Program for the Copermittees identified as dischargers of urban runoff in the San Diego Regional Water Quality Control Board (RWQCB) Order No. 2007-0001 (Permit). This report marks the first year of monitoring and reporting under the Permit. The following monitoring activities were conducted by the Copermittees during the 2007–2008 Monitoring Season and were described in detail in each watershed section of the report:

- Mass loading station (MLS) and temporary watershed assessment station (TWAS) monitoring.
- Toxicity identification evaluations (TIEs) (Agua Hedionda Watershed only).
- Rapid stream bioassessment (RSB) monitoring.
- Coastal storm drain monitoring (CSDM).
- Jurisdictional dry weather monitoring (CSDM)
- Synthetic pyrethroid monitoring.
- Municipal separate storm sewer system (MS4) outfall monitoring.

Receiving water monitoring at MLS and TWAS was conducted during two ambient weather events and two wet weather events. Each element of monitoring is designed to answer the five core management questions. The core management questions, as listed in the Permit, are presented as follows:

1. Are conditions in receiving waters protective, or likely to be protective, of beneficial uses?
2. What is the extent and magnitude of the current or potential receiving water problems?
3. What is the relative urban runoff contribution to the receiving water problem(s)?
4. What are the sources of urban runoff that contribute to receiving water problem(s)?
5. Are conditions in receiving waters getting better or worse?

The current monitoring program has allowed the San Diego County Copermittees to gain an understanding of ambient weather and wet weather conditions at the base of the watersheds and at temporary upstream locations in the northern watersheds in San Diego County. Watershed water quality monitoring is performed by the Copermittees during wet weather rain events, ambient weather monitoring events, dry weather field screening; and illegal connection and illicit discharge (ICID) investigations are performed, CSDM is performed, and limited third-party data are included. These water quality data results are incorporated with annual stream bioassessment data to provide a holistic approach to assessing each watershed and the San Diego County region. Watershed assessments were performed following the Watershed Data Assessment Framework (WESTON, 2004) modified to assess both ambient weather conditions and wet weather conditions separately. Watershed area assessments are prepared on an annual basis and are compared to the baseline water quality priority ratings that assist in guiding watershed management activities. The monitoring program has provided assessments of long-term trends at historic stations and continues to build the foundation for long-term trends. Additionally,

programmatic changes with the implementation of the new Permit cycle provides additional spatial data, assessment of emerging compounds (e.g., synthetic pyrethroids), assessment of trash, and focused programs to address pollutant sources and MS4 outfalls. The Copermittees planned participation in the Southern California Bight Monitoring Program during the 2008–2009 Monitoring Season will also provide valuable insight into the conditions of San Diego estuaries and the regional marine environment.

12.2 Watershed Water Quality Monitoring Conclusions

12.2.1 Ambient Monitoring Conclusions

Ambient weather condition monitoring was conducted in the northern portion of San Diego County and in Chollas Creek in accordance with the Permit. Ambient weather condition samples were collected using flow-weighted composite techniques over approximately 24 hours within each watershed. Grab samples were collected for those parameters not conducive to compositing. The results of each ambient weather event were summarized in the individual watershed management area (WMA) sections. Watersheds were compared by examining key constituents across watersheds and over time to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined either as a potential concern based on the frequency and magnitude of concentrations above the applicable ambient weather water quality benchmark (benchmark) and/or an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group).

A comparison of the regional ambient weather condition data results and highlighted values for the 2007–2008 Monitoring Season are presented by constituent group as follows:

Bacteria – Bacterial concentrations were considerably lower in receiving waters compared with storm event monitoring results. However, enterococcus and fecal coliform exceedances were still noted. Fecal coliform concentrations were above the benchmark in seven of 32 samples collected during the ambient weather monitoring. The highest concentrations were observed at the Chollas Creek MLS during one of the two monitoring events. Enterococci were above the benchmark in 20 of 32 samples collected during the ambient weather monitoring. Enterococcus concentrations were above the benchmark during every event at the Los Peñasquitos MLS, while at the same time, fecal coliforms were below the benchmark during every event at the Los Peñasquitos MLS.

Total Dissolved Solids (TDS) – TDS concentrations were observed above the benchmark in all samples monitored during the ambient weather monitoring events. Higher TDS concentrations may indicate greater contributions from higher dissolved mineral salts from groundwater/base flow or imported water stored in local reservoirs. TDS is a known issue related to importation of municipal water supplies, over-irrigation, and documented recycled water use. The San Diego Regional 303(d) Workgroup developed an issue paper titled, *An Analysis of the Proposed 303(d) Listings for Total Dissolved Solids in San Diego County Watersheds* (San Diego Regional 303(d) Workgroup, 2002). This report noted that many of the dissolved solids in surface water in San Diego County are derived from imported water used in agriculture and other applications within

the basins. Furthermore, many of the watersheds monitored are downstream of local reservoirs supplied by Colorado River water.

Total Suspended Solids (TSS) – TSS concentrations were below the benchmark in all but two of the ambient weather samples collected (two of 32 samples). The only exceedances were noted for the San Dieguito TWAS-2 Site, which was monitored during March 2008 and June 2008. Both sampling events occurred after the 2007 San Diego Wildfires, which burned a significant portion of the San Dieguito Watershed. Sample results indicated that ambient weather condition TSS results were generally low in San Diego watersheds, since they were typically low flow conditions.

