Ventura Countywide Stormwater Quality Management Program

Ventura Countywide Stormwater Monitoring Program 2007/08 Water Quality Monitoring Report October 2008

Ventura Countywide Stormwater Quality Monitoring Report Executive Summary

Pursuant to NPDES Permit No. CAS004002, the Ventura Countywide Stormwater Quality Management Program (Management Program) must submit a Stormwater Monitoring Report annually by October 1st summarizing results of water quality monitoring conducted during the monitoring year. Consistent with this requirement the Management Program has prepared this Report to satisfy the permit requirements as well as to assess the effectiveness of the overall Ventura Countywide Stormwater Monitoring Program (Stormwater Monitoring Program).

This report provides an investigation of stormwater program effectiveness, characterizes the surface water quality of Ventura County, and summarizes water quality data for monitoring conducted during the 2007/08 season. Analysis of samples collected at various monitoring sites throughout the watershed provides information to assess the impact of stormwater runoff and helps characterize the status of surface water quality for watersheds in Ventura County. The monitoring aids in the identification of pollutant sources as well as the evaluation of the Stormwater Monitoring Program's effectiveness. Evaluating the Stormwater Monitoring Program's effectiveness allows for changes to be made and continual improvement of the overall Program. This adaptive management strategy improves the quality and effectiveness of the Stormwater Monitoring Program and minimizes the impact of stormwater pollutant discharges throughout the watersheds.

For the 2007/08 monitoring season, several key points have been identified and are highlighted below.

- **This report presents and discusses the water quality monitoring data collected during three wet weather and three dry weather events monitored by the Stormwater Monitoring Program.** The three wet weather events included monitoring at the Stormwater Monitoring Program's Land Use (Event 2), Receiving Water (Event 1 and Event 2), and Mass Emission (all events) sites, collectively representing all three watersheds (Calleguas Creek, Santa Clara River, and Ventura River) in which the Stormwater Monitoring Program conducts its water quality monitoring activities. The three dry weather events included monitoring only at the Mass Emission stations. The Stormwater Monitoring Program conducted a thorough QA/QC evaluation of the environmental and QA/QC results generated from its analysis of water quality samples and found the resultant data set to have achieved a 95.7% success rate in meeting program data quality objectives. Overall, the 2007/08 monitoring season produced a high quality data set in terms of the low percentage of qualified data, as well as the low reporting levels achieved by all laboratories analyzing the Stormwater Monitoring Program's water quality samples.

- **VCWPD employed the services of CRG Marine Laboratories, Inc., in order to achieve low detection limits for the majority of the water quality parameters evaluated by the Stormwater Monitoring Program.** As a means of improving the detection capability of various constituents found in the water quality samples collected by the VCWPD, the Stormwater Monitoring Program has again employed the services of CRG Marine Laboratories, Inc (CRG). CRG began analyzing the majority of the water quality parameters evaluated by the Stormwater Monitoring Program at the beginning of the 2003/04 monitoring season. CRG is known for their ability to measure analytes at concentrations much lower than most water quality laboratories. During the current monitoring year, CRG was able to achieve detection limits for trace organic compounds (i.e., organics, PCBs, and pesticides) that are 100 – 1000 times lower than laboratories used in the past. Additionally, CRG typically achieved detection limits for metals that are 10 times lower than historic levels for this class of constituent. Additional laboratories used by VCWPD also possess the ability to measure target analytes at very low levels.

- **VCWPD staff evaluated environmental and QA/QC water chemistry data using the *Data Quality Evaluation Plan* and *Data Quality Evaluation Standard Operating Procedures* guidance documents.** The *Data Quality Evaluation Plan* (DQEP) describes the multiple step process used by VCWPD staff to

identify errors, inconsistencies, or other problems potentially associated with Stormwater Monitoring Program data. Furthermore, the DQEP describes the various data quality objectives (DQOs) to which environmental and QA/QC data are compared as part of the Stormwater Monitoring Program's quality assurance/quality control program. The *Data Quality Evaluation Standard Operating Procedures* document is a set of written instructions that describes both technical and administrative operational elements undertaken by the Stormwater Monitoring Program in carrying out its DQEP.

- **VCWPD used its water quality database to store and analyze stormwater quality data.** The Stormwater Monitoring Program has invested approximately $150,000 in the past five years to develop a water quality database to further expedite, standardize, and enhance the Stormwater Monitoring Program's data management and data analysis activities. Key database attributes include automatic importation and cursory evaluation of electronically formatted data, semi-automated QA/QC evaluation, automated comparison of the Stormwater Monitoring Program's data to water quality objectives, and a wide array of hard copy and electronic data reporting features. The database has allowed the Stormwater Monitoring Program to improve its overall data management effort by providing staff with a robust data management tool for the storage, analysis, and reporting of stormwater monitoring data.

- **The volume of the Event 2 composite sample taken at the Mass Emission site ME-VR2 (Ventura River) was insufficient to run all analytical tests.** The automated sampler was programmed appropriately with respect to predicted rainfall amounts and antecedent soil moisture. Despite the fact that rainfall predictions were fairly accurate, flow in the river never increased significantly from baseflow conditions, reducing the number of aliquots taken and forcing enactment of the "priorities list" for analysis of the sample.

- **Acute toxicity of *Ceriodaphnia dubia* was observed only at Receiving Water site W-3 (La Vista) for the sample collected during Event 2.** The permit requires that a TIE be initiated for each sample with a TUa >1.0. The sample was flagged as having specific special instructions on the chain-of-custody. However, the footnote notifying the toxicity laboratory of this requirement was inadvertently omitted from the chain-of-custody and the lab did not question what the special instructions were. Due to this error in communication between the monitoring program and the lab, the TIE for the sample collected at W-3 was not performed. Standard operating procedures have since been modified by having multiple staff members check the pre-printed chains-of-custody. This effort will reduce the likelihood of this type of communication error in the future. It should be noted that the source water at this receiving waters site is primarily from agriculture upstream land-use practices and not urban runoff.

- **Chronic toxicity of *Strongylocentrotus purpuratus* (purple sea urchin) was observed at only one Mass Emission station during only one wet weather event.** Very high chronic toxicity was detected in the ME-VR2 sample collected during the September 2007 wet event (Event 1). Because this type of toxicity is unusual for this site, the Monitoring Program initiated follow-up sampling to investigate this occurrence. The investigation effort included collection of grab samples for organic, metal and pesticide analyses during the following event with the intention of having them analyzed only if the concomitant toxicity grab sample produced an observable effect on the test organism. When the laboratory reported 100% fertilization in the chronic sea urchin fertilization bioassay, the extra samples were discarded.

- **PCB concentrations exceeded applicable water quality objectives on three separate occasions.** These exceedances at ME-CC (Event 2) and ME-SCR (Events 2 and 3) were the first exceedances since the 2000/01 monitoring season.

- **No samples (water chemistry or aquatic toxicity) were gathered for the Ortega Street (I-2) and Swan Street (R-1) Land Use sites.** In previous years, the Stormwater Monitoring Program had already satisfied its NPDES permit condition stating that these two Land Use sites must be monitored a minimum of three times per permit term with respect to the collection of water chemistry samples. Beginning this year, the Stormwater Monitoring Program felt that it had obtained enough data to fulfill its regulatory obligation to collect aquatic toxicity grab samples at these sites in order to amass baseline toxicity information related to land use discharges.

- **Elevated pollutant concentrations were observed at all monitoring sites during one or more monitored wet weather storm events, and at Mass Emission stations ME-CC and ME-SCR during one or more dry weather events.** Constituent concentrations above Los Angeles Region Basin Plan, California Toxics Rule, and/or California Ocean Plan[1] water quality objectives were measured at the following monitoring sites:

  Mass Emission Sites

  ME-CC
  Anion: Chloride
  Bacteriological: *E. coli*, Enterococcus, Fecal Coliform, Total Coliform
  Conventional: Total Dissolved Solids
  Metal: Aluminum, Chromium, Copper, Lead, Mercury, Nickel, Zinc
  Organic: Benzo(a)Pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Indeno(1,2,3-cd)pyrene, Total PAH Compounds
  PCB: Total PCBs (due to detection of PCB congener 095)
  Pesticide: 4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT Compounds, BHC-gamma (Lindane) (dry weather event only)

  ME-VR2
  Anion: Chloride
  Bacteriological: *E. coli*, Enterococcus, Fecal Coliform, Total Coliform
  Conventional: Total Dissolved Solids
  Metal: Aluminum, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc
  Organic: Benzo(b)fluoranthene, Bis(2-ethylhexyl)phthalate, Chrysene, Total PAH Compounds

  ME-SCR
  Bacteriological: *E. coli*, Enterococcus, Fecal Coliform, Total Coliform
  Metal: Aluminum, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc
  Nutrient: Ammonia as N
  Organic: Bis(2-ethylhexyl)phthalate, Chrysene, Total PAH Compounds, Pyrene (dry weather event only)
  PCB: Total PCBs (due to detection of PCB congeners 153 and 209)
  Pesticide: 4,4'-DDE, Total Chlordane Compounds, Total DDT Compounds

  Receiving Water Sites

  W-3
  Bacteriological: *E. coli*, Enterococcus, Total Coliform
  Conventional: Total Dissolved Solids
  Metal: Aluminum, Copper (Dissolved and Total), Lead, Mercury, Nickel, Zinc
  Nutrient: Ammonia as N
  Organic: Total PAH Compounds
  Pesticide: 4,4'-DDD, 4,4'-DDE, Total Chlordane Compounds, Total DDT Compounds

  W-4
  Bacteriological: *E. coli*, Fecal Coliform, Total Coliform
  Conventional: Total Dissolved Solids
  Metal: Aluminum, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc
  Organic: Chrysene, Total PAH Compounds
  Pesticide: 4,4'-DDD, 4,4'-DDE, total Chlordane compounds, total DDT compounds

[1] The Stormwater Management Program believes the comparison of stormwater runoff data to the California Ocean Plan is inappropriate based on the following applicability language contained in the plan: "This plan is not applicable to discharges to enclosed bays and estuaries or inland waters, nor is it applicable to vessel wastes, or the control of dredged material." (California Ocean Plan. State Water Resources Control Board. 2005.)

Even though receiving water objectives are not directly applicable to constituent concentrations measured at Land Use monitoring stations, the Stormwater Monitoring Program performed comparisons between Land Use water quality data and Los Angeles Region Basin Plan, California Toxics Rule, and California Ocean Plan objectives as a means of identifying potential pollutants of concern.

Land Use Sites

A-1

Bacteriological: *E. coli*, Enterococcus, Total Coliform
Conventional: Total Dissolved Solids
Metal: Aluminum, Copper, Nickel
Nutrient: Nitrate as N
Organic: Total PAH Compounds
Pesticide: 4,4'-DDD, 4,4'-DDE, total DDT compounds

Bioassessment Monitoring

The following were the main findings for the 2007 benthic macroinvertebrate (BMI) survey of the Ventura River Watershed:

- **Physical habitat conditions at the nine sampling sites ranged from marginal to optimal.** The best habitat scores were at the locations on the upper main stem of the Ventura River, upper San Antonio Creek, and Matilija Creek. The lowest scores were at locations on the lower Ventura River and Canada Larga Creek.

- **Based on the Southern California Index of Biological Integrity (So CA IBI), the aquatic health of the Ventura Watershed during 2007 ranged from poor to good.** The upper site on the North Fork Matilija Creek and the site at upper San Antonio Creek ranked in the good range, while the site on the lower Ventura River ranked in the poor range. The remaining six sites in the watershed ranked in the fair range. The sites that ranked in the poor range were located in areas of the watershed that were impacted by a large transient human population on the Ventura River or located downstream of an erosion control project in the vicinity of grazing and stables.

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1. Background

Pursuant to NPDES Permit No. CAS004002[2], the Ventura Countywide Stormwater Quality Management Program must submit a Stormwater Monitoring Report, annually by October 1, and include the following:

- Status of implementation of the Stormwater Monitoring Program
- Results of the Stormwater Monitoring Program
- General interpretation of the results
- Tabular and graphical summaries of the monitoring data obtained during the previous years.

Consistent with this requirement, the Ventura Countywide Stormwater Quality Management Program (Management Program) has prepared this Report to address the permit requirements as well as to assess the effectiveness of the overall Management Program. The Ventura Countywide Stormwater Monitoring Program (Stormwater Monitoring Program), as originally proposed, is described in Chapter 9 of the Report of Waste Discharge submitted in February 1999. To facilitate the incorporation of information learned during implementation of the Management Program, increase the effectiveness of the Management Program, and streamline stormwater monitoring procedures, modifications to the Stormwater Monitoring Program have been implemented since 1999. As part of this adaptive management strategy, improvements to the *Mass Emission Stations Water Quality Monitoring Standard Operating Procedures (SOP) 2000-2005* were implemented in April 2003 to make them consistent with NPDES No. CAS004002, Order No. 00-108. The Stormwater Monitoring Program includes both stormwater management and scientific elements. The collection and analysis of stormwater samples across Ventura County and the analysis and interpretation of the resulting data are the central activities of the Stormwater Monitoring Program. The Stormwater Monitoring Program is currently conducted with the following four major objectives at its focus:

- Characterizing stormwater discharges from monitoring sites representative of different land uses: industrial, agricultural, and residential;
- Establishing the impact of stormwater discharges on receiving waters by conducting receiving water quality, mass emission, and bioassessment monitoring;
- Identifying pollutant sources based on analysis of monitoring data, inspection of businesses, and investigation of illicit discharges;
- Defining stormwater program effectiveness using data collected before and after implementation of pollution prevention programs.

This report provides an overview of stormwater program effectiveness and characterizes the surface water quality of Ventura County. Analysis of samples collected at various sites throughout the watershed gives an overall representation of the impact of stormwater discharges. The monitoring also aids in the identification of pollutant sources as well as the assessment of stormwater program effectiveness. Evaluating program effectiveness allows for changes to be made in the Stormwater Monitoring Program in order to resolve any problems that may exist. This adaptive management strategy improves stormwater monitoring program effectiveness and minimizes the impact of stormwater pollutant discharges on the watershed.

The pertinent parts of the Stormwater Monitoring Program include the following:

Land Use Site (Discharge Characterization) Monitoring

Land use monitoring is designed to capture stormwater discharge from a specific type of land use. In the Stormwater Management Plan, sites are chosen to represent three land use types: agricultural, industrial, and residential.

[2] This Order expired July 27, 2005. However, in the absence of a State-issued new permit, the Ventura Countywide Stormwater Quality Management Program has continued to carry out the requirements of the Ventura County Storm Water Quality Management Plan under the expired Order pursuant to 40 CFR 122.6(d).

