Section 3
Discharge Characterization

3.1 Introduction

The ultimate goal of the stormwater management program is to protect the beneficial uses (for example, aquatic life or recreation) of the waterbodies that receive discharges from the MS4. This goal is achieved through the implementation of the MSWMP, which describes how the permittees will manage urban runoff from various types of land uses, such as residential and industrial, or activities, such as municipal maintenance and new development construction.

The RWQCB has established beneficial uses and water quality objectives (WQOs) to protect those uses for each receiving water to which the MS4 discharges (see the Water Quality Control Plan, Santa Ana River Basin (1995, as amended) ("Basin Plan")). These RWQCB-adopted WQOs are supplemented by the WQOs contained in the California Toxics Rule (CTR) promulgated by the U.S. EPA in 2000. Most WQOs established to protect aquatic life uses are based on findings from laboratory toxicity studies. Similarly, most WQOs established to protect human health uses (for example, recreation or drinking water) are based on both laboratory and epidemiological studies. In both instances, the WQOs have substantial margins of safety built into them.

The Basin Plan also contains waterbody-specific WQOs for water quality constituents that are not typically toxic, but can affect the overall physical characteristics of the waterbody. These WQOs, or "non-degradation objectives" were set to minimize the likelihood of overall water quality degradation rather than to protect a particular beneficial use.

The County has been permitted to discharge stormwater from its MS4 since 1990. Since that time substantial progress has been made in the implementation of programs to reduce pollutants in urban runoff. One of the measures of effectiveness is water quality, that is, when all is said and done - are the beneficial uses being protected? Where the answer is no and the reason is deemed to be at least in part pollutants carried by urban runoff, the stormwater program should be modified to target the particular water quality concern. The purpose of this section of the ROWD is to evaluate this basic question. Where the answer is negative, then recommendations will be developed to re-prioritize the stormwater management program to address the area or areas of concern.

3.2 Methodology and Data Sources

To make a finding that a beneficial use is protected requires an evaluation of the available water quality data in the context of the WQOs applicable to the receiving waters. Typically, a simple comparison between the results from a single sampling event and the WQOs is insufficient to evaluate the degree of protection. Instead, the data evaluation needs to consider factors such as how compliance for the WQO is determined (for example, single sample versus four-day average or total recoverable versus dissolved), the representativeness of the sample data compared to how compliance with the WQO is determined, and how often exceedances occur. For this evaluation three primary data sources were evaluated:

- Comparison of the MS4 monitoring program sample results to three sources of measures of compliance: (a) Basin Plan WQOs; (2) CTR objectives; and (3) EPA stormwater benchmarks contained in the EPA Multi-Sector Industrial Stormwater Permit. Exceedances of Basin Plan WQOs and CTR objectives are enforceable and provide the most important comparison. However, these objectives, while often applied to stormwater data, were not developed in a manner that takes into account the exposure scenarios associated with stormwater flows. Thus, any observed exceedances in stormflow data need to be evaluated carefully against WQOs. EPA benchmarks are not enforceable, but can provide some insight into the whether an observed exceedance during a storm event may be a concern.

- RWQCB 2005 Assessment Findings – the RWQCB recently completed its periodic assessment of basin waters to identify water bodies where beneficial uses are impaired. These assessment results will be reviewed to identify any RWQCB water quality concerns.

- U.S. Geological Survey (USGS) National Water Quality Assessment Program (NAQWA) – the USGS recently published a series of water quality reports that include assessments of the San Bernardino County area. This assessment can be used to supplement the RWQCB's recent assessment.

Using the information obtained from the above sources, a list of potential pollutants of concern will be developed. This initial list will include pollutants with an exceedance frequency of an enforceable WQO or non-enforceable EPA stormwater benchmark of greater than 10%. This threshold was selected because given the number of samples collected from 2000-2006 (N = 22 to 25), approximately two or fewer samples would be allowed to exceed the criterion over about five and half years. For toxic and conventional pollutants this is generally consistent with EPA's Consolidated Assessment & Listing Methodology (CALM, EPA 2002) for identifying pollutants that may be causing beneficial use impairment based on ambient water quality data.

After the initial list was generated, the pollutants were evaluated further to take into account factors such as those described above, for example, sample type versus the basis for the WQO. The final list of pollutants of concern will rank the pollutants as high, medium or low priorities.

3.3 MS4 Water Quality Summary

This section summarizes water quality data from two key sources: (1) water quality data collected by the permittees to fulfill permit monitoring requirements; and (2) studies or water quality evaluations conducted by others.