Nutrients (phosphorus, nitrate, and nitrite) – Nutrient concentrations were generally low compared with storm monitoring events. Due to recent developments in nutrient numeric endpoint (NNE) criteria at the statewide level, the results were not compared to Basin Plan standards. An evaluation of the potential impacts of nutrients was conducted using secondary indicators of eutrophication collected during the two ambient weather monitoring events and during one bioassessment monitoring event. The secondary indicators of nutrient-induced eutrophication were selected based on the NNE methodology (Tetra Tech, 2006) and include benthic algal biomass, dissolved oxygen (DO), pH, and dissolved organic carbon (DOC). The purpose of this evaluation is to assess the risk elevated nutrients may pose to beneficial uses by comparing concentrations of secondary indicators at a site to benchmarks established for each beneficial use. Results indicated that watersheds may have localized impacts to a varying degree.

- Presumptive unimpaired sites:
  - Santa Margarita MLS.
  - San Luis Rey MLS and San Luis Rey TWAS.
  - Loma Alta Creek (pH only).
  - Buena Vista Creek (pH and DO only).
  - Agua Hedionda MLS and Agua Hedionda TWAS-1 (pH and DO only).
  - Escondido Creek MLS (pH and DO only) and Escondido Creek TWAS-1.
  - San Dieguito Creek MLS and San Dieguito Creek TWAS-1 (pH and DO only) and San Dieguito Creek TWAS-2 (pH and benthic algal biomass only).
  - Los Peñasquitos MLS (pH and DO only) and Los Peñasquitos TWAS-1 and Los Peñasquitos TWAS-2.

- Potentially impaired sites:
  - Santa Margarita MLS (DOC only for municipal beneficial uses).
  - Buena Vista Creek TWAS-1 (benthic algal biomass for WARM beneficial uses).
  - Loma Alta Creek TWAS-1 (benthic algal biomass and DO for WARM beneficial uses).
  - Agua Hedionda TWAS-1 during Spring 2008 (benthic algal biomass for municipal beneficial uses).
  - Agua Hedionda MLS and Agua Hedionda TWAS-1 during Fall 2007 (DOC only for municipal beneficial uses).
  - Escondido Creek MLS and TWAS-1 (DOC only for municipal beneficial uses).

  - San Dieguito Creek MLS and TWAS-1 (benthic algal biomass for cold, WARM, and municipal beneficial uses) and San Dieguito Creek TWAS-2 (DO for cold beneficial uses).
  - Chollas Creek (pH for WARM beneficial uses).

- Presumptive impaired sites:
  - Agua Hedionda MLS and Agua Hedionda TWAS-1 during Spring 2008 (DOC only for municipal beneficial uses).
  - Escondido Creek MLS (benthic algal biomass for cold, WARM, and municipal beneficial uses).
  - San Dieguito Creek TWAS-1 and San Dieguito Creek TWAS-2 (DOC for municipal beneficial uses and likely due to high presence of ash from 2007 San Diego Wildfires).
  - Los Peñasquitos MLS (benthic algal biomass for WARM beneficial uses).

Pesticides – There were no benchmark exceedances for pesticides in water during the ambient weather monitoring for 2007–2008. Diazinon was the only organophosphate pesticide detected above the method detection limit, which occurred at Agua Hedionda TWAS-1 (estimated value of 3.1 ng/L during May 2008). All other organophosphate compounds were not detected. Synthetic pyrethroids were analyzed in post-storm event sediments in accordance with the Monitoring Work Plan for the Assessment of Synthetic Pyrethroids in San Diego County (WESTON, 2007). Post-storm sediment samples for pyrethroids indicated that results were generally low or not detected in receiving water sites. Bifenthrin was the most common analyte detected and was found in most urbanized sites. Sites with synthetic pyrethroid results above the sediment LC_{50} for *Hyalella azteca* are summarized below:

- Escondido Creek MLS (Bifenthrin =12 ng/g, and Cyfluthrin = 27.4 ng/g).
- Buena Vista Creek TWAS-1 (Bifenthrin = 8.8 ng/g).
- San Dieguito River MLS (Bifenthrin = 4.2 ng/g).
- Los Peñasquitos MLS (Bifenthrin = 6.5 ng/g).
- Chollas Creek MLS (Bifenthrin = 3.5 ng/g).

Metals – Chollas Creek MLS was the only site with an ambient weather metal result above the total or dissolved benchmark. There were no benchmark exceedances of either total or dissolved metals in the north San Diego County sites. At the Chollas MLS during the March 2008 ambient weather event, metals above their respective benchmark include total selenium (0.006 mg/L) and dissolved copper (0.069 mg/L). Dissolved copper was also above the chronic benchmark during the June 2008 ambient weather event. As mentioned in the San Diego Bay WMA section, atmospheric deposition rates of copper in Chollas Creek are considerably higher than other areas throughout City of San Diego jurisdiction.