Land use monitoring began during the 1992-93 monitoring season and is designed to characterize stormwater discharges from the three specific land uses noted above. During the 2007/08 monitoring season, samples from a December 2007 wet weather event were collected for water chemistry and aquatic toxicity at the agricultural (Wood Road, A-1) monitoring site. No samples (water chemistry or aquatic toxicity) were collected at the Ortega Street (I-2) and Swan Street (R-1) Land Use sites. In previous years, the Stormwater Monitoring Program had already satisfied its NPDES permit condition stating that these two Land Use sites must be monitored a minimum of three times per permit term with respect to the collection of water chemistry samples. This year, the Stormwater Monitoring Program evaluated that it had obtained enough data to amass baseline toxicity information related to land use discharges and has fulfilled its regulatory obligation to collect aquatic toxicity grab samples at these sites.

Receiving Water (Tributaries) Monitoring

Receiving water monitoring is designed to characterize the quality of receiving waters rather than urban discharges to the receiving waters. This type of monitoring evaluates the water quality of smaller waterbodies tributary to main river systems. Monitoring smaller tributaries allows the Stormwater Monitoring Program to focus on smaller sub-basins of the watershed that are not impacted by discharges from wastewater treatment facilities. Monitoring a localized section of the watershed allows the Stormwater Monitoring Program to better examine the impact of stormwater on the watershed than mass emission monitoring (see discussion below). During the 2007/08 monitoring season, the Receiving Water sites La Vista (W-3) and Revolon Slough (W-4) were monitored once in December 2007 and September 2007, respectively, under wet weather conditions. Water chemistry and aquatic toxicity samples were collected at both sites. Receiving water monitoring at these sites was first implemented during the 1997-98 season and captures stormwater runoff from the Revolon Slough sub-basin.

Mass Emission Monitoring

The purpose of mass emission monitoring is to identify pollutant loads to the ocean and identify long- term trends in pollutant concentrations. Mass Emission sites are located in the lower reaches of major watersheds. Through water quality monitoring at these sites, the Stormwater Monitoring Program can evaluate the cumulative effects of stormwater and other surface water discharges on beneficial uses in the watershed prior to discharge to the ocean. Both Mass Emission and Receiving Water stations allow for the measurement of water quality conditions in a surface water body, whereas Land Use monitoring stations enable the water quality characterization of discharges to surface waterbodies. Mass Emission monitoring stations allow for the measurement of water quality parameter concentrations resulting from discharges throughout an entire watershed. The Mass Emission drainage areas are much larger than the drainage areas associated with Receiving Water sites, and include other sources of discharge, such as wastewater treatment plants, non-point sources, and groundwater discharges.

Mass Emission stations are located in the three major Ventura County watersheds: Calleguas Creek (ME-CC), Ventura River (ME-VR2), and Santa Clara River (ME-SCR). Water quality samples from four wet weather events (with the exception of the ME-CC station where the composite bottle was broken during Event 2 and the sample determined to be compromised due to contamination) and two dry weather events were collected for water chemistry at the Mass Emission sites. Also, aquatic toxicity samples were collected at each Mass Emission site during Event 1 (September 2007), Event 2 (December 2007) and Event 5 (May 2008). Monitoring at the ME-CC station was initiated during the 2000/01 monitoring season, monitoring at the ME-SCR station was initiated during the 2001/02 monitoring season, and monitoring at the ME-VR2 station was initiated during the 2004/05 monitoring season after landslide activity at the original Ventura River Mass Emission station, ME-VR, precluded further sampling at that location.

Bioassessment Monitoring

The Stormwater Monitoring Program also includes the Bioassessment Monitoring Program. Biological assessments (bioassessments) of water resources integrate the effects of water quality over time and are capable of simultaneously evaluating multiple aspects of water and habitat quality. When integrated with physical and chemical assessments, bioassessments help to further define the effects of point and non-point source discharges of pollutants and provide a more appropriate means for evaluating impacts of non-chemical substances, such as sedimentation and habitat alteration. A work plan for in-stream bioassessment monitoring in the Ventura River watershed was developed and submitted in January 2001 to the Regional Water Quality Control Board (RWQCB) as part of the revised Stormwater

Management Plan. For six years, starting in 2001, bioassessment monitoring has been conducted once a year in the fall to compile a baseline data set. The bioassessment monitoring for this reporting period occurred in September 2007, and included samples collected in main streams and tributaries. This year staff participated in the multiple collection method evaluation for low gradient streams conducted through the Southern California Coastal Water Research Program (SCCWRP) Stormwater Management Coalition (SMC) Bioassessment Workgroup and the California Department of Fish and Game. Bioassessment monitoring is conducted during the fall because it is the time period during which flows are most consistent and macroinvertebrates are most productive and diverse. The fall season provides a consistent, stable environment for sampling that allows for macroinvertebrate comparability from year to year. The results and discussion of the fall 2007 bioassessment monitoring are summarized in Section 2 and presented in their entirety in Appendix O.

Report Contents

This report discusses work conducted from September 2007 to August 2008 and includes precipitation and flow information and associated water quality data from three wet weather events monitored at the Stormwater Monitoring Program's Land Use (Event 2), Receiving Water (Event 1 and 2), and Mass Emission (all events) sites, as well as three dry weather events monitored at each of the Mass Emission stations.

This monitoring report is organized into nine sections. The first section provides the background and purpose of the Stormwater Monitoring Program. Section 2 provides a summary of the fall 2007 bioassessment monitoring. Section 3 includes a description of the monitoring sites. Section 4 discusses precipitation and flow conditions at the monitoring sites. Section 5 gives an overview of sample collection procedures and Section 6 provides tabular results of the sample analyses. Section 7 describes the quality assurance and control procedures employed by the Stormwater Monitoring Program. Section 8 discusses the water quality results and Section 9 summarizes mass loadings and comparisons to water quality objectives.

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2. Ventura River Watershed 2006 Bioassessment Monitoring

BMI Survey

The Stormwater Monitoring Program also includes the Bioassessment Monitoring Program. Biological assessments (bioassessments) of water resources integrate the effects of water quality over time and are capable of simultaneously evaluating multiple aspects of water and habitat quality. When integrated with physical and chemical assessments, bioassessments help to further define the effects of point and non-point source discharges of pollutants and provide a more appropriate means for evaluating impacts of non-chemical substances, such as sedimentation and habitat alteration. A work plan for in-stream bioassessment monitoring in the Ventura River Watershed was developed and submitted in January 2001 to the Regional Water Quality Control Board (RWQCB) as part of the revised Stormwater Management Plan. For seven years, starting in 2001, bioassessment monitoring has been conducted once a year in the fall to compile a baseline data set.

Fifteen benthic macroinvertebrate (BMI) sampling locations were visited during the 2007 bioassessment survey. The survey was conducted by staff members from the Ventura County Watershed Protection District, the Ojai Valley Sanitation District, and Aquatic Bioassay and Consulting Laboratories, Inc. (ABC). Samples were collected on September 9th and 10th of 2007 for BMI organisms, physical and habitat observations, flow, and water quality at each location. All of the quality control guidelines for collection, sorting, and identification of BMI organisms specified in the California Bioassessment Protocol (2003) were met. Staff members from the California Department of Fish and Game (CDFG) and /or the Sustainable Land Stewardship Institute (SLSI) have audited sample collection activities in the past and provided data analysis and reporting services.

The September 2007 BMI survey was preceded by a winter in which significantly less than average rainfall was recorded in the watershed. As a result, only nine of the 15 sites had sufficient flow for sample collection.. Stations 2, 3, 5, 6, 7 and 14 were not sampled in 2007 due to lack of flow. The 15 BMI sampling locations are described in Table 1.

Table 1: BMI Monitoring Stations and Locations

Station	*Waterbody*	*Location*
0	Ventura River	1st above estuary
4	Ventura River	Main stem, closest to San Antonio Creek
6	Ventura River	Main stem
12	Ventura River	1st above urban influence
2	Canada Larga Creek	Downstream of grazing
3	Canada Larga Creek	Above grazing impact
5	San Antonio Creek	1st above Ventura River confluence
7	Lion Canyon Creek	1st above San Antonio Creek confluence
15	San Antonio Creek	Above Lion Canyon Creek
8	Stewart Canyon Creek	1st above San Antonio Creek confluence
9	San Antonio Creek	Close to City of Ojai
10	North Fork Matilija Creek	Above influence of Matilija Dam, below quarry
11	North Fork Matilija Creek	Above influence of Matilija Dam, above quarry
13	Matilija Creek	Above dam, below community
14	Matilija Creek	Above dam, above community

2007 Results

Physical habitat conditions at the nine sampling sites ranged from marginal to optimal, as shown in Figure 1. The best (highest) habitat scores were at locations on the upper main stem of the Ventura River, upper San Antonio Creek and Matilija Creek. The worst (lowest) scores were at locations on the lower Ventura River and Canada Larga Creek. Habitat conditions were scored out of a total possible score of 200.

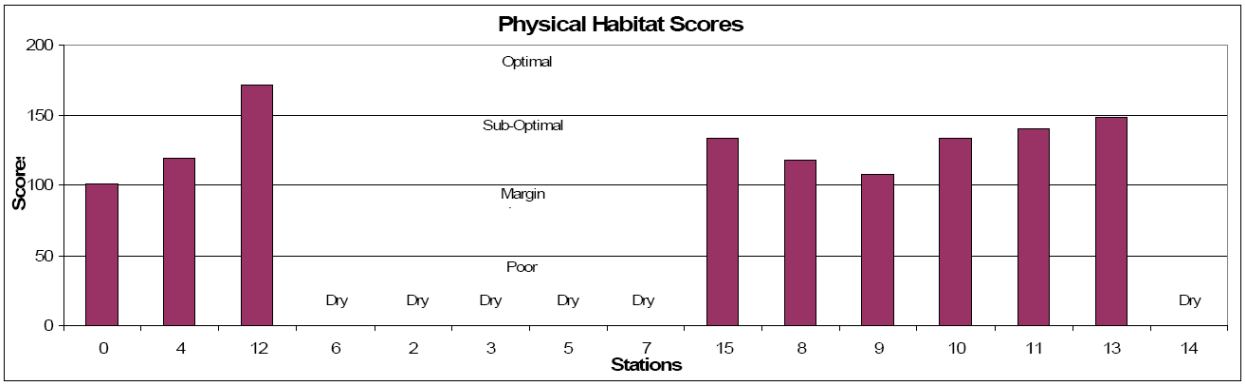

Figure 1: Physical Habitat Scores for Reaches in the Ventura River Watershed, 2007

Based on the Southern California Index of Biological Integrity (So CA IBI), the aquatic health of the Ventura River Watershed during 2007 ranged from poor to good, as shown in
Figure 2. The upper site on the North Fork Matilija Creek and the site at upper San Antonio Creek ranked in the good range, while the site on the lower Ventura River ranked in the poor range. The remaining six sites in the watershed ranked in the fair range. The sites that ranked in the poor range were located in areas of the watershed that were impacted by a large transient human population on the Ventura River or located downstream of an erosion control project in the vicinity of grazing and stables.

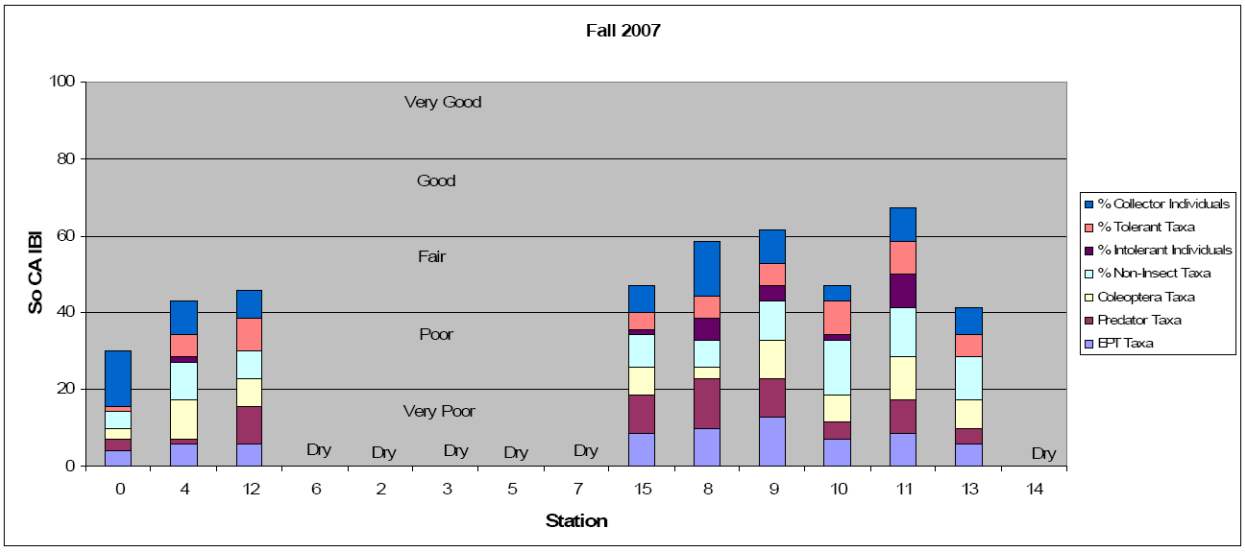

Figure 2: Southern California IBI Scores for sites in the Ventura River Watershed, 2007

The highly invasive New Zealand Mud Snail (*Potamopyrgus antipodarum*) that has infested a number of California waterbodies in recent years was not found in the Ventura River Watershed during the 2007 BMI survey. VCWPD staff takes great precaution to avoid the introduction of the snail into the waterbodies monitored by the Stormwater Monitoring Program.

Figure 3: Benthic Macroinvertebrate Sampling on San Antonio Creek (BMI Station 9)

Historical Results (2001-2007)

The best habitat conditions during the seven year period were measured at Station 12 below the Matilija Dam and the worst occurred on Canada Larga Creek above its confluence with the main stem of the Ventura River. Physical habitat scores increased as elevation in the watershed increased, becoming progressively greater on the Ventura River main stem from the ocean to below Matilija Dam and from Canada Larga Creek to the North Fork of the Matilija Creek.

During the seven year period from 2001 to 2007 the average IBI scores for all sites, except Stations 0, 1, 2, and 12 were in the fair or good range. The average scores for Stations 0, 1 (above the Main Street Bridge) and 2 (Canada Larga Creek), were slightly below the impairment threshold (39). IBI scores increased with elevation on the Ventura River, Canada Larga Creek (Stations 2 and 3) and San Antonio Creek (Stations 7, 15, 8 and 9). The greatest average IBI score during the seven year period was at Station 12 below the Matilija Dam.

Results for cluster and ordination analysis of the combined BMI data from 2001 to 2007 showed that the BMI community in the Ventura Watershed has been relatively stable, both spatially and temporally during the seven year period between 2001 and 2007. Nine station groups were identified based on cluster analysis. The three main cluster groups were spatially delineated by their location in either the lower or upper watershed, with little separation by sampling year. Stations above Matilija Dam (10, 11, 13 and 14) clustered together while lower watershed stations located on the main stem (1 and 4), Canada Larga Creek (2) and the San Antonio Creek system (7, 9 and 15) tended to cluster together. In addition, there was a transition cluster group that spanned sites in both the upper (11) and lower (8 and 9) watersheds.