3.3.1 Permittee Monitoring Program

As a requirement for the implementation of MS4 Permit, the permittees are required to implement the approved water quality monitoring program. This program has evolved over the life of three permits. This section will summarize the current water quality monitoring program as it pertains to the collection of wet weather data since 2000 (year of last ROWD submittal).

3.3.1.1 MS4 Sampling Locations

Since 2002 the County has collected water quality data regularly from five sites in the County (Table 3-1). The sites were originally selected to characterize runoff from various types of land uses, including urban, agricultural and open space. The receiving water sites include both concrete-lined and natural channels.

Table 3-1. Area-wide MS4 Stormwater Monitoring Sites

Site No.	Location	Site Type	Primary Land Use	Nearest Rain Gauge	Rain Gauge Station No.
2	Cucamonga Creek @ Hwy 60	Stormwater (concrete-lined channel)	Commercial & Industrial	Ontario Fire Station #3	1335
3	Cucamonga Creek @ Hellman Avenue	Stormwater (concrete-lined channel)	Agricultural	Chino County Airport	1360
5	Stormwater Pipe @ Hunts Lane north of Hospitality Lane	Stormwater	Commercial & Light Industrial	District Office	2001B3
8	Santa Ana River @ Hamner Avenue	Receiving Water (natural channel)	Urbanized	Chino County Airport	1360
10	Santa Ana River upstream of Seven Oaks Dam tributary	Receiving Water (natural channel)	Open/Rural	Santa Ana P.H.	3162

For the purposes of this monitoring program, samples collected at Sites 2 and 3 represent stormwater discharge samples. However, these sites are within Cucamonga Creek, which is a concrete-lined waterbody as it passes through the urban area. Cucamonga Creek has beneficial uses applied to it, and although the samples are used to measure the quality of urban runoff, they are effectively receiving water quality samples. The land use upstream of Site 2 is predominantly commercial and industrial, but some portions of the watershed include both open space/rural and residential land uses. Similarly, the predominant land use in the vicinity of Site 3 is agricultural; however, the urban runoff at Site 3 is also influenced by a mix of other land uses, including open space/rural and discharge from a municipal wastewater treatment plant located between Sites 2 and 3. Site 5 samples are collected from within the constructed storm drain system (via a maintenance hole) prior to discharge to the receiving water. The two receiving water sites are located on the Santa Ana River: (1) Hamner Avenue (Site 8); and (2) upstream of the Seven Oaks Dam tributary (Site 10).

3.3.1.2 Sample Collection Summary

The permittee's stormwater monitoring program consists of two parts: (1) monitoring the first 30 minutes of stormwater runoff ("First Flush"); and (2) monitoring the subsequent 2.5 hours of stormwater runoff ("Main Program"). The First Flush and Main Program samples are collected as time-weighted composite samples.

For each stormwater sample, 24 discrete 350-mL samples are collected over a three hour period. The first 14 discrete samples are collected during the first half hour, at one to three minute intervals. The first sample is discarded, and the remaining 13 samples are composited as a single First Flush sample. The remaining 10 discrete samples are taken at 15 minute intervals and composited as a single Main Program sample. The receiving water samples are collected as single grab samples, one per site per storm event.

Sampling methods and sample handling procedures used in the monitoring program have evolved over time. The current methods in use are generally consistent with procedures described in the District's Stormwater System and Receiving Waters Monitoring Program (January 1993, as amended in the April 1995 ROWD). The primary differences between the two source documents are the number of storms to be monitored and the use of lower detection limits for selected parameters.

Substantial amendments to the monitoring program proposed in the 2000 ROWD and recommended in previous annual reports are still being evaluated and, in part, have begun to be implemented. For example, some constituents have been eliminated from analysis due to a preponderance of "non-detect" results and the number of sites monitored on a routine basis also has been reduced based on the analysis of the accumulated monitoring data. In addition, consistent with the 2004 Annual Report recommendations, during FY 2004/05, samples were collected from early, mid-season, and late season storms.

3.3.1.3 Water Quality Summary

The annual reports submitted per the requirements of the MS4 Permit provide annual and cumulative summaries of water quality data collected from the sites and per the methods described above. This information is incorporated by reference and will not be re-summarized here. Instead, this section will focus on a comparison between the water quality results reported for the 2000 ROWD (1994-1999 data) and the results obtained since that time (2000-2006). The purpose of this approach is to illustrate whether water quality for constituents with Basin Plan or CTR objectives is similar between the two periods or whether it has changed, either better or worse. This approach provides a simple, but clear, method for comparing water quality results collected during two different permits.