Toxicity – Toxicity test results were considerably different for ambient weather events compared with storm water events monitored. With the exception of the Chollas Creek MLS, there was no acute or chronic survival toxicity observed to *Ceriodaphnia dubia* or *H. azteca.* During the March 2008 ambient weather event at the Chollas Creek MLS, toxicity was observed in all endpoints measured (*C. dubia* acute, chronic, and reproductive tests; *H. azteca* acute; and *Selenastrum capricornutum* chronic) and was likely associated with elevated copper and

selenium results detected during this event. However, no toxicity was observed in any of the endpoints measured during the June 2008 ambient weather, which suggests that toxicity observed during March 2008 may be associated with an isolated discharge event and was not indicative of long-term ambient weather conditions in Chollas Creek. Toxicity was observed to *C. dubia* reproduction in ten of 30 ambient weather event tests conducted and to *S. capricornutum* in seven of 32 ambient weather event tests. Toxicity was not observed during the ambient weather monitoring for any species tested at the Santa Margarita MLS, San Luis Rey MLS, or Buena Vista TWAS-1.

12.2.2 Wet Weather Monitoring Conclusions

Wet weather (storm event) condition monitoring was conducted in the northern portion of San Diego County and in Chollas Creek in accordance with the Permit. Storm event samples were collected using flow-weighted composite techniques and using grab samples for those parameters not conducive to compositing. The results of each storm event were summarized in the individual WMA sections. Watersheds were compared by examining key constituents across watersheds and over time to determine similarities among the areas, land use, and watershed characteristics. Key constituents were defined as having either been rated as a potential concern based on the frequency and magnitude of concentrations above the applicable wet weather benchmark and/or being an indicator of water quality within a constituent group (e.g., total phosphorus is an indicator constituent in the nutrient group).

A comparison of the regional wet weather condition results and highlighted values for the 2007–2008 Monitoring Season are presented by constituent group as follows:

Bacteria – Bacterial concentrations were elevated throughout the region for all three of the indicator bacteria. Fecal coliform concentrations were above the benchmark in 27 of 32 samples collected during the season. The highest fecal coliform concentrations were observed at the San Dieguito River TWAS-2 Site (220,000 most probable number (MPN)/100 mL).

TDS – TDS concentrations were lower during storm events compared with ambient weather conditions, likely a result of dilution associated with precipitation events. The second storm event monitored was also typically lower than the first storm monitored. TDS results above the benchmark were noted for the San Luis Rey MLS; Agua Hedionda Creek MLS and TWAS-1; Escondido Creek TWAS-1; San Dieguito River MLS, TWAS-1, and TWAS-2; and Los Peñasquitos Creek MLS and TWAS-1. Higher TDS concentrations may indicate greater contributions from higher dissolved mineral salts from groundwater/base flow or imported water stored in local reservoirs.

TSS – TSS concentrations were above the benchmark in 20 of 32 samples tested. TSS was below the benchmark in both storm events captured at the Santa Margarita MLS. TSS concentrations were an order of magnitude higher at San Dieguito Creek TWAS-2 compared with all other sites during both storm events and was directly associated with the recently burned watershed from the 2007 San Diego Wildfires. High concentrations of TSS indicate the potential for hydromodification and transport of organic constituents. The intensity and duration of storm events can affect TSS concentrations. Similar patterns were observed for turbidity results.

Nutrients (phosphorus, nitrate, and nitrite) – Total phosphorus concentrations were below the wet weather benchmark in all but one site (San Dieguito River TWAS-2), which had results above the benchmark during both storm events. There were no nitrate results above the wet weather benchmark. Nitrite was above the wet weather benchmark only at the San Dieguito TWAS-2 Site during the November 2007 storm event, which also coincides with the high ammonia observed at the site during this event. Fire related impacts from the 2007 San Diego Wildfires in this watershed and elevated sediment concentrations are a likely cause for the high nutrient results in the San Dieguito Watershed.

Pesticides – The organophosphate pesticides (Chlorpyrifos, Diazinon, and Malathion) were mostly below the wet weather benchmark. Chlorpyrifos was above the benchmark during both storm events at the Agua Hedionda MLS and TWAS-1 sites and during both storms at the San Dieguito TWAS-1 Site. The two exceedances of Chlorpyrifos detected at the San Dieguito River TWAS-1 Site (which is in a mostly residential land use area) may be related to pre-termiticide applications of this previously banned pesticide. Monitoring occurred after the 2007 San Diego Wildfires, and entire neighborhoods in this area were destroyed by the Witch Fire. Many of the homes were burned to the ground, leaving only the foundation area exposed. Diazinon was above only the chronic benchmark in Chollas Creek during the first storm event monitored. Chollas Creek is one of the most highly urbanized areas in San Diego County and has a total maximum daily load (TMDL) for Diazinon. Historical monitoring results are presented on Figure 12-1, including associated restriction dates. It is evident that Diazinon use and detections have dramatically decreased since the first restriction date. However, a shift in pesticide use to readily available synthetic pyrethroids has been noted.