The lack of any observable temporal trend across the seven year period is of note. Historic rainfall during the winter of 2005 dropped over 40 inches of rain in most parts of the watershed, leading to scouring, erosion and sedimentation at many of the sampling sites, especially in the lower watershed. There were observable changes in the BMI community in 2006, but these changes were not of a magnitude great enough to create an observable signal

in the seven year trend analysis. This indicates that the BMI community in the watershed is relatively stable and responds to natural environmental stressors (heavy rainfall) in a predictable way.

The complete Ventura County Stormwater Monitoring Program Ventura River Watershed 2007 Bioassessment Monitoring Report prepared by ABC is presented in Appendix O.

3. Monitoring Site Locations and Descriptions

The locations of stormwater quality monitoring stations (including current and historical monitoring sites) are shown in Figure 4.

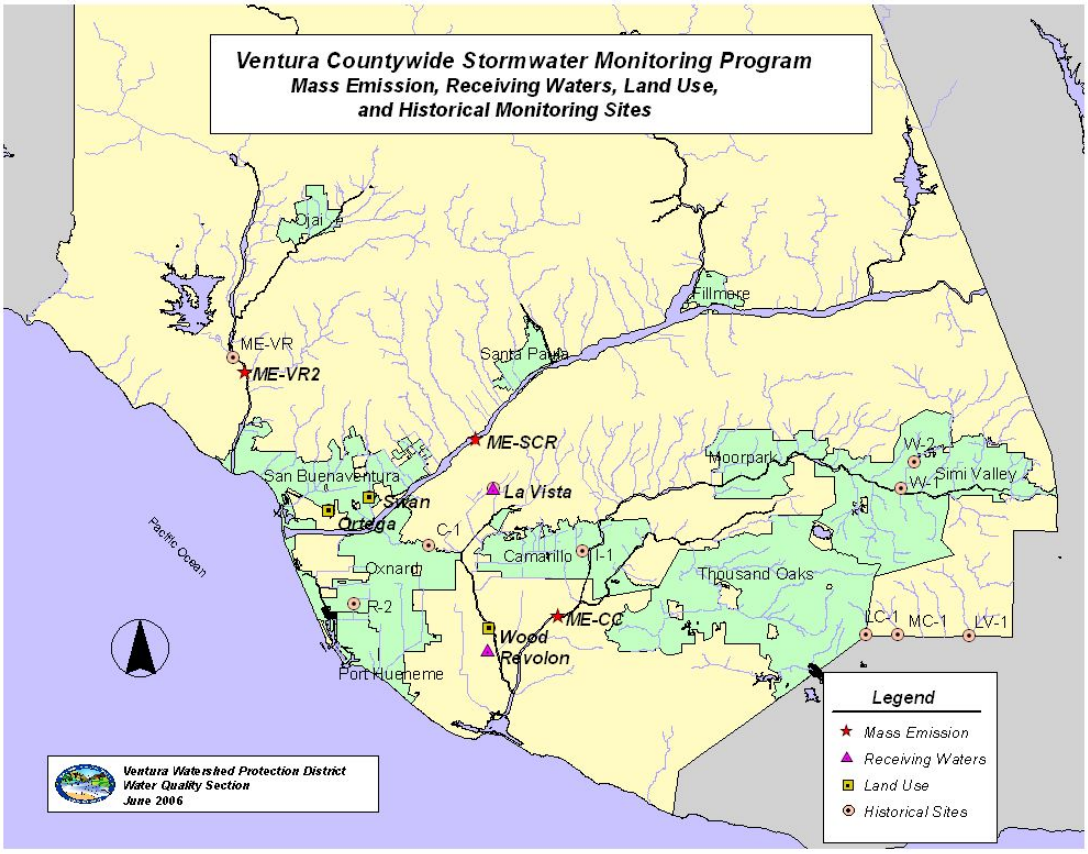

Figure 4: Ventura County Stormwater Monitoring Locations

Table 2 lists rain gauges and their corresponding gauge numbers used by the Stormwater Monitoring Program for recording precipitation that falls near NPDES stormwater monitoring sites.

Table 2: Rain Gauge Sites

ALERT No.	*Standard No.*	*Gauge*	*Assoc. Monitoring Site*
—	194	Camarillo-Adohr	ME-CC
2633	165	Ojai-Stewart Canyon	ME-VR2
110	222a	Ventura County Government Center	I-2, R-1
—	190	Somis-Bard	W-3
2660	171	Fillmore Fish Hatchery	ME-SCR
—	168	Oxnard Airport	A-1, W-4

Sites with multiple gauge numbers represent two different rain gauges located at the same location. The ALERT gauge transmits electronic data to the flood warning ALERT (Automated Local Evaluation in Real Time) system and measures precipitation with an accuracy of 0.04 inches. The standard gauge is a tipping bucket that measures rainfall with an accuracy of 0.01 inches. The more accurate tipping bucket data are used for calculating rainfall

totals unless they are unavailable. ALERT gauge numbers are typically 4 digits (i.e. 2633) while tipping bucket gauge numbers are 3 digits (i.e. 165), with the exception of the Ventura County Government Center (i.e., 222/110).

Land Use Sites

The Stormwater Monitoring Program includes three Land Use monitoring sites: Swan Street (R-1), Ortega Street (I-2), and Wood Road (A-1) as shown in Figure 4. Each station is identified by a code related to the primary land use in the monitored watershed: I for industrial, A for agricultural, and R for residential. The monitoring schedule for the Land Use sites is specified in the *Ventura Countywide Stormwater Monitoring Program: Standard Operating Procedures 2000-2005 Stormwater Monitoring.* During the 2007/08 monitoring season, the only Land Use site that was monitored was the Wood Road (A-1) site during one wet weather event (Event 2 – 12/18/07). The Ortega Street (I-2) and Swan Street (R-1) sites were not monitored for reasons described in Section 1 of this report. Land Use station characteristics are summarized in
Table 3.

Table 3: Land Use Site Characteristics

Station Code	Year Installed	Location	Primary Land Use	Drainage Basin Area (acres)	Rain Gauge Location
R-1	1992 (2003 Upgrade)	Swan Street and Macaw Avenue (City of San Buenaventura)	Residential	65	County Government Center
I-2	1992 (2003 Upgrade)	Ortega Street (City of San Buenaventura)	Industrial	189	County Government Center
A-1	1994 (2001 Upgrade)	Wood Road at Revolon Slough	Agricultural	350 (estimated)	Oxnard Airport

The Swan Street (R-1) site receives runoff from a relatively new (15 to 20 year old) residential neighborhood consisting of single-family dwellings, churches, parks, and a recreation center. The Ortega Street (I-2) site is located in an area of older manufacturing facilities, newer industrial parks, and a few undeveloped city lots. The associated drainage basin for (I-2) consists of diverse types of industrial facilities. The Wood Road (A-1) site receives drainage from the Oxnard Agricultural Plain and is comprised almost entirely of agricultural land (primarily row crops), including a small number of farm residences and ancillary farm facilities for equipment maintenance and storage. All three Land Use monitoring sites are equipped with automated monitoring equipment that collects composite water quality samples as time-paced composites. Sites R-1 and I-2 were upgraded in 2003 with new, portable refrigerated samplers and ISCO 4250 area velocity flow meters.

Receiving Water (Tributaries) Characterization Sites

Two Receiving Water stations are included among the Stormwater Monitoring Program's characterization sites: La Vista (W-3) and Revolon Slough (W-4). The land use surrounding both Receiving Water sites is dominated by agriculture. The La Vista station is located in the upper Revolon Slough watershed, and the Revolon Slough station is located in the lower Revolon Slough Watershed at Wood Road as shown in Figure 4. Both Receiving Water sites were sampled during one wet weather event (W-3, Event 2 – 12/18/07; W-4, Event 1 – 9/21/07) for water chemistry and aquatic toxicity during the current monitoring season. Composite water quality samples at sites W-3 and W-4 are collected as time-paced composites. Receiving Water site characteristics are summarized in Table 4.

Table 4: Receiving Water Site Characteristics

Station Code	Year Installed	Location	Land Uses	Percent Developed	Watershed Area (acres)	Rain Gauge
W-3	1997 (2003 Upgrade)	La Vista Avenue south of Center Road	Agricultural/ Open Space	<2%	752	Somis-Bard
W-4	2001 (2003 Upgrade)	Revolon Slough at Wood Road	Agricultural/ Mixed Use	20%	28,800	Oxnard Airport

Mass Emission Sites

Mass Emission monitoring was conducted in the Santa Clara River, Calleguas Creek, and Ventura River watersheds at the stations shown in Figure 4. Photographs of each Mass Emission monitoring location are presented in Figure 5 (Event 3, January 2008). The site characteristics are summarized in Table 5. Both the ME-SCR and ME-VR2 stations are located in large watersheds possessing diverse inputs of runoff sources, which are dominated by agricultural and urban land uses.

Table 5: Mass Emission Site Characteristics

Station Code	Location	Land Uses	Watershed Area (acres)	Rain Gauge
ME-CC	Calleguas Creek – CSUCI north side of Hueneme Road, just east of Lewis Road at the CSUCI Bridge	Mixed Use	160,640	Camarillo-Adohr
ME-SCR	Santa Clara River – at Freeman Diversion Dam	Mixed Use	1,003,524	Fillmore Fish Hatchery
ME-VR2	Ventura River – Ojai Valley Sanitation District Treatment Plant (OVSDTP)	Mixed Use	134,490	Ojai-Stewart Canyon

The Mass Emission station ME-CC was installed and monitored for the first time during the 2000/01 monitoring season. The ME-SCR site was installed and first monitored during the 2001/02 season. The extremely heavy rainfalls and correspondingly high flows observed in the Ventura River Watershed during January and February 2005 resulted in landslides near the original ME-VR Mass Emission station (monitored since February 2001). Due to safety concerns associated with the landslide activity, the Ventura River Mass Emission site was moved downstream approximately one mile. The new ME-VR2 Mass Emission site (located at the Ojai Valley Sanitation District Treatment Plant, above the POTW outfall) was first monitored using portable sampling equipment in May 2005. A refrigerated sampler, flow meter, and tipping bucket rain gauge were permanently installed at the ME-VR2 site in September 2005 (see Figure 6).

ME-CC and ME-VR2 mass emission samples are collected using automated flow-proportional ISCO 6712 composite samplers. The ME-SCR station also uses an ISCO 6712FR sampler, but the sampler is programmed to collect composite samples on a time-paced basis due to the configuration of the sampling location. The ME-SCR station is located at a dam where water is diverted by United Water Conservation District for ground water infiltration. The diversion configuration poses challenges to the accurate measurement of flows at this location (as discussed in Section 4). Consequently, time-based composite samples are collected at this site rather than flow-proportional composite samples.

The Mass Emission stations are also configured for remote access monitoring using state-of-the-art telemetry equipment. Additionally, rain gauges are located at all three Mass Emission sites, and the ME-VR2 and ME-SCR stations feature refrigerated sampling units. These refrigerated sampling units allow the Stormwater Monitoring Program to keep its water quality samples at a constant temperature throughout the duration of a monitoring event and thus comply with sample handling QA/QC objectives. The ME-CC station is monitored using a non-

refrigerated, portable sampler which requires the constant icing of samples collected at the site in order to keep them at a temperature of 4° C.

Figure 5: Mass Emission Site Photos: ME-CC (Calleguas Creek), ME-SCR (Santa Clara River), and ME-VR2 (Ventura River) during storm flows in January 2008 (Event 3)

Figure 6: ISCO 6712 refrigerated sampler, ISCO 4230 flowmeter, and steel enclosure at Mass Emission site ME-VR2

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4. Precipitation and Flow

Rainfall data compiled for the monitoring sites were obtained from six rain gauges. The data from the gauges associated with a particular monitoring site and events are identified in Figure 7 through Figure 12. With the exception of Land Use sites R-1 and I-2, each monitoring site is equipped with an automatic tipping bucket rain gauge. As mentioned previously, monitoring sites may have two different rain gauges, a tipping bucket and a standard gauge. All precipitation data presented herein are from tipping bucket measurements. As shown in Figure 4, these gauges are located nearby associated monitoring stations or within the tributary watershed. The Ventura County Watershed Protection District currently operates and maintains these gauges.

Historical average annual rainfall in the monitored area varies from 14 to 16 inches per year (based on data for the period between 1950 and 1989). The 2007-2008 rain year produced approximately normal precipitation totals throughout Ventura County, although it should be noted that most of the rain fell in the first half of the winter. The rainfall totals from September 2007 to June 2008 ranged from 11.54 inches at the Camarillo-Adohr gauge (Station #194a) to 20.05 inches at the Ojai-Stewart gauge (Station #165). Daily precipitation during the 2007/2008 monitoring year and the corresponding monitored storm event dates are shown in Figure 7 through Figure 12. Dry weather monitoring was conducted during the 2007/08 monitoring season at each of the three Mass Emission sites. While the dates of all six monitoring events are noted on each precipitation graph, it should be noted that as few as one event (at Land Use and Receiving Water stations) and as many as six events (at Mass Emission stations) were monitored at any given site. The daily precipitation data from September 2007 through June 2008 used to generate these graphs are presented in Appendix A. The seasonal precipitation pattern at these sites is representative of the pattern throughout the monitoring area.