Table 3-2 shows that the median concentrations for most constituents were often very similar for each period of record (Note: median values calculated by using the one half of the lowest reported detection limit). Between-site comparisons also illustrate well the signature of each site. For example, Site 8 had a much higher median hardness value than the other three sites during both periods of record. Site 10, which represents relatively undeveloped land, had water quality results suggesting less development, for example, much lower nitrate, phosphorus and TSS concentrations.

Figures 3-1 through 3-8 illustrate how variable the sample results are for a variety of pollutants. Again, looking at the more than 10 year record, high variability among the sample results is the norm.

In summary, the water quality data suggest that stormwater quality has remained essentially the same at each site for more than 10 years. Variability remains high from one runoff event to another. The signature of each site has remained essentially the same.

3.3.2 Regional Water Quality Findings

Other agencies collect water quality data or evaluate water quality data in the Santa Ana River watershed. These data collection efforts or analyses may be done for reasons unrelated to the water quality monitoring conducting under the MS4 Permit. However, the findings from these other efforts can provide critical insight regarding the question – Are the beneficial uses protected? This is especially true if the other studies provide ambient (non-stormwater) receiving water data or data from other media, e.g., sediment or fish tissue, which can be good measures of long term trends.

3.3.2.1 RWQCB 2005 Assessment

To comply with Section 305(b) of the Clean Water Act, the RWQCB is required to assess water quality in all surface waters at least once every two years. This information, developed by the RWQCB, is used by the SWRCB to identify impaired beneficial uses, that is, beneficial uses that are not being protected. This impairment evaluation results in the preparation by the SWRCB of the so-called 303(d) list which identifies the waters in need of a TMDL.

The last approved 303(d) list was adopted by the SWRCB in 2002 and approved by the EPA in 2003. However, the SWRCB issued its revised draft 303(d) list for public comment on September 15, 2006 (Table 3-3). The revised list also established new TMDL completion dates for waters already on the 2002 303(d) list. TMDLs expected to be completed during the next MS4 Permit term include: (1) 2006 - Big Bear Lake Nutrient TMDL, which includes listed Big Bear Lake tributaries (draft TMDL currently undergoing public review); (2) 2006 – Big Bear Lake and Rathbun Creek Sediment TMDL (draft TMDL currently undergoing public review); and (3) 2007 - Big

Table 3-2

Table 3-3. Waterbodies Requiring a TMDL in San Bernardino County[1]

Waterbody	Pollutant/Stressor	Potential Source	Proposed TMDL Completion Date
Big Bear Lake	Copper	Resource extraction	2007
	Mercury	Resource extraction	2007
	Metals	Resource extraction	2007
	Noxious aquatic plants	Construction/Land development; Unknown point source	2006
	Nutrients	Construction/Land development; Snow skiing activities	2006
	PCBs	Source unknown	2016
	Sedimentation/ Siltation	Construction/Land development; Snow skiing activities; Unknown nonpoint source	2006
Summit Creek	Nutrients	Construction/Land development	2008[2]
Knickerbocker Creek	Metals	Unknown nonpoint source	2007
Grout Creek	Metals	Unknown nonpoint source	2007
	Nutrients	Unknown nonpoint source	2008[2]
Rathbun Creek	Nutrients	Snow skiing activities; Unknown nonpoint source	2008[2]
	Sedimentation/ Siltation	Snow skiing activities; Unknown nonpoint source	2006
Mountain Home Creek	Pathogens	Unknown nonpoint source	2019
East Mountain Home Creek	Pathogens	Unknown nonpoint source	2019
Lytle Creek	Pathogens	Unknown nonpoint source	2019
Chino Creek Reach 1	Nutrients	Agriculture, dairies	2019
Mill Creek Reach 1	Pathogens	Unknown nonpoint source	2019
Mill Creek Reach 2	Pathogens	Unknown nonpoint source	2019
Mill Creek (Prado)	Nutrients	Agriculture, dairies	2019
	Suspended Solids	Dairies	2019
Prado Park Lake	Nutrients	Nonpoint source	2019
Santa Ana River (Reach 4)	Pathogens	Nonpoint source	2019

1 - Based on SWRCB Draft 303(d) List, September 15, 2006

2 – Although completion date is formally listed as 2008, these waterbodies are being incorporated into the nutrient TMDL under development for Big Bear Lake.