The Copermittees have implemented a region-wide assessment of synthetic pyrethroids and have added pyrethroids to the wet weather analytical constituent list. Post-storm pyrethroid sediment monitoring was also implemented and described previously in the ambient weather monitoring section. Synthetic pyrethroids were detected in eight of the nine monitored watersheds. Synthetic pyrethroids were not monitored in storm water by Camp Pendleton for the Santa Margarita River. However, pyrethroids were not detected in the post-storm sediments from the Santa Margarita River MLS, and due to the low residential land use in this area, it is not likely that pyrethroids are an issue in this watershed. The synthetic pyrethroid Bifenthrin was detected in all monitored urban watersheds. Bifenthrin measured above the benchmark in 22 of 30 site samples analyzed. There were no detections of pyrethroids at the San Dieguito TWAS-2 Site, which is mostly vacant and undeveloped land and agriculture land uses. Watersheds with exceedance of both storm water results and post-storm sediments above the water and sediment benchmark were noted at the Buena Vista Creek TWAS-1, Escondido Creek MLS, San Dieguito River MLS, Los Peñasquitos Creek MLS, and Chollas Creek MLS.

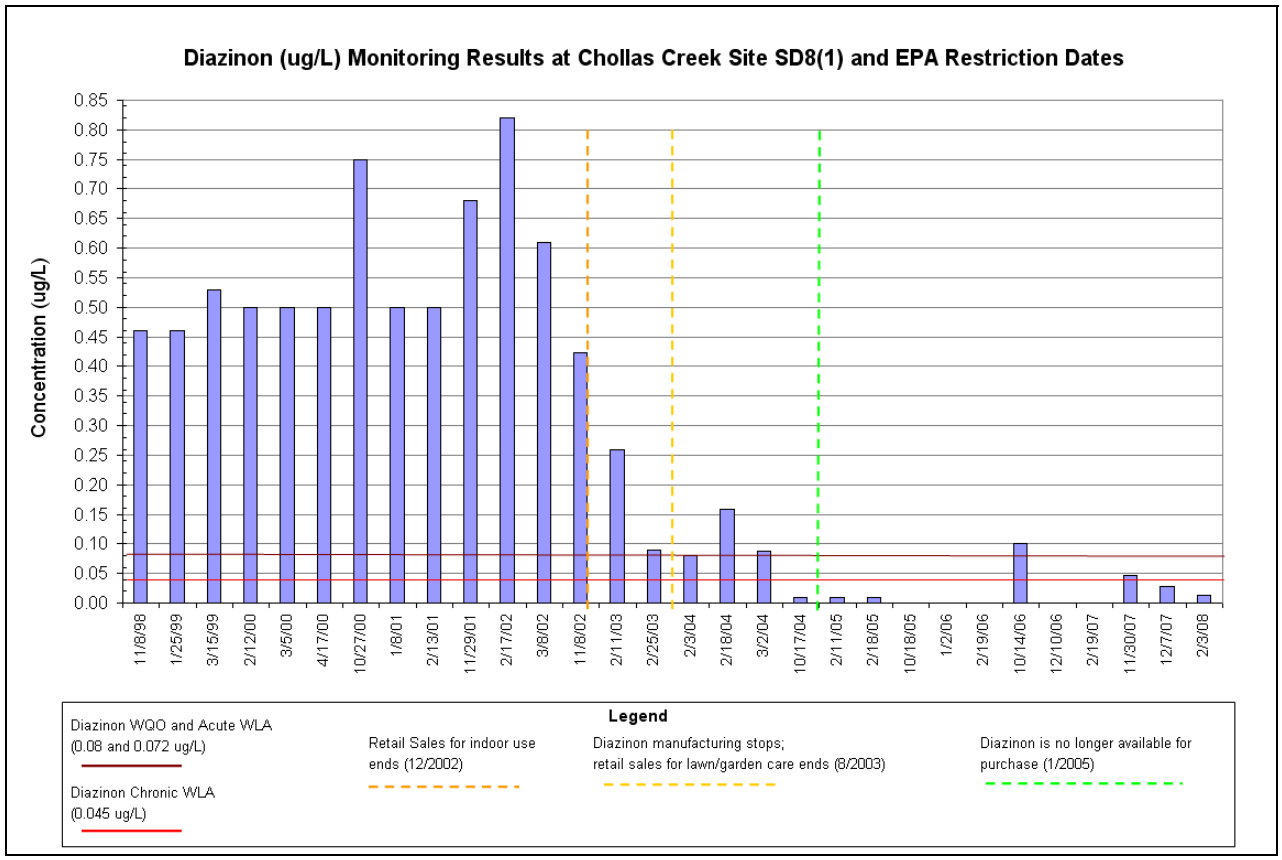

Figure 12-1. Historical Wet Weather Diazinon Concentrations at Site SD8(1) with Restriction Dates

Metals – There were no results above the total metals benchmarks during the 2007–2008 Monitoring Season. Chollas Creek was the only watershed with results above the dissolved metals wet weather benchmarks, which are based on the California Toxics Rule (CTR) hardness based acute criteria which were noted for dissolved copper and dissolved zinc during both wet weather monitoring events. Chollas Creek has a TMDL for dissolved copper, lead, and zinc, and there are known issues related to atmospheric deposition, high impervious area, and low hardness results. As a result, Chollas Creek has the lowest benchmark criteria compared with all other watersheds.