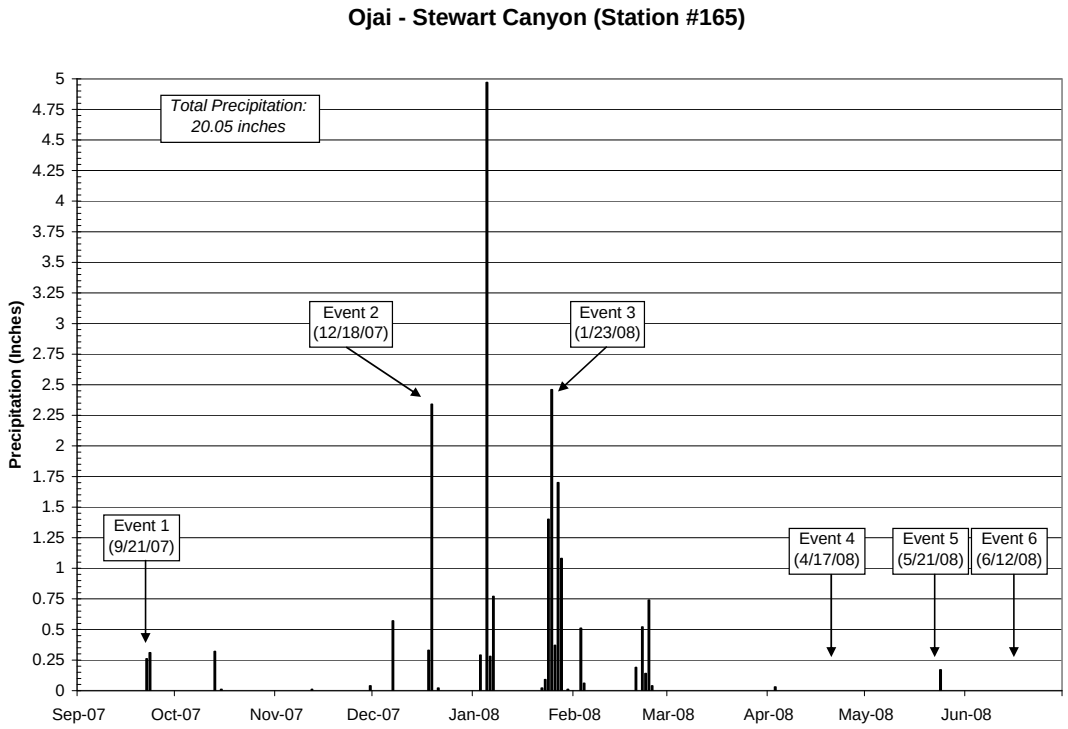

Figure 7: Ojai-Stewart Canyon Rain Gauge (ME-VR2 Monitoring Station)

Fillmore Fish Hatchery (Station #171)

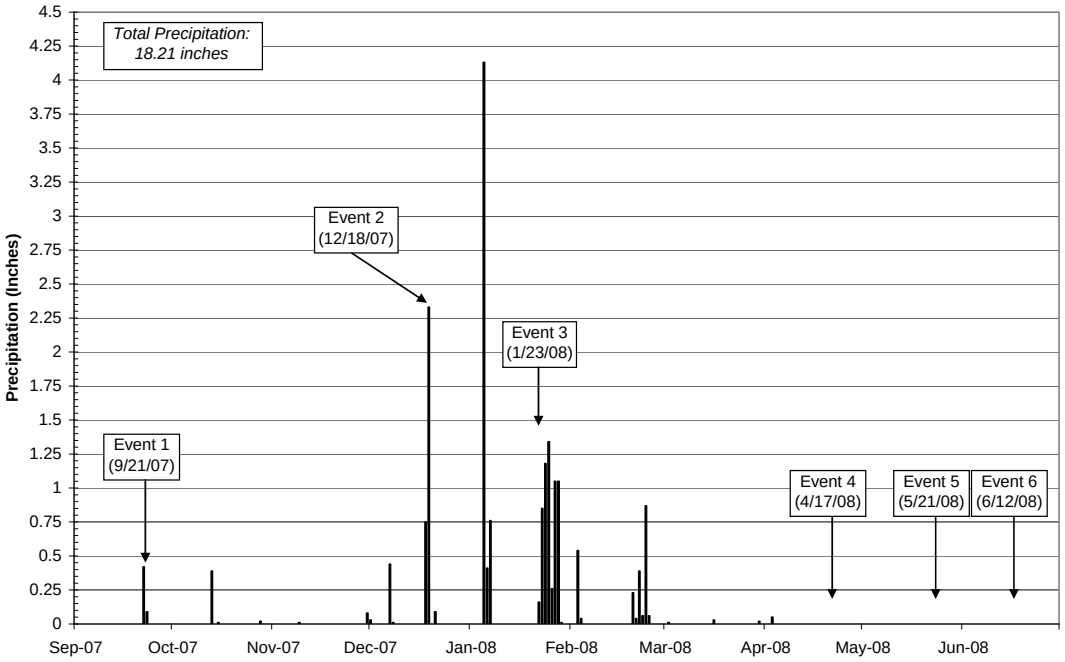

Figure 8: Fillmore Fish Hatchery Rain Gauge (ME-SCR Monitoring Station)

Oxnard Airport (Station #168)

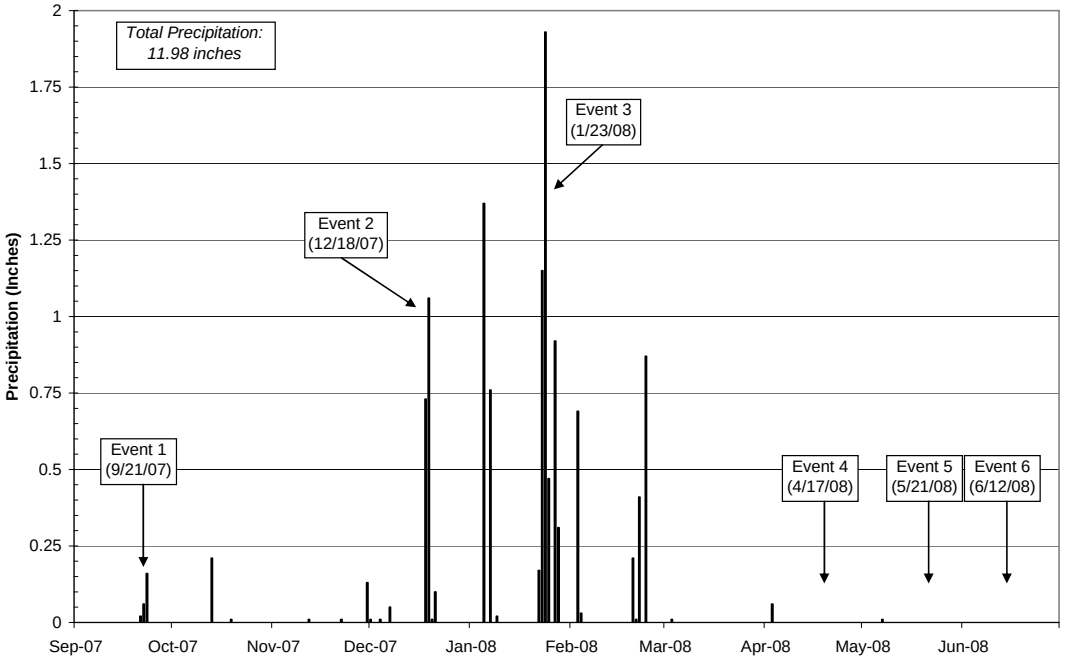

Figure 9: Oxnard Airport Rain Gauge (W-4 and A-1 Monitoring Stations)

Somis-Bard (Station #190)

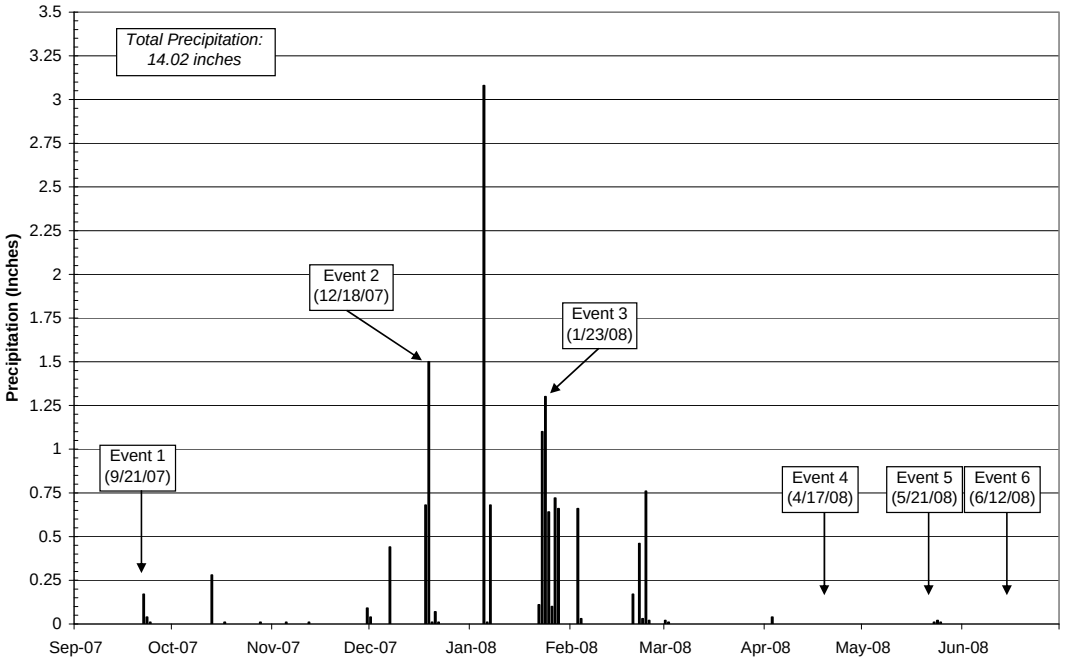

Figure 10: Somis-Bard Rain Gauge (W-3 Monitoring Station)

Camarillo-Adohr (Station #194a)

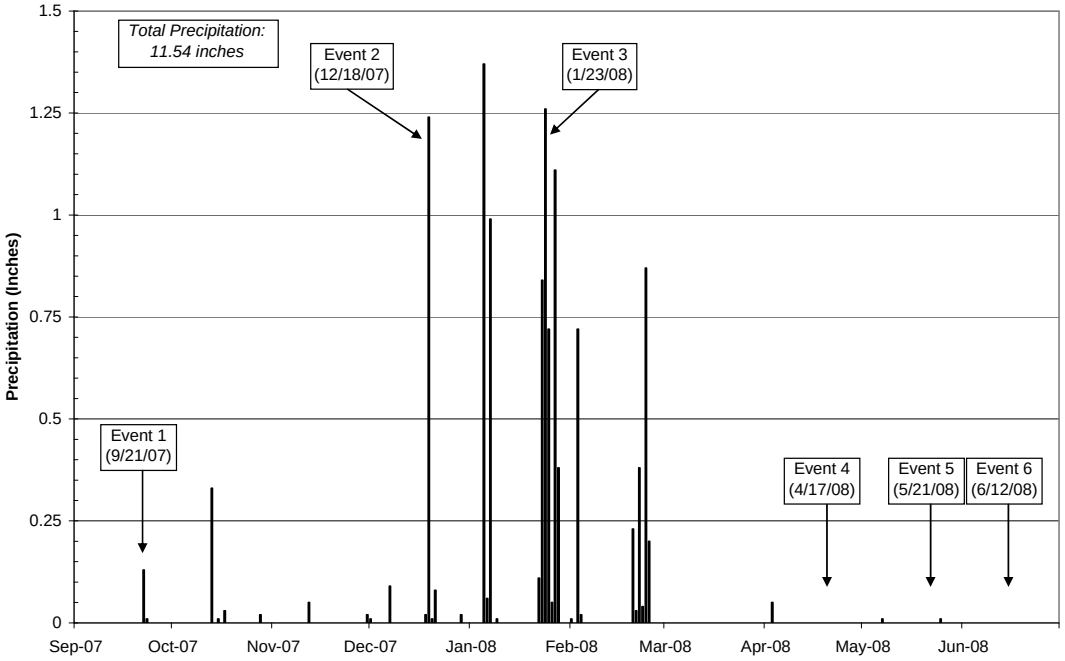

Figure 11: Camarillo-Adohr Rain Gauge (ME-CC Monitoring Station)

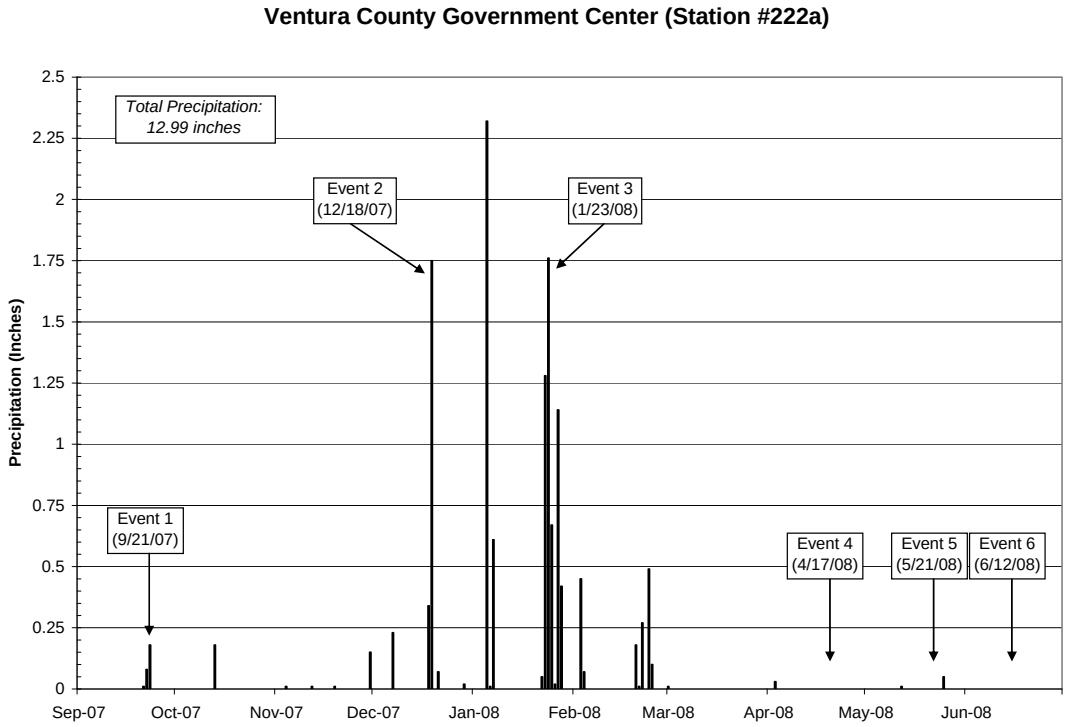

Figure 12: Ventura Co. Govt. Center Rain Gauge (R-1 and I-2 Monitoring Stations)

Rainfall variability among all rain gauges employed by the Stormwater Monitoring Program is shown in a graph of cumulative rainfall from October 1, 2007, through June 30, 2008 (see Figure 13). This cumulative rainfall graph illustrates the rainfall variability throughout Ventura County, and hence among the Stormwater Monitoring Program's sites. Unique rainfall and runoff patterns exhibited by each of the monitoring sites adds to the complexity of sample collection for the Stormwater Monitoring Program in terms of capturing the first flush runoff or peak of the hydrograph at a site for any given monitoring event.

Flow Rates

Flow rates were calculated at each of the Mass Emission sites to establish baseline conditions and load estimates. The automated composite sampling equipment collects information on flow rates (in cubic feet per second, cfs) and volumes (in cubic feet, cf) passing by the composite sampler during the monitoring period. Flowlink software, provided by Teledyne/ISCO, the manufacturer of the sampling equipment, allows the user to analyze the data collected by the sampling equipment to calculate flow rates and volumes over any designated time period. The output from this software was used to calculate average flow rates for the current monitoring events. Flowlink software also allows the generation of a composite graph showing an event hydrograph, sample collection times, and precipitation record for a particular monitoring event. These composite graphs were produced for each event monitored during the 2007/08 season and are presented in Appendix B.