Figure 3-1 - COD

Figure 3-2 - TSS

Figure 3-3 - TDS

Figure 3-4 - Cu

Figure 3-5 - Pb

Figure 3-6 - Zn

Figure 3-7 - Nitrate

Figure 3-8 - Phosphorus

Bear Lake Metals TMDL for Big Bear Lake and Grout and Knickerbocker Creeks (see Table 3-3).

The RWQCB completed its most recent water quality assessment in 2005. This assessment resulted in the recommendation that one additional waterbody in San Bernardino County be added to the 303(d) list: Big Bear Lake for PCBs, based on exceedances of fish tissue screening values being used by the State.

The RWQCB considers all available data when developing its impairment recommendations. Accordingly, the RWQCB included the County's stormwater data collected during the current permit term in its most recent evaluation. The RWQCB's finding that no other waters should be added to the basin 303(d) list because of impairment demonstrates that the RWQCB agrees that the beneficial uses in the County are for the most part protected for most constituents.

For those waters that are on the existing 303(d) list (Table 3-3), the list acknowledges sources of pollutants other than urban runoff for many of the listed waters. For some waters the source is "unknown nonpoint source," which could include some stormwater water runoff, but these waters are small tributaries in relatively un-urbanized areas, for example in the Big Bear Lake area.

3.3.2.2 National Water Quality Assessment (NAWQA)

In 1991, the USGS initiated the NAWQA program, which was designed to conduct comprehensive water quality assessments in 51 major river and groundwater basins across the United States. NAWQA studies were initiated in the Santa Ana River (SAR) Basin in 1997 and intensive sampling was conducted throughout the basin from 1998 to 2001. Only recently were the results from this sampling effort made available in a series of reports:

- Belitz, K., Hamlin, S.N., Burton, C.A., Kent, R., Fay, R.G., and Johnson, T. 2004. *Water Quality in the Santa Ana Basin California, 1999-2001*. Circular 1238. U.S. Geological Survey.
- Kent, R.H., Belitz, K., Altmann, A.J., Wright, M.T., and Mendez, G.O. 2005. *Occurrence and Distribution of Pesticide Compounds in Surface Water of the Santa Ana Basin, California, 1998-2001*. Scientific Investigations Report 2005-5203. U.S. Geological Survey.
- Kent, R.H. and Belitz, K. 2004. *Concentrations of Dissolved Solids and Nutrients in Water Sources and Selected Streams of the Santa Ana Basin, California, October 1998-September 2001*. Water Resources Investigations Report 03-4326. U.S. Geological Survey.
- Burton, C.A. 2002. *Effects of Urbanization and Long-Term Rainfall on the Occurrence of Organic Compounds and Trace Elements in Reservoir Sediment Cores, Streambed Sediment, and Fish Tissue from the Santa Ana River Basin, California, 1998.* Water-Resources Investigations Report 02-4175.

The USGS notes that the SAR Basin represents the most densely populated river basin of all of its NAWQA study sites. Accordingly, the SAR Basin study provided an opportunity to assess the effects of urbanization on water quality. Data were collected over a three year period from October 1998 to September 2001 from a variety of sites representing two types: (1) "indicator" sites, which represent stream water-quality conditions resulting from specific land uses and important influences on water quality in the basin; and (2) "integrator" sites, which represent stream water quality conditions affected by a combination of land uses, point sources, natural processes, and human influences. Sites were distributed throughout the basin.

Sample collection, which included sediment and fish tissue, followed USGS protocols. When considering the findings of the USGS studies, it is important to recognize that the laboratory methods used by the USGS often provide lower detection levels compared to most commercial laboratories used for public agency water quality monitoring. As a result, detection frequencies may be higher than what is observed in other studies simply because of differences in methodologies. In addition, when comparing data results to some threshold concentration to identify levels of concern, the USGS often uses guidelines from the literature or even EPA that have not been approved as enforceable objectives. Even with these caveats in mind, the USGS reports do provide a good overview of the state of water quality in the basin.

Belitz et al. (2004) provides the best overview of water quality findings from the NAWQA SAR Basin studies, incorporating information from the various NAQWA basin reports listed above. For streams and rivers, the following key water quality findings were reported:

- Nitrate concentrations were considered high in the Santa Ana River (at MWD Crossing) and Cucamonga Creek, with some sample results greater than 10 mg/L as nitrogen. The USGS noted that both of these sites were reaches dominated by treated wastewater and that in mountain sites and Warm Creek, which receive urban runoff and groundwater influx, nitrate concentrations were less than 1 mg/L. Moreover, in all samples consisting primarily of storm runoff only, nitrate concentrations ranged from 1 to 3 mg/L.