Toxicity – Toxicity testing was conducted using three test species (*C. dubia*, *H. azteca*, and *S. capricornutum*). Toxicity was not observed at any sites monitored during wet weather for the acute or chronic survival endpoints for *C. dubia* or to *S. capricornutum*. Toxicity was observed to the *C. dubia* reproductive endpoint in two of 32 samples collected (one sample collected from the San Luis Rey TWAS-1 Site and one sample collected from the San Dieguito River MLS Site). Toxicity to *H. azteca* was observed in 20 of 30 test wet weather monitoring samples. Toxicity to *H. azteca* was observed in all samples collected from the Carlsbad WMA and from Chollas Creek MLS. Every sample where toxicity was observed to *H. azteca* was associated with a detection of the synthetic pyrethroid Bifenthrin above the published water LC_{50} for *H. azteca*. TIEs also confirmed synthetic pyrethroids as the causative agent of toxicity to *H. azteca*

in samples collected from the Agua Hedionda MLS. Toxicity to *H. azteca* as a result of synthetic pyrethroids is a region-wide and state-wide problem and is currently being addressed by the Department of Pesticide Regulation (DPR). The California Stormwater Quality Association (CASQA) Pesticide Subcommittee is actively working with DPR during the re-registration period for these compounds. The CASQA Pesticide Subcommittee is also a valuable resource for information sharing on synthetic pyrethroids and other pesticides.

12.2.3 Toxicity Identification Evaluation

Based on the recommendations from the 2006–2007 Annual Monitoring Report findings, TIEs were recommended for toxicity to *H. azteca* during the 2007–2008 Monitoring Season at the Agua Hedionda Creek MLS. TIEs are very useful to identify the family of chemical compounds contributing to the observed toxicity. TIEs use a variety of physical (e.g., filtration) and chemical treatments (e.g., sodium thiosulfate to bind free chlorine) performed on the sample combined with sequential toxicity tests to identify the toxic agent. During the 2007–2008 Monitoring Season, one TIE was conducted on a water sample collected at the Agua Hedionda MLS during the November 30, 2007 storm event.

The results from the TIE performed on the Agua Hedionda Creek storm water sample indicated that synthetic pyrethroids were the most likely cause of the observed toxicity to *H. azteca.* This was based primarily on one of the TIE treatments involving the addition of a compound called piperonyl butoxide (PBO). Toxicity increased dramatically when the storm water sample was supplemented with PBO, which is known to work synergistically with pyrethroids in enhancing toxicity (Budavari, 1989). In addition, a reduction in toxicity was observed following filtration of the storm water sample, which indicates that the causative agent was highly bound to particulates in the sample. Pyrethroids have high adsorption coefficients, indicating their tendency to adsorb to particulates (Kidd and James, 1991). Other possible constituents (e.g., metals, volatiles, surfactants, and organophosphate pesticides) were considered to be unlikely sources of the toxicity based on tests conducted in the TIE. Together, these results suggest that synthetic pyrethroids, which were found in relatively high concentrations in storm water samples from Agua Hedionda Creek, were the most likely cause of toxicity observed in the November 30, 2007 storm event.

12.2.4 Rapid Stream Bioassessment Monitoring

RSB monitoring was conducted in accordance with Permit year one. The Fall 2007 bioassessment sampling was not required as a result of Addendum No. 2 of the Permit, which specified that fall bioassessment surveys would not be required if the Copermittees participated in the Stormwater Monitoring Coalition (SMC) Spring 2009 Regional Sampling Program. During the 2007–2008 Monitoring Season, the Copermittees elected to participate in the SMC Monitoring Program, and therefore, only conducted the RSB Program survey during Spring 2008.

RSB monitoring was conducted pursuant to California Department of Fish and Game (CDFG) RSB monitoring procedures to provide a measure of stream health. During the RSB surveys, periphyton monitoring was conducted in accordance with the United States Environmental

Protection Agency (USEPA) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (EPA 841-B-99-002, Section 6.2).

Result of the 2008 Spring bioassessment survey are summarized in Table 12-1. Results show that non-reference sites were all rated Poor or Very Poor, while reference sites were rated Fair, Good, or Very Good.

Table 12-1. Summary of Index of Biotic Integrity Scores and Ratings from Spring 2008 Bioassessment Survey

Watershed	Monitoring Reach	Total IBI Score	IBI Rating
Santa Margarita River	REF-SC2	30	**Fair**
Santa Margarita River	RC-WGR	28	**Fair**
Santa Margarita River	SMR-MLS-2	20	**Poor**
San Luis Rey River	REF-DC	58	**Very Good**
San Luis Rey River	SLR-MLS	3	**Very Poor**
San Luis Rey River	SLR-TWAS-1	5	**Very Poor**
Loma Alta Creek	LAC-TWAS-1	12	**Very Poor**
Buena Vista Creek	BVC-TWAS-1	13	**Very Poor**
Agua Hedionda Creek	AHC-MLS	15	**Poor**
Agua Hedionda Creek	AHC-TWAS-1	8	**Very Poor**
Escondido Creek	ESC-MLS	11	**Very Poor**
Escondido Creek	ESC-TWAS-1	16	**Poor**
San Dieguito River	SDC-MLS	18	**Poor**
San Dieguito River	SDC-TWAS-1	9	**Very Poor**
San Dieguito River	SDC-TWAS-2	28	**Fair**
Los Penasquitos	PC-MLS	9	**Very Poor**
Los Penasquitos	PC-TWAS-1	3	**Very Poor**
Los Penasquitos	PC-TWAS-2	3	**Very Poor**
San Diego River	REF-BCR	44	**Good**
Chollas Creek	CC-FB	4	**Very Poor**

IBI – Index of Biotic Integrity

12.2.5 Receiving Water Persistent Constituents of Concern and Trends

The results for the 2007–2008 Monitoring Season were combined with historical results, and were compared statistically to identify temporal trends within each watershed. The high frequency of occurrence constituents of concern (COCs) identified through the WMA assessment process and the observed significant Mann-Kendall statistical trends are shown in Table 12-2.