The Stormwater Monitoring Program's composite samples are made up of multiple sub-samples (aliquots) collected over a temporal range. Such temporal composite samples can be collected on a flow-proportional basis or time-paced basis. Flow-proportional composite samplers are programmed prior to the monitoring event to collect samples over certain flow volume increments. During flow-proportional sampling, samples are collected on a volumetric-flow interval basis, with a set aliquot volume collected at passage of each equal, pre-set flow volume. These flow volume increments are determined by predicting the duration of rainfall for a storm event and adjusting the sampler accordingly to collect samples during the course of the flow event that best represent the storm event (i.e., capture peak flow). Sample adjustment is based on the estimated volume of water passing by the monitoring station for a given size rain event. The estimate is based on over 60 years of rainfall data and takes into account antecedent

conditions. Time-paced composite samplers are also programmed according to the predicted duration of rainfall prior to a monitoring event. Under time-paced sampling, equal sample aliquot volumes are collected at equal time intervals. Although composite samplers are automated, VCWPD staff actively monitor storm and flow conditions during each event in order to adaptively adjust the sampler to capture the best representation of storm flow.

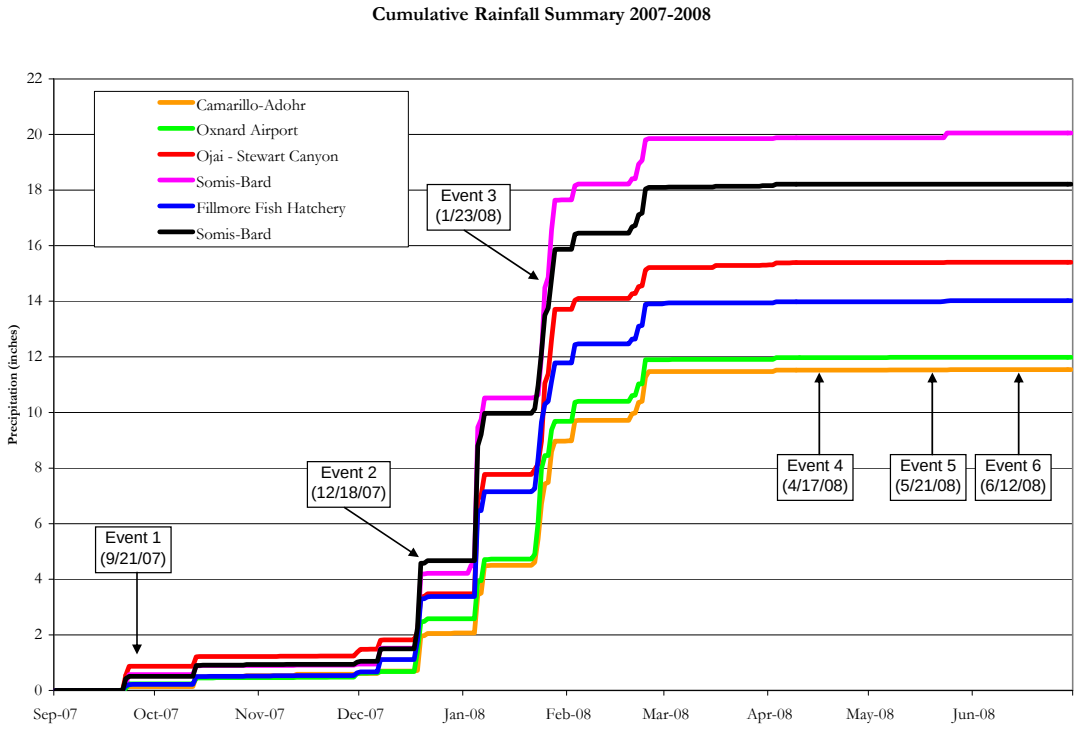

Figure 13: Cumulative Rainfall Summary 2007-2008

Flows at the Santa Clara River (ME-SCR) Mass Emission site are measured using two different meters, one for dry weather and one for wet weather sampling. The ME-SCR site is located on the Santa Clara River at the Freeman Diversion Dam which diverts water into infiltration ponds for groundwater recharge. The United Water Conservation District diverts water from the Santa Clara River during dry conditions for their infiltration facilities. An area velocity flow meter is installed inside the dry weather diversion channel downstream of the infiltration channel gate and is used for measuring dry weather flows (see
Figure 14 and Figure 15). No water flows over the diversion dam during dry weather conditions. During wet weather, the Santa Clara River primarily flows through a river diversion gate, shown in Figure 15, in order to maintain connectivity between the diversion structure and the river. However, during higher wet weather flows, water flows through the river diversion gate and over the diversion dam itself. A flow gauge is presently installed at the top of the diversion dam for wet weather monitoring. There is no flow meter installed at the river diversion gate. VCWPD plans on installing a flow meter at the river diversion gate in the future in order to allow the collection of flow-proportional composite samples at the ME-SCR site. However, there are technical challenges involved in placing a non-intrusive flow meter (ultrasonic) at the river diversion gate due to equipment limitations and debris in the flow. Debris present in wet weather flows, such as trees, vegetation or sediment, could cause inaccurate flow readings and damage this type of meter. VCWPD is currently investigating the use of a radar or non-intrusive flow meter for measuring flow at this gate. These types of meters are capable of measuring open channel flows that contain debris. As mentioned previously, composite samples at ME-SCR are collected on a time-paced basis.

Figure 14: ME-SCR Freeman Diversion Dam (Facing Upstream)

Flow measurement in the infiltration channel during dry weather monitoring can also be problematic in that there is no fixed time schedule for diverting water from the river into the infiltration channel which makes it difficult to determine a daily average flow in the infiltration channel. The aforementioned challenges associated with measuring wet and dry weather flows preclude the complete measurement of flows at ME-SCR at this time, especially with the very low flows observed during this rainfall-deficient winter. However, the VCWPD is working to overcome these difficulties and develop methods for measuring all wet and dry weather flows at the ME-SCR site.

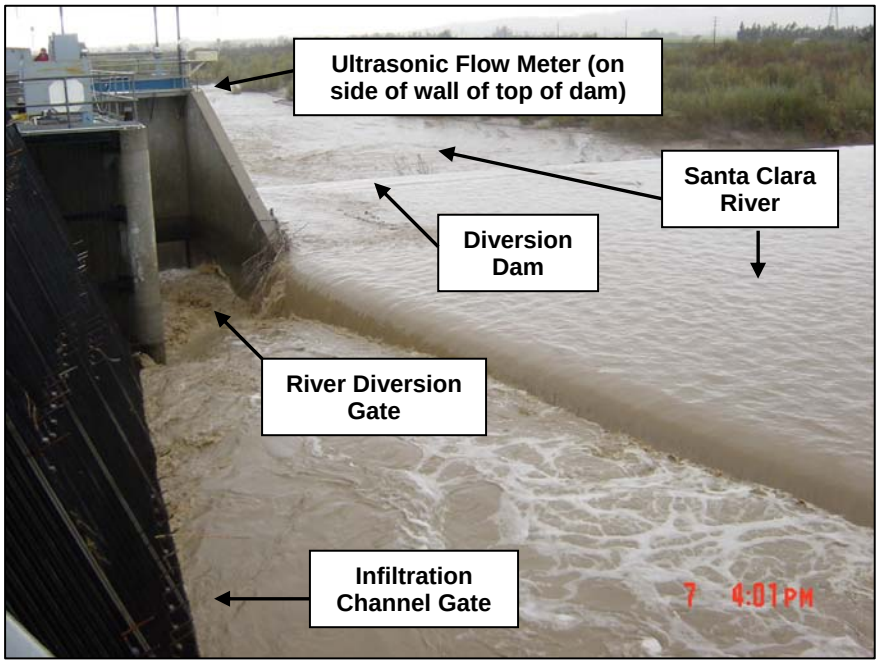

Figure 15: ME-SCR Freeman Diversion Dam (Facing Downstream)

Figure 16: River Diversion Gate (Facing Downstream)

Figure 17: Infiltration Channel (Facing Upstream)

Table 6 summarizes flow rates at the Mass Emission, Land Use, and Receiving Water stations for each of the monitoring events conducted in 2007/08. Event duration is defined as the number of hours elapsed between the first aliquot distributed into the first sample bottle collected through the last aliquot distributed into the last sample bottle collected by a composite sampler. Average flow is determined by averaging all available flow data over the event duration time period. It should be noted that all wet weather flows listed for ME-SCR in Table 6 do not include flow

at the river diversion gate, and depending on the flow volume of a particular wet weather event, may represent only a portion of the total wet weather flow.

Table 6: Site Flow Data and Event Durations

Site ID	Event No.	Event Date[A]	Average Flow (CFS)	Start Date, Time	End Date, Time	Event Duration
ME-CC	1	9/21/2007	54.49	9/21/2007 18:04	9/23/2007 19:04	49:00
	2	12/18/2007	535.32	12/18/2007 7:06	12/19/2007 6:25	23:19
	3	1/23/2008	739.38	1/23/2008 0:01	1/24/2008 13:08	37:07
	4	4/17/2008	36.42	4/17/2008 10:00	4/18/2008 9:50	23:50
	5	5/21/2008	14.87	5/21/2008 10:01	5/22/2008 12:26	26:25
	6	6/12/2008	14.17	6/12/2008 10:00	6/13/2008 9:04	23:04
ME-VR2	1	9/21/2007	1.57	9/21/2007 19:30	9/22/2007 19:14	23:44
	2	12/18/2007	3.99	12/18/2007 8:18	12/19/2007 19:07	34:49
	3	1/23/2008	343.72	1/23/2008 0:01	1/24/2008 19:04	43:03
	4	4/17/2008	27.67	4/17/2008 10:03	4/18/2008 9:38	23:35
	5	5/21/2008	16.40	5/21/2008 10:03	5/22/2008 9:52	23:49
	6	6/12/2008	7.62	6/12/2008 10:12	6/13/2008 9:47	23:35
ME-SCR[B]	1	9/21/2007	[C]	9/21/2007 18:46	9/22/2007 18:31	23:45
	2	12/18/2007	[C]	12/18/2007 7:38	12/19/2007 20:03	36:25
	3	1/23/2008	[C]	1/23/2008 0:00	1/24/2008 9:59	33:59
	4	4/17/08	[C]	4/17/2008 10:00	4/18/2008 10:29	24:29
	5	5/21/08	[C]	5/21/2008 10:01	5/22/2008 9:44	23:43
	6	6/12/08	[C]	6/12/2008 9:59	6/13/2008 11:29	25:30
A-1	2	12/18/2007	1.37	12/18/2007 6:44	12/19/2007 6:29	23:45
W-3	2	12/18/2007	14.97	12/18/2007 6:19	12/19/2007 2:34	20:15
W-4	1	9/21/2007	[D]	9/21/2007 17:46	9/22/2007 17:31	23:45

A. Event Date describes the date on which composite sampling began for a particular monitoring event.

B. During wet weather the Santa Clara River flows through the river diversion gate and over the diversion dam. Currently, there is no flow meter installed at the river diversion gate where a majority of the wet weather flow passes. It should be noted that until a flow meter is installed at the river diversion gate, these values only represent a portion of the total wet weather flow at ME-SCR (see Flow Rates section above for further information).

C. Events 1 – 6 at the ME-SCR site produced insufficient flows to be measured by the flow meter located at the top of the diversion dam. Ostensibly, all flows produced during this event were redirected through the river diversion gate and into the infiltration channel.

D. Flow measured at the W-4 site during Event 1 (9/21/07) was considered erroneous due to approximately one foot of sediment that had built up at the stream gauge since its installation. Sediment build-up produced a back water effect that prevented the accurate measurement of water levels and flow volumes in Revolon Slough. Due to these conditions, the VCWPD Hydrology Section has since moved the stream gauge 776A – Revolon Slough from Laguna Road upstream to Pleasant Valley Road.

5. Sample Collection

Sampling conducted by the Stormwater Monitoring Program during the 2007/08 monitoring season consisted of the capturing of the first flush storm event in Ventura County on September 21, 2007, followed by the monitoring of two mid-season storms on December 18, 2007 and January 23, 2008. Unfortunately, a late-February storm event was not captured because a significant rainfall event was preceded by several days of below-criteria rainfall. Storm event sampling criteria contained in the NPDES permit specify that not more than 0.1 inch of rain shall occur during the 72 hours preceding a monitored event. Storms are selected for monitoring based on the antecedent conditions (72-hour dry period), fulfillment of the dry period, and predicted precipitation. The three dry weather events were monitored on April 17, 2008, May 21, 2008 and June 12, 2008. Dry weather events are monitored when there has been at least a 72-hour antecedent dry period without measurable rainfall (< 0.01 inches).

At the Calleguas Creek (ME-CC) and Ventura River (ME-VR2) sites automated composite samplers are programmed to collect flow-proportional samples based on water volume passing by the station during wet weather monitoring. The flow volume necessary to trigger sample collection is determined based on the predicted amount of precipitation over a specific period of time and the estimated volume of runoff from the watershed. These values are based on 60 years of historic precipitation data used to develop runoff tables included in the Standard Operating Procedures. Samples at ME-SCR are collected on a time-paced basis during wet weather monitoring because flow-proportional compositing is not possible due to the diversion of Santa Clara River water by the United Water Conservation District. The Stormwater Monitoring Program has installed a flow gauge in the diversion channel to monitor flow diverted to infiltration ponds during dry weather, as well as a flow meter on top of the Freeman Diversion Dam to measure flow during wet weather. Time-paced composite samples were collected at the Land Use (A-1) and Receiving Water (W-3, W-4) sites. Receiving Water site W-4 collects samples on a time interval basis because sample to volume (runoff) tables are not available.

The Santa Clara River (ME-SCR), Wood Road (A-1), and both Receiving Water (La Vista, W-3, and Revolon Slough, W-4) monitoring sites have hard line phone and electrical connections and refrigerated sampling units. The Ventura River (ME-VR2) site also possesses an electrical connection and refrigerated sampling unit, but communication with the sampling equipment is made possible via a cellular phone connection. The Calleguas Creek (ME-CC) station possesses a cellular phone connection and runs on solar/battery power. The Ortega Street (I-2) and Swan Street (R-1) Land Use sites do not possess phone or power connections, and utilize portable refrigerated samplers for sample collection. Automated data logging is available at all sites, while tipping bucket rain gauges are installed at all sites except for I-2 and R-1. Additionally, all sites except for I-2 and R-1 can be remotely accessed via telemetry, including the area velocity flow meter installed in the infiltration channel at ME-SCR.