- Volatile organic compounds (VOCs) were detected in 100% of 106 surface water samples collected from Warm Creek, SAR below Prado Dam, and SAR below Imperial Hwy. VOCs were also detected in 5 of 8 samples collected from the SAR near Mentone, a generally undeveloped area. While detections were ubiquitous (again, note that USGS uses laboratory methods that can detect chemical constituents at very low concentrations), only one constituent, chloroform, was detected at levels that sometimes exceeded EPA guidelines (Note: No chloroform WQOs have been established in the Basin Plan or CTR). However these exceedances were restricted to the SAR below Prado Dam location. Chloroform is a by-product of water disinfection processes.

- Pesticides were detected in 104 of 105 surface water samples collected from three urban sites: Warm Creek, SAR below Prado Dam, and SAR below Imperial Hwy. Six pesticides were detected at levels above EPA chronic exposure guidelines for aquatic life protection (Note: No WQOs have been established for these compounds):
  - Carbaryl, chlorpyrifos, malathion, and chloranthalonil, were only detected above the EPA guidelines in stormflow samples, suggesting that aquatic organisms are not chronically exposed at concentrations of concern.
  - Diazinon was detected above EPA guidelines in both baseflow and stormflow samples. However, after December 31, 2004, it became illegal to sell diazinon for outdoor, non-agricultural, or residential uses in the United States. Diazinon may still be used for non-residential or agricultural uses that are consistent with product labeling and precautions approved under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).
  - Lindane was not detected above EPA guidelines in stormflow samples.

  Results from the pesticide studies suggested that the frequency of pesticide detections was related to time since it last rained. That is, pesticides, which can build up on the landscape during extended dry periods, are washed off of the landscape by storms. Following runoff events, some pesticide compounds persisted at elevated levels in post-storm dry weather flows for almost two weeks. Data from sediment cores collected from reservoirs supported this finding, that is, sediments deposited during wet periods had higher concentrations of pesticides than sediments deposited during dry periods.

- Although the number of organochlorine and semivolatile compounds (SVOCs) detected and the concentrations of detected compounds were higher in sediments of waters draining urban areas, these compounds were also frequently detected in sediments of waters draining both urban and non-urban areas. Detection frequencies for organochlorine were typically greater at SAR mainstem sites than in SAR tributary sites. This finding may result from the persistent nature of organochlorine compounds as well as the accumulation of them in the mainstem river. In contrast, SVOC detection frequencies were typically greater in the tributaries to the SAR, especially in urban areas.

- Concentrations of arsenic, lead and zinc exceeded USGS-selected sediment guidelines for protection of aquatic life in three urban streams: Chino Creek, Warm Creek and the San Jacinto River. None of the observed concentrations of these metals exceeded SWRCB sediment guidelines for identifying impaired waters (*Revision of the Clean Water Act Section 303(d) List of Water Quality Segments*, SWRCB Staff Report, Volume I, 2005). Moreover, the median concentrations of these metals were well below sediment guidelines, regardless of which guidelines were used.

Data also showed that concentrations of lead were much lower in more recently deposited sediments and that, similar to the pesticides, metals in sediment cores tend to be higher during wet periods than dry periods.

- Aquatic communities (invertebrates and algae) were considered more “degraded” (that is, lower species richness, higher relative abundance of pollution-tolerant species) in streams receiving treated wastewater than in streams receiving urban runoff. Streams draining mountain areas were the least degraded.

Based on the USGS results few concerns were noted with regard to water quality associated with stormwater. While it appears that concentrations of various constituents increase during runoff events as the landscape is “washed,” the resulting concentrations are not causing any impairment of waterbodies in the County. Constituents of potential concern in stormwater, such as diazinon, are already highly regulated, for example, it is banned from residential use.

3.4 Reasonable Potential Analysis

The purpose of this section is to identify pollutants of concern. These findings provide a significant part of the basis for stormwater program prioritization during the next permit. To identify the prioritized pollutants of concern list, two basic steps were used: (1) program monitoring results were compared to various WQOs or benchmarks that are considered measures of beneficial use protection; and (2) the results of the comparison to WQOs or benchmarks were evaluated in the context of factors relevant to the medium sampled, that is stormwater.