Table 12-2. Table Mass Loading Station or Base Temporary Watershed Assessment Station Persistent Constituents and Trends

Mass Loading Station or Base TWAS	Persistent Ambient Weather Constituents of Concern	Persistent Wet Weather Constituents of Concern	Significant Wet Weather Trends Observed[1]
Santa Margarita River	TDS	Turbidity Fecal coliform	Decreasing – fecal coliform
San Luis Rey River	TDS Enterococci	TDS Fecal coliform	Increasing – turbidity, fecal coliform, total coliform, nitrate, and enterococci
Loma Alta Creek	TDS	TSS Turbidity Fecal coliform Enterococci	Insufficient data to conduct trend analysis
Buena Vista Creek	TDS Enterococci	TSS Turbidity Total coliform Fecal coliform Enterococci	Insufficient data to conduct trend analysis
Agua Hedionda Creek	TDS Fecal coliform Enterococci	TDS TSS Turbidity Total coliform Fecal coliform Enterococci	Increasing – ammonia, chemical oxygen demand (COD), dissolved phosphorus, TSS and turbidity, indicator bacteria, and four metals (total copper, lead, nickel, and zinc) Decreasing – TDS and conductivity
Escondido Creek	TDS Enterococci	TDS Turbidity Total coliform Fecal coliform Enterococci	Increasing – biochemical oxygen demand (BOD), indicator bacteria, and total zinc Decreasing – TDS, dissolved nickel, dissolved phosphorus, and total hardness
San Dieguito River	TDS Enterococci	TDS Fecal coliform	Increasing – total kjeldahl nitrogen (TKN) and total phosphorus
Los Peñasquitos Creek	TDS Enterococci	TDS Fecal coliform	Increasing – turbidity and total nickel
Tecolote Creek[2]	No ambient weather monitoring to date	Turbidity Total coliform Fecal coliform	Increasing – enterococci Decreasing – Diazinon, oil & grease, nitrate, and BOD
San Diego River[2,3]	TDS Enterococci	Turbidity Fecal coliform	Increasing – turbidity and TSS Decreasing – nitrate, dissolved copper, and dissolved arsenic
Chollas Creek	TDS Dissolved copper	Turbidity TSS Total coliform Fecal coliform Enterococci	Increasing – total copper, total zinc, turbidity, and toxicity to *H. azteca* Decreasing – nitrate and TDS
Sweetwater River[2]	No ambient weather monitoring to date	Fecal coliform	Increasing – pH and dissolved phosphorus
Tijuana River[2]	No ambient weather monitoring to date	Turbidity TSS Total coliform Fecal coliform Enterococci Diazinon	Increasing – nitrate, total organic carbon (TOC), TSS, turbidity, total coliform, fecal coliform, total arsenic, lead, zinc, and toxicity to *H. azteca* Decreasing – TDS, Diazinon, dissolved arsenic, and dissolved nickel

1. This is the first year of ambient weather analyses; therefore, only wet weather trends are presented.
2. Results were based on 2006–2007 receiving water monitoring data.
3. Ambient weather data for San Diego River was based on third-party data from Padre Dam and City of Santee.

12.2.6 Jurisdictional Dry Weather Monitoring Conclusions

Each jurisdiction conducts a separate Dry Weather Monitoring (DWM) Program described in each Jurisdictional Urban Runoff Management Program (JURMP) Annual Report. Dry weather samples are collected from the jurisdictions' MS4 to detect and eliminate ICIDs. Samples are collected from May 1 through September 30 each Permit year. The results of the 2007 DWM Program were included in this report's data assessment and provide a comparison of urban runoff in the MS4 to the ambient weather and storm event receiving water condition. The DWM Program primarily answers two core management questions, which address urban runoff discharges in the MS4: 3) What is the relative urban runoff contribution to the receiving water problem(s)? and 4) What are the sources of urban runoff that contribute to receiving water problem(s)?

During the 2007 DWM Program, out of 8,749 individual field and analytic samples, 540 samples had results measured above the dry weather action levels (Table 12-3) for an exceedance rate of only 6.2%. Table 12-3 also shows the exceedance rate for each analyte measured under the DWM Program. The analyte with the highest rate of results above the action level for 2007 was total coliform (25.1%). Conductivity had the second highest exceedance rate (14.6%), which is consistent with the known regional issues related to TDS. Out of 333 dry weather samples collected from the region, there were no dry weather action level exceedances of the pesticides Chlorpyrifos or Diazinon. Aside from action level exceedance for dissolved copper, dissolved metals were below the action levels, which are based on the CTR, hardness based criteria.