The sampling methods and sample handling procedures used during the 2007/08 monitoring year are based on EPA Method 1669 and are described in the revised *Ventura Countywide Stormwater Monitoring Program: Water Quality Monitoring Standard Operating Procedures 2000-2005 Stormwater Monitoring* (LWA, 2001) – a document also referred to as the *Land Use and Receiving Water Guide*. The sampling methods and sample handling procedures employed at Mass Emission monitoring sites are also based on EPA Method 1669 and are described in *Ventura Countywide Stormwater Monitoring Program: Mass Emission Stations Water Quality Monitoring Standard Operating Procedures 2000-2005* (VCWPD, 2003) – a document also referred to as the *Mass Emission Guide*. The parameters required to be monitored by the Stormwater Monitoring Program are described as a part of NPDES Permit No. CAS004002 Section No. CL 7388. The Stormwater Monitoring Program produces an *event sample matrix* for each event prior to its monitoring as a means of documenting the specific environmental and QA/QC samples to be collected at any given monitoring site for a particular event, as well as the specific sample container to be used when collecting a certain sample. All event sample matrices associated with the 2007/08 monitoring season are presented in Appendix C.

At Mass Emission, Receiving Water, and Land Use sites, both composite and grab samples are collected. Composite samples are collected in glass containers and then delivered to the lab where they are split by pouring off with a tipper. When the splitting of a composite sample is performed, the composite sample is continually rocked in a sample-pouring stand to provide as much "non-invasive" mixing as possible. Sample splitting allows homogeneous aliquots of a single, large water sample to be divided into several smaller samples for the purpose of delivering these

smaller volumes of water to individual analytical laboratories as necessary. The volume of sample collected depends upon the volume required by the lab to perform requested water quality and QA/QC analyses.

Figure 18: Grab Sample Collection using EPA Sampling Protocols

In an effort to maintain quality control for the sampling program, the sampling crew, in cooperation with the analytical laboratories, has minimized the number of laboratories and sample bottles used for analysis. This has minimized bottle breakage, increased efficiency, and reduced the chances for contamination of the samples. Also, a dedicated monitoring team is used to provide consistent sample collection and handling. Remote access capability at all but two Land Use monitoring sites (I-2 and R-1) also provides data-on-demand which allows immediate onsite evaluation of stream conditions.

For constituents analyzed from samples required to be collected as “grabs”, samples are ideally taken at the peak runoff flow to provide the best estimate for an event mean concentration (EMC). In practice it is difficult to both predict the peak flow and to allocate manpower such that all sites are grab-sampled at the storm event peak flow. It should be noted that peak flow times vary for each monitoring station due to the size and inherent characteristics of the watershed in which the site is located. All grab and composite wet weather samples collected during the 2007/08 monitoring season are considered best available estimates of storm EMCs. During dry weather, time-paced composite samples are collected at each site over a 24 to 48-hour period. Dry weather grab samples are collected during this composite sample period. Table 7 summarizes the samples collected at each of the monitoring locations during the 2007/08 monitoring season.

As a means of documenting all preparatory, operational, observational, and concluding activities of a monitoring event, the Stormwater Monitoring Program produces an event summary for each monitoring event it conducts. These event summaries include, but are not limited to information related to event duration, predicted and actual precipitation, weather conditions, the programming of sampling equipment, equipment malfunctions, sample collection and handling, and sample tracking with respect to delivery to an analytical laboratory. All event summaries associated with the 2007/08 monitoring season are presented in Appendix D.

Table 7: 2007/08 Monitoring Event Summary

Event Number	*Event Date*	*A-1 Wood Road*	*W-3 La Vista Avenue*	*W-4 Revolon Slough*	*ME-CC Calleguas Creek-CSUCI*	*ME-SCR Santa Clara River*	*ME-VR2 Ventura River-OVSDTP*
1	9/21/07	-	-	CGT	CGT	CGT	CGT
2	12/18/07	CGT	CGT	-	CGT	CGT	CGT
3	1/23/08	-	-	-	CG	CG	CG
4	4/17/08	-	-	-	CG	CG	CG
5	5/21/08	-	-	-	CGT	CGT	CGT
6	6/12/08	-	-	-	CG	CG	CG

Notes:
"G" indicates that a grab sample was collected
"C" indicates that a composite sample was collected.
"T" indicates that toxicity samples were collected.
"-" indicates that no sample was collected.

In addition to documenting the water quality samples scheduled for collection during an event through the generation of an event sample matrix, the Stormwater Monitoring Program also documents the actual samples it collects – and their date and time of collection – during the course of an event by completing a chain of custody (COC) form for each sampling event conducted at a monitoring site. The COC form not only documents sample collection, but also notifies an analytical laboratory that a particular sample should be analyzed for a certain constituent or group of constituents, oftentimes specifying the analytical method to be employed. Finally, the COC form acts as an evidentiary document noting how many samples were relinquished – and at what date and time – to a particular laboratory by the Stormwater Monitoring Program. All chain of custody forms associated with the 2007/08 monitoring season are presented in Appendix E.

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6. Analyses Performed

Stormwater Monitoring Program analyses include those for anions, bacteriologicals, conventionals, hydrocarbons, trace metals, nutrients, semi- and non-volatile organics, PCBs, various pesticides, including chlorinated and organophosphorus compounds, acute and chronic toxicity, and bioassessment. The following laboratories analyzed Stormwater Monitoring Program water quality samples during the 2007/08 monitoring season:

- CRG Marine Laboratories, Inc. of Torrance, CA performed all tests except for perchlorate, BOD, TOC, TKN, MTBE, glyphosate and other pesticides analyzed via EPA 8151A, bacteria, toxicity, and bioassessment;
- Calscience Environmental Laboratories, Inc. performed the following analyses: perchlorate, BOD, TOC, MTBE, 2,4,5-T, 2,4,5-TP (Silvex), 2,4-D, 2,4-DB,Dalapon, Dicamba, Dichlorprop, Dinoseb, MCPA, and MCPP;
- Aquatic Bioassay & Consulting Laboratories, Inc. performed all toxicity tests;
- Ventura County Health Care Agency Laboratory performed bacteriological tests for E. coli, Enterococcus, and Total and Fecal Coliforms for Events 1-4 and 6;
- Pat-Chem Laboratories performed bacteriological tests for E. coli, Enterococcus, and Total and Fecal Coliform for Event 5;
- Thomas Analytical Laboratory performed the Total Kjeldahl Nitrogen (TKN) analyses; and
- Weck Laboratories, Inc. was used to perform the Glyphosate analyses.

Analytical methods employed by all laboratories comply with those outlined in the permit. The analytical methods employed allow the laboratories to achieve the lowest possible detection limits.

The aquatic toxicity tests were conducted by Aquatic Bioassay & Consulting Laboratories, Inc. of Ventura, CA under the guidelines prescribed in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA-821-R-02-012) and *Short-Term Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms* (EPA-600-R95/136). The toxicity tests included acute *Ceriodaphnia dubia* survival and chronic purple sea urchin (*Strongylocentrotus purpuratus*) fertilization bioassays. Aquatic Bioassay & Consulting also performs the macroinvertebrate bioassessment testing (including taxonomic identification and data analysis) and reporting in addition to aquatic toxicity bioassays.

Table 8 provides a complete listing of the constituents and associated analytical methods for all water quality analyses conducted by the Stormwater Monitoring Program during the 2007/08 monitoring year.

Table 8: Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/08

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
Anion Analyses	Bromide	n/a	EPA 300.0	CRG
	Chloride	n/a	EPA 300.0	CRG
	Perchlorate	n/a	EPA 314.0	Calscience
Bacteriological Analyses	E. coli	n/a	MMO-MUG[1] and SM 9223 B[2]	VCHCA and Pat-Chem
	Enterococcus	n/a	Enterolert[1] and SM 9230 B[2]	VCHCA and Pat-Chem
	Fecal Coliform	n/a	SM 9221 E	VCHCA and Pat-Chem
	Total Coliform	n/a	MMO-MUG[1] and SM 9223 B[2]	VCHCA and Pat-Chem
Conventional Analyses	BOD	n/a	EPA 405.1 and SM 5210 B[3]	CRG and Calscience
	Conductivity	n/a	SM 2510	CRG
	Hardness as CaCO3	Total	SM 2340 B	CRG
	pH	n/a	SM 4500 H+	CRG
	Total Dissolved Solids	n/a	SM 2540 C	CRG
	Total Organic Carbon	n/a	EPA 415.1 and SM 5310 B	CRG
	Total Suspended Solids	n/a	SM 2540 D	CRG
	Turbidity	n/a	EPA 180.1	CRG
Hydrocarbon Analyses	Oil and Grease	n/a	EPA 1664A	CRG
	TRPH	n/a	EPA 1664	CRG
Metals Analyses	Aluminum	Dissolved	EPA 200.8m	CRG
	Aluminum	Total	EPA 200.8m	CRG
	Arsenic	Dissolved	EPA 200.8m	CRG
	Arsenic	Total	EPA 200.8m	CRG
	Cadmium	Dissolved	EPA 200.8m	CRG
	Cadmium	Total	EPA 200.8m	CRG
	Chromium	Dissolved	EPA 200.8m	CRG
	Chromium	Total	EPA 200.8m	CRG
	Chromium VI	Total	SM 3500-Cr D	CRG
	Copper	Dissolved	EPA 200.8m	CRG
	Copper	Total	EPA 200.8m	CRG
	Lead	Dissolved	EPA 200.8m	CRG
	Lead	Total	EPA 200.8m	CRG
	Mercury	Dissolved	EPA 1631Em	CRG
	Mercury	Total	EPA 1631Em	CRG
	Nickel	Dissolved	EPA 200.8m	CRG
	Nickel	Total	EPA 200.8m	CRG
	Selenium	Dissolved	EPA 200.8m	CRG
	Selenium	Total	EPA 200.8m	CRG
	Silver	Dissolved	EPA 200.8m	CRG
	Silver	Total	EPA 200.8m	CRG

Table 8 (Continued): Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/08

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
Metals Analyses	Thallium	Dissolved	EPA 200.8m	CRG
	Thallium	Total	EPA 200.8m	CRG
	Zinc	Dissolved	EPA 200.8m	CRG
	Zinc	Total	EPA 200.8m	CRG
Nutrient Analyses	Ammonia as N	n/a	SM 4500-NH3 F	CRG
	Nitrate as N	n/a	EPA 300.0	CRG
	Nitrite as N	n/a	EPA 300.0	CRG
	Orthophosphate as P (Diss)	n/a	EPA 300.0	CRG
	TKN	n/a	EPA 351.1	TA
	Total Phosphorus	Dissolved	SM 4500-P E	CRG
	Total Phosphorus	Total	SM 4500-P E	CRG
Organic Analyses	1,2,4-Trichlorobenzene	n/a	EPA 625m	CRG
	1,2-Dichlorobenzene	n/a	EPA 625m	CRG
	1,3-Dichlorobenzene	n/a	EPA 625m	CRG
	1,4-Dichlorobenzene	n/a	EPA 625m	CRG
	1-Methylnaphthalene	n/a	EPA 625m	CRG
	1-Methylphenanthrene	n/a	EPA 625m	CRG
	2,3,5-Trimethylnaphthalene	n/a	EPA 625m	CRG
	2,4,6-Trichlorophenol	n/a	EPA 625m	CRG
	2,4-Dichlorophenol	n/a	EPA 625m	CRG
	2,4-Dimethylphenol	n/a	EPA 625m	CRG
	2,4-Dinitrophenol	n/a	EPA 625m	CRG
	2,4-Dinitrotoluene	n/a	EPA 625m	CRG
	2,6-Dimethylnaphthalene	n/a	EPA 625m	CRG
	2,6-Dinitrotoluene	n/a	EPA 625m	CRG
	2-Chloronaphthalene	n/a	EPA 625m	CRG
	2-Chlorophenol	n/a	EPA 625m	CRG
	2-Methyl-4,6-dinitrophenol	n/a	EPA 625m	CRG
	2-Methylnaphthalene	n/a	EPA 625m	CRG
	2-Nitrophenol	n/a	EPA 625m	CRG
	3,3'-Dichlorobenzidine	n/a	EPA 625m	CRG
	4-Bromophenyl phenyl ether	n/a	EPA 625m	CRG
	4-Chloro-3-methylphenol	n/a	EPA 625m	CRG
	4-Chlorophenyl phenyl ether	n/a	EPA 625m	CRG
	4-Nitrophenol	n/a	EPA 625m	CRG
	Acenaphthene	n/a	EPA 625m	CRG
	Acenaphthylene	n/a	EPA 625m	CRG
	Anthracene	n/a	EPA 625m	CRG
	Azobenzene	n/a	EPA 625m	CRG
	Benzidine	n/a	EPA 625m	CRG
	Benzo(a)anthracene	n/a	EPA 625m	CRG
	Benzo(a)pyrene	n/a	EPA 625m	CRG
	Benzo(b)fluoranthene	n/a	EPA 625m	CRG

Table 8 (Continued): Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/08

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
Organic Analyses	Benzo(e)pyrene	n/a	EPA 625m	CRG
	Benzo(g,h,i)perylene	n/a	EPA 625m	CRG
	Benzo(k)fluoranthene	n/a	EPA 625m	CRG
	Biphenyl	n/a	EPA 625m	CRG
	Bis(2-chloroethoxy)methane	n/a	EPA 625m	CRG
	Bis(2-chloroethyl)ether	n/a	EPA 625m	CRG
	Bis(2-chloroisopropyl)ether	n/a	EPA 625m	CRG
	Bis(2-ethylhexyl)phthalate	n/a	EPA 625m	CRG
	Butyl benzyl phthalate	n/a	EPA 625m	CRG
	Chrysene	n/a	EPA 625m	CRG
	Dibenz(a,h)anthracene	n/a	EPA 625m	CRG
	Dibenzothiophene	n/a	EPA 625m	CRG
	Diethyl phthalate	n/a	EPA 625m	CRG
	Dimethyl phthalate	n/a	EPA 625m	CRG
	Di-n-butylphthalate	n/a	EPA 625m	CRG
	Di-n-octylphthalate	n/a	EPA 625m	CRG
	Fluoranthene	n/a	EPA 625m	CRG
	Fluorene	n/a	EPA 625m	CRG
	Hexachlorobenzene	n/a	EPA 625m	CRG
	Hexachlorobutadiene	n/a	EPA 625m	CRG
	Hexachlorocyclopentadiene	n/a	EPA 625m	CRG
	Hexachloroethane	n/a	EPA 625m	CRG
	Indeno(1,2,3-cd)pyrene	n/a	EPA 625m	CRG
	Isophorone	n/a	EPA 625m	CRG
	Methyl tert-butyl ether (MTBE)	n/a	EPA 8260B	Calscience
	Naphthalene	n/a	EPA 625m	CRG
	Nitrobenzene	n/a	EPA 625m	CRG
	N-Nitrosodimethylamine	n/a	EPA 625m	CRG
	N-Nitrosodi-N-propylamine	n/a	EPA 625m	CRG
	N-Nitrosodiphenylamine	n/a	EPA 625m	CRG
	Pentachlorophenol	n/a	EPA 625m	CRG
	Perylene	n/a	EPA 625m	CRG
	Phenanthrene	n/a	EPA 625m	CRG
	Phenol	n/a	EPA 625m	CRG
	Pyrene	n/a	EPA 625m	CRG
	Total Detectable PAHs	n/a	EPA 625m	CRG
PCB Analyses	Aroclor 1016	n/a	EPA 625m	CRG
	Aroclor 1221	n/a	EPA 625m	CRG
	Aroclor 1232	n/a	EPA 625m	CRG
	Aroclor 1242	n/a	EPA 625m	CRG
	Aroclor 1248	n/a	EPA 625m	CRG
	Aroclor 1254	n/a	EPA 625m	CRG
	Aroclor 1260	n/a	EPA 625m	CRG
	PCB 003	n/a	EPA 625m	CRG