3.4.1 Measures of Comparison

3.4.1.1 Basin Plan Objectives

As noted in the introduction to this section, the RWQCB has established WQOs in the Basin Plan to protect the beneficial uses of waterbodies in the SAR watershed. The Basin Plan also contains WQOs for water quality constituents that are not typically toxic, but can affect the overall physical characteristics of the waterbody. These WQOs, which are typically waterbody-specific, were not typically set to protect a particular beneficial use, but instead were set to minimize the likelihood of overall water quality degradation.

WQOs are either beneficial use- or waterbody-specific. Often, multiple uses with different objectives are applicable to the same waterbody. For the purposes of this evaluation, for each constituent for which there is a Basin Plan WQO, the most stringent objective was used as the point of comparison with the water quality data.

3.4.1.2 California Toxics Rule

Also noted in the introductory section, is that the Basin Plan objectives are supplemented by the WQOs contained in the CTR promulgated by the U.S. EPA, May 18, 2000. EPA promulgated the objectives to fill the gap in California’s water quality standards that was created in 1994 when a State court overturned the State's existing water control plans which contained water quality objectives for toxic pollutants. To ensure compliance with Clean Water Act requirements for the adoption of numeric water quality objectives for toxic pollutants, the EPA promulgated the CTR. The CTR objectives address the protection of aquatic life and human health where human consumption of water and aquatic organisms may occur.

3.4.1.3 EPA Stormwater Benchmarks

The WQOs in the Basin Plan and in the CTR were typically developed for ambient conditions, that is, baseflow conditions, where constant exposure assumptions apply. Stormwater quality may be highly variable, thus exposure to a pollutant during a stormflow event may be not be equivalent to an exposure that occurs during baseflow. To assist with determining when monitoring may be necessary for industrial facilities, the EPA established benchmarks to provide a threshold above which pollutant concentrations in stormflows may be a concern with regard to the protection of beneficial uses (NPDES Stormwater Multi-Sector General Permit (MSGP) for Industrial Facilities, October 30, 2000):

> The ''benchmarks'' are the pollutant concentrations above which EPA determined represent a level of concern. The level of concern is a concentration at which a stormwater discharge could potentially impair, or contribute to impairing, water quality or affect human health from ingestion of water or fish. The benchmarks are also viewed by EPA as a level that, if below, a facility presents little potential for water quality concern. As such, the benchmarks also provide an appropriate level to determine whether a facility's stormwater pollution prevention measures are successfully implemented. The benchmark concentrations are not effluent limitations and should not be interpreted or adopted as such. These values are merely levels which EPA has used to determine if a stormwater discharge from any given facility merits further monitoring to ensure that the facility has been successful in implementing a SWPPP. As such, these levels represent a target concentration for a facility to achieve through implementation of pollution prevention measures at the facility.

Benchmarks are not enforceable objectives, but are simply thresholds that can be used to require further monitoring to ensure that the stormwater discharge is not causing impairment.

3.4.1.4 Data Considerations and Measures of Comparison

It is important to note that the water quality data gathered under the stormwater program is often not directly comparable to WQOs. This is not a failure of the monitoring program or the WQOs, but instead a recognition that the purpose and methods for developing WQOs did not necessarily take into consideration stormwater runoff scenarios. In fact, it is this reality that provides a good reason to use thresholds such as EPA's benchmarks to in part guide impairment decisions when looking at water quality data which includes only stormflow data. Following is a summary of important considerations when evaluating stormwater data:

- NPDES regulations require that the results from metals analyses of water samples be reported as total recoverable. Accordingly, the County's monitoring data only reports the total recoverable fraction for all metals. However, the aquatic life WQOs for most metals are based on the dissolved fraction and direct comparison between the metals data and the WQOs is not appropriate. In contrast, the EPA benchmarks for metals are based on the total recoverable fraction; thus they provide a direct comparison with the stormwater monitoring data.

- Aquatic life objectives are typically established in two forms: (1) acute – to protect aquatic organisms from short duration exposures to toxic pollutants (1 hour of continuous exposure); and (2) chronic – to protect aquatic organisms from long duration exposures to toxic pollutants (continuous 4-day average exposure). Given the short duration of stormflows, the exposure scenario addressed by the chronic objective is unlikely. In contrast, the acute exposure is certainly possible. Samplers which collect discrete samples over a period of time (often several hours) do provide an opportunity to measure the average concentration of a pollutant in stormwater. However, a single grab sample collected from a stormflow provides little relevant information regarding compliance with an acute WQO.

- Beneficial uses are applied to the receiving water; not the MS4. Thus, an exceedance observed in a stormwater sample, especially if it is a grab sample, provides little relevant information regarding the impact of stormflow quality on water quality in the receiving water.