When the Regional Monitoring Program implemented the analysis of organophosphate pesticides in 2001, it is was based on the threat of these pesticides entering the regions receiving waters, evidence of persistent exceedances of Diazinon and Chlorpyrifos, and evidence of pesticide-induced acute and chronic toxicity to *C. dubia*. DWM results for Chlorpyrifos and Diazinon over the past five years are shown in Table 12-4. The dry weather exceedance rates for Diazinon and Chlorpyrifos have steadily declined over the past five years of monitoring and have been less than 1% in each year over the past three years. With respect to the USEPA ban on the pesticides Diazinon and Chlorpyrifos and the infrequent (or lack of) detections for these analytes in the DWM Program, this analysis could be justifiably removed from monitoring program requirements.

Table 12-3. 2007 Jurisdictional Dry Weather Monitoring Data Summary of Action Level Exceedances

Constituent Group	Analyte	Number of Dry Weather Samples Collected Regionally	Number of Dry Weather Action Level Exceedances	Percentage of Action Level Exceedances (%)
General chemistry	pH	855	27	3.2
	Conductivity*	829	121	14.6
	Oil & grease	342	1	0.3
	Ammonia (NH_3-N)	854	39	4.6
	Methylene blue active substance (MBAS)	341	7	2.1
	Turbidity**	825	96	11.6
Nutrients	Orthophosphate (PO_4-P)	865	30	3.5
	Nitrate (NO_3-N)	860	41	4.8
Metals	Cadmium (dissolved)	320	0	0
	Copper (dissolved)	321	1	0.3
	Lead (dissolved)	318	0	0
	Zinc (dissolved)	322	0	0
Pesticides	Chlorpyrifos	333	0	0
	Diazinon	333	0	0
Bacteria	Total coliform	343	86	25.1
	Fecal coliform	344	45	13.1
	Enterococci	344	46	13.4
Grand Total		**8,749**	**540**	**6.2**

* The action levels were adopted by the dry weather workgroup and are based on best professional judgement (BPJ).
** The turbidity action level is BPJ, however, the Basin Plan WQO was used for the interim watershed assessments.
Results are reported as provided by the Dry Weather Workgroup.

Table 12-4. Jurisdictional Dry Weather Monitoring Results for Chlorpyrifos and Diazinon for the Period 2003–2007

Monitoring Year	Analyte	Number of Dry Weather Samples Collected Regionally	Number of Dry Weather Action Level Exceedances	Percentage of Action Level Exceedances (%)
2003	Chlorpyrifos	373	117	31.4
2004	Chlorpyrifos	241	1	0.4
2005	Chlorpyrifos	285	0	0
2006	Chlorpyrifos	382	1	0.3
2007	Chlorpyrifos	333	0	0
2003	Diazinon	373	129	34.6
2004	Diazinon	240	6	2.5
2005	Diazinon	286	2	0.7
2006	Diazinon	377	2	0.5
2007	Diazinon	333	0	0

12.2.7 Coastal Storm Drain Monitoring

Each coastal jurisdiction conducts a separate CSDM Program. The purpose of the CSDM Program is to detect and eliminate ICIDs resulting in coastal beach closures for bacteria. Samples are collected from outfalls and receiving waters and are analyzed for fecal indicator bacteria (total coliform, fecal coliform, and enterococci) in accordance with the CSDM Program Work Plan (SDCRC, 2007).

The results from the CSDM Program are provided annually as a separate report in Appendix F. The reporting period of the CSDM Program occurs from October 1 through September 30 of each monitoring year.

The CSDM Program primarily answers two core management questions, which address urban runoff discharges in coastal areas and the relation to receiving water impairments: 3) What is the relative urban runoff contribution to the receiving water problem(s)? and 4) What are the sources of urban runoff that contribute to receiving water problem(s)?. CSDM bacterial monitoring results were summarized in each monitoring section and suggest that coastal storm drains during non-storm events are not impacting coastal receiving waters with any regularity.

12.2.8 Municipal Separate Storm Sewer System Outfall Monitoring

During the 2007–2008 Monitoring Season, the Copermittees collaboratively developed the MS4 Outfalls Monitoring Program in San Diego County WMAs (SDCRC, 2008). The purpose of this program is to characterize pollutant discharges from MS4 outfalls in each watershed during wet weather and dry weather, as required by the Permit (Section II.B.1 of the Order).

The targeted MS4 Outfall Monitoring Program was implemented during Summer 2008. Targeted sampling was conducted to address the following subquestions:

1. Which of the targeted MS4 outfalls have the greatest pollutant loading?
2. Are the pollutant loadings decreasing from these MS4 outfalls?

Targeted sampling was conducted by the County of San Diego and City of San Diego during Summer 2008. One sample was collected from each WMA, and results were included in Appendix I. The data will not be assessed until the program is fully implemented in the 2008-2009 monitoring year.

12.3 Recommendations

12.3.1 2007–2008 Recommendations

The recommended actions from the triad assessments are summarized in Table 12-5 and include continuing water quality monitoring in all watersheds to gather long-term trend information and investigating upstream sources of contaminants. While several recommended actions are to conduct TIEs for persistent toxicity to *H. azteca* during wet weather conditions, the Copermittees have demonstrated that toxicity to this organism is most likely associated with the presence of the synthetic pyrethroid Bifenthrin in storm water runoff. Pyrethroids were detected in most sediments collected in urban areas during the post-storm sediment sampling. However, the following sites did have detections above the sediment benchmark:

- Escondido Creek MLS.
- Buena Vista Creek TWAS-1.
- San Dieguito River MLS.
- Los Peñasquitos MLS.
- Chollas Creek MLS.