Table 8 (Continued): Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/086

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
PCB Analyses	PCB 008	n/a	EPA 625m	CRG
	PCB 018	n/a	EPA 625m	CRG
	PCB 028	n/a	EPA 625m	CRG
	PCB 031	n/a	EPA 625m	CRG
	PCB 033	n/a	EPA 625m	CRG
	PCB 037	n/a	EPA 625m	CRG
	PCB 044	n/a	EPA 625m	CRG
	PCB 049	n/a	EPA 625m	CRG
	PCB 052	n/a	EPA 625m	CRG
	PCB 056/060	n/a	EPA 625m	CRG
	PCB 066	n/a	EPA 625m	CRG
	PCB 070	n/a	EPA 625m	CRG
	PCB 074	n/a	EPA 625m	CRG
	PCB 077	n/a	EPA 625m	CRG
	PCB 081	n/a	EPA 625m	CRG
	PCB 087	n/a	EPA 625m	CRG
	PCB 095	n/a	EPA 625m	CRG
	PCB 097	n/a	EPA 625m	CRG
	PCB 099	n/a	EPA 625m	CRG
	PCB 101	n/a	EPA 625m	CRG
	PCB 105	n/a	EPA 625m	CRG
	PCB 110	n/a	EPA 625m	CRG
	PCB 114	n/a	EPA 625m	CRG
	PCB 118	n/a	EPA 625m	CRG
	PCB 119	n/a	EPA 625m	CRG
	PCB 123	n/a	EPA 625m	CRG
	PCB 126	n/a	EPA 625m	CRG
	PCB 128	n/a	EPA 625m	CRG
	PCB 138	n/a	EPA 625m	CRG
	PCB 141	n/a	EPA 625m	CRG
	PCB 149	n/a	EPA 625m	CRG
	PCB 151	n/a	EPA 625m	CRG
	PCB 153	n/a	EPA 625m	CRG
	PCB 156	n/a	EPA 625m	CRG
	PCB 157	n/a	EPA 625m	CRG
	PCB 158	n/a	EPA 625m	CRG
	PCB 167	n/a	EPA 625m	CRG
	PCB 168 + 132	n/a	EPA 625m	CRG
	PCB 169	n/a	EPA 625m	CRG
	PCB 170	n/a	EPA 625m	CRG
	PCB 174	n/a	EPA 625m	CRG
	PCB 177	n/a	EPA 625m	CRG
	PCB 180	n/a	EPA 625m	CRG

Table 8 (Continued): Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/08

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
PCB Analyses	PCB 183	n/a	EPA 625m	CRG
	PCB 187	n/a	EPA 625m	CRG
	PCB 189	n/a	EPA 625m	CRG
	PCB 194	n/a	EPA 625m	CRG
	PCB 195	n/a	EPA 625m	CRG
	PCB 200	n/a	EPA 625m	CRG
	PCB 201	n/a	EPA 625m	CRG
	PCB 206	n/a	EPA 625m	CRG
	PCB 209	n/a	EPA 625m	CRG
	Total Detectable PCBs	n/a	EPA 625m	CRG
Pesticide Analyses	2,4,5-T	n/a	EPA 8151A	Calscience
	2,4,5-TP (Silvex)	n/a	EPA 8151A	Calscience
	2,4-D	n/a	EPA 8151A	Calscience
	2,4-DB	n/a	EPA 8151A	Calscience
	2,4'-DDD	n/a	EPA 625m	CRG
	2,4'-DDE	n/a	EPA 625m	CRG
	2,4'-DDT	n/a	EPA 625m	CRG
	4,4'-DDD	n/a	EPA 625m	CRG
	4,4'-DDE	n/a	EPA 625m	CRG
	4,4'-DDT	n/a	EPA 625m	CRG
	Aldrin	n/a	EPA 625m	CRG
	BHC-alpha	n/a	EPA 625m	CRG
	BHC-beta	n/a	EPA 625m	CRG
	BHC-delta	n/a	EPA 625m	CRG
	BHC-gamma (Lindane)	n/a	EPA 625m	CRG
	Bolstar	n/a	EPA 625m	CRG
	Chlordane-alpha	n/a	EPA 625m	CRG
	Chlordane-gamma	n/a	EPA 625m	CRG
	Chlorpyrifos	n/a	EPA 625m	CRG
	cis-Nonachlor	n/a	EPA 625m	CRG
	Dalapon	n/a	EPA 8151A	Calscience
	Demeton-O	n/a	EPA 625m	CRG
	Diazinon	n/a	EPA 625m	CRG
	Dicamba	n/a	EPA 8151A	Calscience
	Dichlorprop	n/a	EPA 8151A	Calscience
	Dichlorvos	n/a	EPA 625m	CRG
	Dieldrin	n/a	EPA 625m	CRG
	Dimethoate	n/a	EPA 625m	CRG
	Dinoseb	n/a	EPA 8151A	Calscience
	Disulfoton	n/a	EPA 625m	CRG
	Endosulfan sulfate	n/a	EPA 625m	CRG
	Endosulfan-I	n/a	EPA 625m	CRG
	Endosulfan-II	n/a	EPA 625m	CRG

Table 8 (Continued): Constituents and Analytical Methods for Water Quality Analyses Conducted by the Stormwater Monitoring Program 2007/08

Classification	*Constituent*	*Fraction*	*Method*	*Analytical Laboratory*
Pesticide Analyses	Endrin	n/a	EPA 625m	CRG
	Endrin aldehyde	n/a	EPA 625m	CRG
	Endrin ketone	n/a	EPA 625m	CRG
	Ethoprop	n/a	EPA 625m	CRG
	Fenchlorophos (Ronnel)	n/a	EPA 625m	CRG
	Fensulfothion	n/a	EPA 625m	CRG
	Fenthion	n/a	EPA 625m	CRG
	Glyphosate	n/a	EPA 547	WL
	Heptachlor	n/a	EPA 625m	CRG
	Heptachlor epoxide	n/a	EPA 625m	CRG
	Malathion	n/a	EPA 625m	CRG
	MCPA	n/a	EPA 8151A	Calscience
	MCPP	n/a	EPA 8151A	Calscience
	Merphos	n/a	EPA 625m	CRG
	Methoxychlor	n/a	EPA 625m	CRG
	Methyl parathion	n/a	EPA 625m	CRG
	Mevinphos	n/a	EPA 625m	CRG
	Mirex	n/a	EPA 625m	CRG
	Oxychlordane	n/a	EPA 625m	CRG
	Phorate	n/a	EPA 625m	CRG
	Tetrachlorovinphos (Stirofos)	n/a	EPA 625m	CRG
	Tokuthion	n/a	EPA 625m	CRG
	Total Detectable DDTs	n/a	EPA 625m	CRG
	Toxaphene	n/a	EPA 625m	CRG
	trans-Nonachlor	n/a	EPA 625m	CRG
	Trichloronate	n/a	EPA 625m	CRG

1. Ventura County Health Ventura County HCA Laboratories performed the bacteriological analysis for Events 1 – 4 and 6.
2. Pat-Chem Laboratories performed the bacteriological analysis for Event 5.
3. Calscience Environmental Laboratories performed BOD analyses for Events 1, 4 and 6.

Land Use and Receiving Water Characterization Sites

A summary of the composite and grab samples (including lab duplicate samples) collected and analyzed during the 2007/08 monitoring year for the Land Use and Receiving Water sites are shown in Table 9 and Table 10, respectively.

Table 9: Environmental and QA/QC Samples Collected at Land Use Sites

	Event 2		
Monitoring Site	***A-1***	***R-1***	***I-2***
Date	***12/18/2007***	*Not Sampled*	*Not Sampled*
Composite Constituents			
Bromide	✓ (FD)	—	—
Chloride	✓ (FD)	—	—
BOD	✓ (FD)	—	—
Hardness as $CaCO_3$	✓ (FD)	—	—
Total Dissolved Solids	✓ (FD)	—	—
Total Organic Carbon	✓ (FD)	—	—
Total Suspended Solids	✓ (FD, LD)	—	—
Turbidity	✓ (FD)	—	—
Metals, Total Recoverable	✓ (FD)	—	—
Metals, Dissolved	✓ (FD)	—	—
Chromium VI	✓ (FD)	—	—
Nitrate as N	✓ (FD)	—	—
Nitrite as N	✓ (FD)	—	—
Orthophosphate as P (Diss)	✓ (FD)	—	—
TKN[2]	✓ (FD)	—	—
Total Phosphorus, Total	✓ (FD)	—	—
Total Phosphorus, Dissolved	✓ (FD)	—	—
Organic – EPA 625m	✓ (FD)	—	—
PCB – EPA 625m	✓ (FD)	—	—
Pesticide – EPA 547[4]	✓ (FD)	—	—
Pesticide – EPA 625m	✓ (FD)	—	—
Pesticide – EPA 8151A[1]	✓ (FD)	—	—
Grab Constituents			
Perchlorate[1]	✓ (FD)	—	—
Bacteriological[3]	✓ (FD)	—	—
pH/Conductivity	✓ (FD)	—	—
Hydrocarbons	✓ (FD)	—	—
Mercury, Total Recoverable	✓ (FD)	—	—
Mercury, Dissolved	✓ (FD)	—	—
Ammonia as N	✓ (FD)	—	—
MTBE – EPA 8260B[1]	✓ (FD)	—	—
Aquatic Toxicity Bioassay[5]	✓	—	—

Notes

"✓" indicates that the analysis was performed on an environmental sample; "—" indicates that no sample was collected.

"FD" indicates that a field duplicate analysis was performed.

"LD" indicates that a laboratory duplicate analysis was performed.

Hydrocarbons include: Oil & Grease, TRPH

Metals include: Al, As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, & Zn.

Unless noted otherwise, all analyses performed by CRG Marine Laboratories, Inc.

1. Performed by Calscience Environmental Laboratories, Inc.
2. Performed by TA Laboratories
3. Performed by Ventura County HCA Laboratories
4. Performed Weck Laboratories
5. Performed by Aquatic Bioassay & Consulting Labs, Inc.

Table 10: Environmental and QA/QC Samples Collected at Receiving Water Sites

	Event 2	***Event 1***
Monitoring Site	***W-3***	***W-4***
Date	***12/18/2007***	***9/21/2007***
Composite Constituents		
Bromide	✓	✓
Chloride	✓	✓
BOD	✓	✓[1]
Hardness as $CaCO_3$	✓	✓
Total Dissolved Solids	✓	✓
Total Organic Carbon	✓	✓
Total Suspended Solids	✓	✓
Turbidity	✓	✓
Metals, Total Recoverable	✓	✓
Metals, Dissolved	✓	✓
Chromium VI	✓	✓
Nitrate as N	✓	✓
Nitrite as N	✓	✓
Orthophosphate as P (Diss)	✓	✓
TKN[2]	✓	✓
Total Phosphorus, Total	✓	✓
Total Phosphorus, Dissolved	✓	✓
Organic – EPA 625m	✓	✓
PCB – EPA 625m	✓	✓
Pesticide – EPA 547[4]	✓	✓ (MS/MSD)
Pesticide – EPA 625m	✓	✓
Pesticide – EPA 8151A[1]	✓	✓
Grab Constituents		
Perchlorate[1]	✓	✓
Bacteriological[3]	✓	✓
pH/Conductivity	✓	✓
Hydrocarbons	✓	✓
Mercury, Total Recoverable	✓	✓
Mercury, Dissolved	✓	✓
Ammonia as N	✓	✓
MTBE – EPA 8260B[1]	✓	✓
Aquatic Toxicity Bioassay[5]	✓	✓

Notes

"✓" indicates that the analysis was performed on an environmental sample; "—" indicates that no sample was collected.

"MS/MSD" indicates that a matrix spike/matrix spike duplicate analysis was performed.

Hydrocarbons include: Oil & Grease, TRPH

Metals include: Al, As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, & Zn.

Unless noted otherwise, all analyses performed by CRG Marine Laboratories, Inc.

1. Performed by Calscience Environmental Laboratories, Inc.
2. Performed by TA Laboratories
3. Performed by Ventura County HCA Laboratories
4. Performed Weck Laboratories
5. Performed by Aquatic Bioassay & Consulting Labs, Inc.

Mass Emission Sites

A summary of the composite and grab samples (including field blanks, field duplicates, lab duplicates, and matrix spike samples) collected and analyzed during the 2007/08 monitoring year at the Mass Emission monitoring sites are shown in Table 11 through Table 16.

Table 11: Composite Environmental and QA/QC Samples Collected at Mass Emission Site ME-CC

	ME-CC Calleguas Creek					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Composite Constituents						
Bromide	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓
Chloride	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)
BOD	✓ (LD)[1]	✓	✓	✓[1]	✓	✓ (LD)[1]
Hardness as $CaCO_3$	✓ (LD)	✓ (LD)	✓ (LD)	✓	✓ (FB)	✓
Total Dissolved Solids	✓ (LD)	✓ (LD)	✓ (LD)	✓	✓ (LD)	✓
Total Organic Carbon[1]	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓
Total Suspended Solids	✓ (LD)	✓	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)
Turbidity	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓
Metals, Total Recoverable	✓ (LD)	✓ (LD)	✓ (LD)	✓	✓ (FB)	✓
Metals, Dissolved	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓	✓	✓
Chromium VI	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓	✓
Nitrate as N	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓
Nitrite as N	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓
Orthophosphate as P (Diss)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓
TKN[2]	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)
Total Phos., Total	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)	✓
Total Phos., Dissolved	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓	✓ (LD, MS/MSD)	✓
Organic – EPA 625	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD, MS/MSD)	✓	✓ (FB)	✓
PCB – EPA 625	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD, MS/MSD)	✓	✓ (FB)	✓
Pesticide – EPA 547[4]	✓	✓	✓	✓	✓	✓
Pesticide – EPA 625	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD, MS/MSD)	✓	✓ (FB)	✓
Pesticide – EPA 8151A[1]	✓	✓	✓ (MS/MSD)	✓	✓	✓

Notes – See bottom of Table 12.