- The WQOs for a number of constituents (for example, COD, TDS, Na, SO_4, Cl, and Hardness) were established to protect waters from degradation. It is likely that these objectives were established for long-term ambient-based conditions rather than stormflows. If so, the objectives may not have taken into account naturally elevated concentrations that may occur during stormflows.

3.4.2 Pollutants of Concern

In the following sections the potential pollutants of concern will be identified by comparison to various measures of beneficial use protection. The list of potential pollutants generated from this list will be further evaluated to either remove it from the list or to prioritize with regards to the level of concern.

3.4.2.1 Potential Pollutants of Concern

For the following evaluation only stormwater data collected at Sites 2, 3, 8, and 10 will be considered. All four of these sites are open channels and have applicable beneficial uses. Site 5 is located within a storm drain and is physically part of the MS4. Tables 3-4 to 3-7 summarize the comparison between the median pollutant concentrations

Table 3-4

Table 3-5

Table 3-6

Table 3-7

observed from 2000 (date of last ROWD submittal) to 2006 and various objectives or benchmarks.

The initial list of potential pollutants of concern includes constituents that showed more than a 10% frequency of exceedance with any objective or benchmark (Table 3-8). This threshold was selected because given the number of samples collected from 2000-2006 (22 to 25), two or fewer samples would be allowed to exceed the criterion over about five and half years. For toxic and conventional pollutants this is generally consistent with EPA's Consolidated Assessment & Listing Methodology (CALM, EPA 2002) for identifying pollutants that are causing impairment of a beneficial use.

For those constituents, which did not exceed an objective but exceeded an EPA stormwater benchmark, the basis for the benchmark was evaluated to determine if the benchmark had any relationship to a water quality objective established to protect a beneficial use. If not, then any concern regarding the constituent was lowered significantly.

A review of Table 3-8 finds that the frequency of exceedances is substantially lower for metals and COD when the data are compared to the EPA benchmarks. For the metals this difference is most significant for copper and lead.

For both nitrate as nitrogen and total phosphorus, no exceedances of water quality objectives were observed (in the Basin Plan, no objective has been established for phosphorus; the nitrate as nitrogen objective is 10 mg/L, which only applies to waters designated as a municipal water supply [MUN]); however, the EPA has established benchmarks that were exceeded. Similarly, the EPA has established a benchmark for TSS, but there is no Basin Plan WQO.

Of note is the difference in the frequency of exceedances observed at Sites 2, 3, and 8 versus Site 10. Site 10 still has some exceedances but they are of much lower frequency and do not include bacteria or metals. Instead, the exceedances are mostly for constituents that have had nondegradation objectives set: COD, Sulfate and Hardness. Since it is likely that the setting of objectives for these constituents did not consider intermittent stormflows, they may not be applicable to evaluations of stormwater quality.

3.4.2.2 Prioritized Pollutants of Concern

The initial list of pollutants of concern can be sorted into four categories: Bacteria, metals, nutrients and conventional or physical parameters. Each of these groupings will be discussed further in order to establish a final list of pollutants of concern:

Bacteria – With exception of Site 10, bacteria concentrations are typically far above the WQOs for the watershed. Median fecal coliform concentrations at Sites 2, 3 and 8 range from 8,000 MPN/100 mL to 12,000 MPN/100 mL (*E. coli* concentrations, for which no State WQO has yet been established, also greatly exceed recommended federal guidelines). This finding further substantiates the need for implementation of the MSAR Bacteria Indicator TMDL to reduce controllable sources of bacteria. Accordingly, elevated bacteria concentrations are the highest level of concern and thus the highest priority for stormwater program implementation.

Table 3-8. Preliminary List of Potential Pollutants of Concern

Site	Constituent	% Single Sample Exceedance of a WQO (Basin Plan or CTR)	% Single Sample Exceedance of an EPA Stormwater Benchmark
2	COD	100	57
	TSS	No WQO	78
	Copper	91	17
	Lead	52	0
	Zinc	91	74
	Phosphorus	No WQO	9
	Nitrate as Nitrogen	0	65
	Fecal Coliform	93	No Benchmark
3	COD	100	58
	TSS	No WQO	79
	Copper	96	13
	Lead	50	0
	Zinc	65	65
	Phosphorus	No WQO	17
	Nitrate as Nitrogen	0	100
	Fecal Coliform	100	No Benchmark
8	COD	92	40
	TSS	No WQO	76
	Copper	76	36
	Lead	72	24
	Zinc	32	56
	Phosphorus	No WQO	21
	Nitrate as Nitrogen	0	100
	Fecal Coliform	100	No Benchmark
10	COD	60	4
	TSS	No WQO	17
	Hardness	33	No Benchmark
	Sulfate	46	No Benchmark
	Nitrate as Nitrogen	0	13