Further studies using sediment exposures with *H. azteca* are recommended to deteremine if sediment samples are impacting test organisms. As previosly mentioned, toxicity to *H. azteca* as a result of synthetic pyrethroids is a region-wide and state-wide problem, and is currently being addressed by the DPR. The CASQA Pesticide Subcommittee is actively working with DPR during the re-registration period for these compounds. The CASQA Pesticide Subcommittee is also a valuable resource for information sharing on synthetic pyrethroids and other pesticides, and these studies will further the information needed to influence DPRs decision-making process during the re-registration period.

Based on the results of ambient weather monitoring, a TIE is recommended for ambient weather toxicity to *C. dubia* reproduction at the Los Peñasquitos WMA Site LPC-TWAS-1 (Carroll Canyon). However, toxicity results observed were below the threshold recommended for a TIE during the two events monitored during 2007–2008. In the event that persistent low level toxicity is observed during the next ambient weather monitoring cycle in north San Diego County, additional dilution series to refine *C. dubia* toxic endpoints and/or implementation of additional highly sensitive tests are recommended.

Since the USEPA has banned the retail sale of Diazinon and Chlorpyrifos and with the increased public outreach and education regarding the handling of pesticides in general, a decreasing trend for the organophosphate pesticide compounds is evident and should continue. Continued monitoring of the organophosphate compounds in receiving water samples should show an overall decrease in the number of benchmark exceedances and concentrations over time with the expectation that residual public supply and use will eventually be exhausted. However, based on the DWM data collected for these compounds and the less than 1% exceedance rate over the past three years of monitoring, this analysis could be justifiably removed from the monitoring program requirements. This would result in potential cost savings to the Copermittees on a region-wide basis and is consistent with the intentions of the SMC concept of adaptive management.

Table 12-5. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment[1]	Action
Santa Margarita	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Turbidity	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
San Luis Rey	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Loma Alta	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified).	Evidence of persistent toxicity.	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results).* Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Buena Vista	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified).	Evidence of persistent toxicity.	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results). * Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.

Table 12-5. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment[1]	Action
Agua Hedionda	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified).	Evidence of persistent toxicity.	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results). * Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Escondido Creek	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified).	Evidence of persistent toxicity.	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results). * Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
San Dieguito River	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Pyrethroids at SDC-TWAS-1	Evidence of persistent toxicity. *Hyalella* at SDC-TWAS-1	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results). * Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
Los Peñasquitos	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Pyrethroids at LPC-TWAS-2	Evidence of persistent toxicity. *Hyalella* at LPC-TWAS-2	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results). * Address upstream sources as a high priority.
	Ambient Weather	No persistent exceedances of water quality objectives.	Evidence of persistent toxicity.	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (Not warranted at this time due to low levels of toxicity). **

Table 12-5. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment[1]	Action
			(*C. dubia* reproductive endpoint at LPC-TWAS-1		Address upstream sources as a high priority. Address potential role of urban runoff causing physical habitat disturbance.
Tecolote Creek	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Turbidity	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
	Ambient Weather	Not Applicable Monitoring not conducted during 2007-2008 Monitoring Season.			
San Diego River	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Turbidity	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
	Ambient Weather	Not Applicable Monitoring not conducted during 2007-2008 Monitoring Season.			
Chollas Creek	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Pyrethroids, Turbidity, and TSS	Evidence of persistent toxicity. ***Hyalella***	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. (However, Pyrethroids are the likely source of toxicity based on chemistry results and recent TIEs).* Address upstream sources as a high priority.
	Ambient Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). Dissolved Copper	No evidence of persistent toxicity.	Indications of alteration.	Address upstream source as a high priority.
Sweetwater River	Wet Weather	No persistent exceedances of water quality objectives.	No evidence of persistent toxicity.	Indications of alteration.	No action necessary to address toxic chemicals. Address potential role of urban runoff in causing physical habitat disturbance.
	Ambient Weather	Not Applicable Monitoring not conducted during 2007-2008 Monitoring Season.			
Tijuana River	Wet Weather	Persistent exceedance of water quality objectives (high frequency constituent of concern identified). TSS, Turbidity, Diazinon	Evidence of persistent toxicity. (*C. dubia* acute, chronic, and reproductive endpoints)	Indications of alteration.	Conduct TIE to identify contaminants of concern, based on TIE metric. Address upstream sources as a high priority.

Table 12-5. Recommended Actions From the Triad Assessment

Watershed	Condition	Chemistry	Toxicity	Bioassessment[1]	Action
	Ambient Weather	Not Applicable Monitoring not conducted during 2007-2008 Monitoring Season.			

1. Bioassessment is used for assessment of both conditions
*Toxicity to H. azteca has been linked to detections of Bifenthrin in storm water runoff at these sites.
**Toxicity to C. dubia at LPC-TWAS-1 during ambient weather conditions warrants a TIE but should only be conducted if significant toxicity is observed and if TIE treatments would be statistically different between treatments.