Metals – The median concentrations for lead and copper, while often above Basin Plan or CTR WQOs, are typically well below the EPA benchmarks. Given that the WQOs are applicable to only the dissolved fraction and the benchmarks are applicable to the total recoverable fraction, the EPA benchmarks provide a better measure for identifying concerns. Zinc has a high frequency of exceedance of WQOs at Sites 2, 3, and 8. The frequency of exceedance of EPA benchmarks is similar; simply because the EPA benchmark is very similar to the WQO.

In their 2005 assessment, the RWQCB did not list copper, lead or zinc as impairing basin waters; however, given their elevated levels, especially above what is observed at undeveloped Site 10 metals may still be considered medium priority pollutants of concern. Lead appears to be on the decline (as noted by the USGS NACWA studies) because of changes in the nature of its use. Sources of zinc are unknown, but given the relatively high levels, it is possible that zinc concentrations are naturally high in the watershed soils. Although none of these metals is as high a priority as bacteria, further monitoring and study is warranted.

Nutrients – With regards to WQOs, no concerns were noted for nitrate as nitrogen. Exceedances of the EPA benchmark were common; however, the basis for the benchmark is the median value taken from the National Urban Runoff Program (NURP). Consequently, the benchmark is a statistically generated value and has no relationship to what concentration is recommended to protect a particular beneficial use or avoid an exceedance of a narrative objective such excess algal growth.

Total phosphorus also does not have a Basin Plan objective. The EPA benchmark that was occasionally exceeded is a based on a North Carolina benchmark developed from that state's water quality standards. It likely has some relationship to protection of beneficial uses, but further investigation would be necessary to confirm that.

The USGS noted in its findings that it believed that the primary source for elevated nutrients in the watershed was wastewater treatment facilities and dairies; not urban runoff. The USGS reported typical nitrate as nitrogen concentrations of 1 – 3 mg/L in flows dominated by urban runoff. This range of values is consistent with observations at site 5 which consisted only of stormwater prior to it being discharged to receiving waters. It is important to note that several waters in the lower elevations of the MS4 Permit area are still listed as impaired for nutrients (upper basin waters listed as impaired for nutrients are being addressed by the Big Bear Lake Nutrient TMDL): Prado Park Lake, Mill Creek (Prado), and Chino Creek Reach 1. Sources are believed to be primarily agricultural activities and dairies. A TMDL is not planned for completion in these waters until 2019; however, continued monitoring of nutrients is appropriate. Based on these findings and given that a TMDL is not planned during the next permit term, nutrients are considered a low priority relative to metals and bacteria.

Conventional Pollutants – Of the conventional or physical parameters listed in Table 3-7, the only constituents with WQOs are COD, sulfate and hardness. All of these WQOs are non-degradation objectives rather than objectives set to protect a particular beneficial use. The applicability of these WQOs to a stormflow sample is questionable.

According to the Basin Plan, COD is a concern in waste discharges and the discharge should not result in an increase in COD levels "which exceed the values shown in Table 4-1 [WQOs in Basin Plan] or which adversely affect beneficial uses." While stormwater certainly could be considered a "waste discharge" it is likely that the intent of the Basin Plan language is to control wastes from sewage treatment facilities. That likelihood and given the lack of evidence that elevated COD in stormwater flows is adversely affecting beneficial uses, concerns regarding the COD concentrations is considered very low.

No WQO has been established for TSS; however, the EPA has established a benchmark of 100 mg/L. This benchmark, which is equivalent to the median concentration observed in the National Urban Runoff Program (NURP), is regularly exceeded at Sites 2, 3 and 8 and is occasionally exceeded at Site 10. Sources of elevated TSS can be land use activities that can result in increased suspended solids flushing into the MS4 during rain events.

Given the sandy nature of the natural waters in the area, what levels of TSS are natural versus what is caused by anthropogenic activity is poorly understood. However, undeveloped Site 10 often had lower TSS than the developed areas; accordingly TSS is a constituent that should continue to be monitored, , the level of concern is low.

In summary, based on the findings described in the previous sections, the pollutants of concern with regards to stormwater management, in order of priority, are:

- High Priority: Bacteria
- Medium Priority: Zinc, copper, lead
- Low Priority: Nutrients, COD, TSS