Table 12: Grab Environmental and QA/QC Samples Collected at Mass Emission Site ME-CC

	ME-CC Calleguas Creek					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Grab Constituents						
Perchlorate[1]	✓	✓	✓	✓	✓	✓
Bacteriological Analyses	✓[3]	✓ (FB)[3]	✓[3]	✓[3]	✓[6]	✓[3]
pH/Conductivity	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓ (LD)	✓
Hydrocarbons	✓	✓	✓	✓ (MS)	✓ (LD, MS)	✓
Mercury, Total Recoverable	✓ (LD, MS/MSD)	✓ (FB, LD, MS/MSD)	✓	✓	✓ (FB)	✓
Mercury, Dissolved	✓ (LD)	✓ (FB)	✓	✓	✓ (FB)	✓
Ammonia as N	✓	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)
Aquatic Toxicity Bioassay[5]	✓	✓	—	—	✓	—

Notes

"✓" indicates that the analysis was performed on an environmental sample; "#" indicates that sample was lost due to breakage.
"—" indicates that sample was not collected.
"FB" indicates that a field blank analysis was performed.
"LD" indicates that a laboratory duplicate analysis was performed.
"MS/MSD" indicates that a matrix spike/matrix spike duplicate analysis was performed.
Hydrocarbons include: Oil & Grease, TRPH
Metals include: Al, As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, & Zn.
Unless noted otherwise, all analyses performed by CRG Marine Laboratories, Inc.

1. Performed by Calscience Environmental Laboratories, Inc.
2. Performed by TA Laboratories
3. Performed by Ventura County HCA Laboratories
4. Performed by Weck Laboratories, Inc.
5. Performed by Aquatic Bioassay & Consulting Labs, Inc.
6. Pat-Chem Laboratories

Table 13: Composite Environmental and QA/QC Samples Collected at Mass Emission Site ME-VR2

	ME-VR2 Ventura River					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Composite Constituents						
Bromide	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Chloride	✓	✓	✓	✓	✓	✓
BOD	✓[1]	✓ (LD)	✓ (LD)	✓[1]	✓	✓[1]
Hardness as $CaCO_3$	✓ (FB)	✓	✓	✓ (LD)	✓	✓ (LD)
Total Dissolved Solids	✓	✓	✓	✓	✓	✓ (LD)
Total Organic Carbon[1]	✓	✓	✓	✓	✓	✓ (LD, MS/MSD)
Total Suspended Solids	✓	✓	✓	✓	✓	✓
Turbidity	✓	✓	✓	✓	✓	✓ (LD)
Metals, Total Recoverable	✓ (FB)	✓	✓	✓ (LD)	✓	✓ (LD)
Metals, Dissolved	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Chromium VI	✓	✓	✓	✓ (MS/MSD)	✓	✓ (LD, MS/MSD)
Nitrate as N	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Nitrite as N	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Orthophosphate as P (Diss)	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
TKN[2]	✓ (MS/MSD)	—	✓ (MS/MSD)	✓ (MS/MSD)	✓ (MS/MSD)	✓ (MS/MSD)
Total Phos., Total	✓	✓	✓	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Total Phos., Dissolved	✓	✓	✓ (LD, MS/MSD)	✓ (LD, MS/MSD)	✓	✓ (LD, MS/MSD)
Organic – EPA 625	✓ (FB, LD)	✓	✓	✓ (MS/MSD)	✓	✓ (LD, MS/MSD)
PCB – EPA 625	✓ (FB, LD)	✓	✓	✓	✓	✓ (LD, MS/MSD)
Pesticide – EPA 547[4]	✓	—	✓	✓ (MS/MSD)	✓	✓
Pesticide – EPA 625	✓ (FB, LD)	✓	✓	✓ (MS/MSD)	✓	✓ (LD, MS/MSD)
Pesticide – EPA 8151A[1]	✓	—	✓	✓ (MS/MSD)	✓	✓ (MS/MSD)

Notes – See bottom of Table 14.

Table 14: Grab Environmental and QA/QC Samples Collected at Mass Emission Site ME-VR2

	ME-VR2 Ventura River					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Grab Constituents						
Perchlorate[1]	✓	✓ (FD)	✓	✓	✓	✓ (MS/MSD)
Bacteriological Analyses	✓ (FB)[3]	✓ (FD)[3]	✓[3]	✓[3]	✓[6]	✓[3]
pH/Conductivity	✓	✓ (FD)	✓	✓	✓	✓ (LD)
Hydrocarbons	✓	✓ (FD)	✓	✓	✓	✓
Mercury, Total Recoverable	✓ (FB)	✓ (FD)	✓	✓	✓	✓
Mercury, Dissolved	✓ (FB)	✓ (FD)	✓	✓	✓	✓
Ammonia as N	✓ (LD, MS/MSD)	✓ (FD)	✓	✓	✓	✓
Aquatic Toxicity Bioassay[5]	✓	✓	—	—	✓	—

Notes

"✓" indicates that the analysis was performed on an environmental sample; "—" indicates that sample was not collected.
"FB" indicates that a field blank analysis was performed.
"FD" indicates that a field duplicate analysis was performed.
"LD" indicates that a laboratory duplicate analysis was performed.
"MS/MSD" indicates that a matrix spike/matrix spike duplicate analysis was performed.
Hydrocarbons include: Oil & Grease, TRPH
Metals include: Al, As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, & Zn.
Unless noted otherwise, all analyses performed by CRG Marine Laboratories, Inc.

1. Performed by Calscience Environmental Laboratories, Inc.
2. Performed by TA Laboratories
3. Performed by Ventura County HCA Laboratories
4. Performed by Weck Laboratories, Inc.
5. Performed by Aquatic Bioassay & Consulting Labs, Inc.
6. Pat-Chem Laboratories

Table 15: Composite Environmental and QA/QC Samples Collected at Mass Emission Site ME-SCR

	ME-SCR Santa Clara River					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Composite Constituents						
Bromide	✓	✓	✓	✓	✓	✓ (FD)
Chloride	✓	✓	✓	✓	✓	✓ (FD)
BOD	✓[1]	✓	✓	✓[1]	✓	✓ (FD)[1]
Hardness as $CaCO_3$	✓	✓ (LD)	✓ (FB)	✓ (LD)	✓ (LD)	✓ (FD)
Total Dissolved Solids	✓	✓	✓	✓ (LD)	✓	✓ (FD)
Total Organic Carbon[1]	✓	✓	✓	✓	✓	✓ (FD)
Total Suspended Solids	✓	✓	✓	✓	✓	✓ (FD)
Turbidity	✓	✓	✓	✓	✓	✓ (FD)
Metals, Total Recoverable	✓	✓ (LD)	✓ (FB)	✓ (LD)	✓ (LD)	✓ (FD)
Metals, Dissolved	✓	✓ (LD, MS/MSD)	✓	✓	✓ (LD, MS/MSD)	✓ (FD)
Chromium VI	✓	✓	✓	✓	✓ (MS/MSD)	✓ (FD)
Nitrate as N	✓	✓	✓	✓	✓	✓ (FD)
Nitrite as N	✓	✓	✓	✓	✓	✓ (FD)
Orthophosphate as P (Diss)	✓	✓	✓	✓	✓	✓ (FD)
TKN[2]	✓	✓ (MS/MSD)	✓	✓	✓	✓ (FD)
Total Phos., Total	✓	✓	✓	✓	✓	✓ (FD)
Total Phos., Dissolved	✓	✓	✓	✓	✓	✓ (FD)
Organic – EPA 625	✓	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD)	✓ (LD, MS/MSD)	✓ (FD)
PCB – EPA 625	✓	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD)	✓ (LD, MS/MSD)	✓ (FD)
Pesticide – EPA 547[4]	✓	✓ (MS/MSD)	✓	✓	✓	✓
Pesticide – EPA 625	✓	✓ (LD, MS/MSD)	✓ (FB)	✓ (LD)	✓ (LD, MS/MSD)	✓ (FD)
Pesticide – EPA 8151A[1]	✓	✓ (MS/MSD)	✓	✓	✓	✓ (FD)

Notes – See bottom of Table 16.

Table 16: Grab Environmental and QA/QC Samples Collected at Mass Emission Site ME-SCR

	ME-VR2 Santa Clara River					
Event	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Grab Constituents						
Perchlorate[1]	✓	✓	✓	✓ (LD)	✓ (MS/MSD)	✓ (FD)
Bacteriological Analyses	✓[3]	✓[3]	✓ (FB)[3]	✓ (LD)[3]	✓[6]	✓ (FD)[3]
pH/Conductivity	✓	✓	✓	✓ (LD)	✓	✓ (FD)
Hydrocarbons	✓	✓	✓	✓ (LD)	✓	✓ (FD)
Mercury, Total Recoverable	✓	✓	✓ (FB)	✓ (LD)	✓ (LD)	✓ (FD)
Mercury, Dissolved	✓	✓	✓ (FB)	✓ (LD)	✓	✓ (FD, MS/MSD)
Ammonia as N	✓	✓	✓	✓ (LD)	✓	✓ (FD)
Aquatic Toxicity Bioassay[5]	✓	✓	—	—	✓	—

Notes

"✓" indicates that the analysis was performed on an environmental sample; "—" indicates that sample was not collected.
"FB" indicates that a field blank analysis was performed.
"FD" indicates that a field duplicate analysis was performed.
"LD" indicates that a laboratory duplicate analysis was performed.
"MS/MSD" indicates that a matrix spike/matrix spike duplicate analysis was performed.
Hydrocarbons include: Oil & Grease, TRPH
Metals include: Al, As, Cd, Cr, Cu, Pb, Ni, Se, Ag, Tl, & Zn.
Unless noted otherwise, all analyses performed by CRG Marine Laboratories, Inc.

1. Performed by Calscience Environmental Laboratories, Inc.
2. Performed by TA Laboratories
3. Performed by Ventura County HCA Laboratories
4. Performed by Weck Laboratories, Inc.
5. Performed by Aquatic Bioassay & Consulting Labs, Inc.
6. Pat-Chem Laboratories

Table 9 through Table 16 includes information related to QA/QC samples scheduled for collection and analysis by the Stormwater Monitoring Program, as well as results from unsolicited QA/QC analyses provided by various analytical laboratories. Unsolicited QA/QC analyses received by the Stormwater Monitoring Program during the 2007/08 monitoring season took the forms of non-requested matrix spike and lab duplicate analyses provided by most laboratories. Since these additional QA/QC analyses provide valuable information related to the laboratory's ability to accurately (matrix spike analyses) and precisely (lab duplicate analyses) evaluate water quality samples, they were included in the Stormwater Monitoring Program's database and considered along with all requested QA/QC analyses during the Stormwater Monitoring Program's QA/QC evaluation.

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7. Quality Assurance and Quality Control (QA/QC)

The following is a discussion of the results of the quality assurance and quality control (QA/QC) analysis performed on the 2007/08 stormwater quality monitoring data. The data were evaluated for overall sample integrity, holding time exceedances, contamination, accuracy, and precision using field- and lab-initiated QA/QC sample results according to the Stormwater Monitoring Program's *2005/06 Data Quality Evaluation Plan* and *Data Quality Evaluation Standard Operating Procedures*. The Data Quality Evaluation Plan (DQEP) describes the process by which water chemistry data produced by the Stormwater Monitoring Program are evaluated. Data quality evaluation is a multiple step process used to identify errors, inconsistencies, or other problems potentially associated with Stormwater Monitoring Program data. The DQEP contains a detailed discussion of the technical review process, based on U.S. Environmental Protection Agency (EPA) guidance[3] and requirements set forth by the Stormwater Monitoring Program, used to evaluate water quality monitoring data. The DQEP provides a reference point from which a program-consistent quality assurance/quality control (QA/QC) evaluation can be performed by the Stormwater Monitoring Program. The Data Quality Evaluation Standard Operating Procedures (SOPs) document provides a set of written instructions that documents the process used by the Stormwater Monitoring Program to evaluate water quality data. The SOPs describe both technical and administrative operational elements undertaken by the Stormwater Monitoring Program in carrying out its DQEP. The SOPs act as a set of prescriptive instructions detailing in a step-by-step manner how District staff carry out the data evaluation and data quality objectives set forth in the DQEP. QA/QC sample results from the 2007/08 monitoring season are presented in Appendix G.

QA/QC sample collection and analysis relies upon QA/QC samples collected in the field (such as equipment blank, field blank, field duplicate, and matrix spike samples), as well as QA/QC samples prepared and analyzed by the analytical laboratory (i.e., lab-initiated samples, such as method blanks, filter blanks, and laboratory control spikes) performing the analysis. The actual chemical analysis of field-initiated and lab-initiated QA/QC samples is conducted in an identical manner as the analysis of field-collected environmental samples. After all analyses are complete, the results of the field-initiated and lab-initiated QA/QC sample results are compared to particular Data Quality Objectives (DQOs), also commonly referred to as "QA/QC limits". These limits are typically established by the analytical laboratory based on EPA protocols and guidance. However, in some cases, the Stormwater Monitoring Program will set a particular DQO, such as the QA/QC limit for field duplicate results.

QA/QC sample results are evaluated in order to compare them to their appropriate QA/QC limits and identify those results that fall outside of these limits. The QA/QC evaluation occurs in two separate steps as the laboratory will review those results that fall outside of its QA/QC limits and typically label these results with some type of qualification or note. If a QA/QC sample result falls grossly outside of its associated QA/QC limit, and thus indicates that there is a major problem with the lab's instrumentation and/or analytical process, then the laboratory should re-run both the affected QA/QC and environmental samples as necessary. The second step in the QA/QC evaluation process occurs when the Stormwater Monitoring Program performs an overall sample integrity evaluation, as well as specific holding time, contamination, accuracy, and precision checks. This second evaluation step provides an opportunity to thoroughly review the Stormwater Monitoring Program's data to identify potential errors in a laboratory's reporting of analytical data and/or recognize any significant data quality issues that may need to be addressed. After this evaluation the Stormwater Monitoring Program is ready to qualify their environmental data as necessary based on the findings of the QA/QC assessment.

Data qualification occurs when the Program assigns a particular *program qualification* to an analytical result as a means to notify downstream data users that the result was produced while one or more QA/QC limitations were exceeded. Environmental sample results are qualified in order to provide the user of these data with information

[3] U.S. Environmental Protection Agency. February 1994. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* EPA-540/R-94-013.

U.S. Environmental Protection Agency. December 1994. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* EPA-540/R-94-090.

U.S. Environmental Protection Agency. April 1995. *Guidance on the Documentation and Evaluation of Trace Metals Data Collected for Clean Water Act Compliance Monitoring.* EPA-821/B-95-002.

regarding the quality of the data. Depending on the planned use of the data, qualifications may help to determine whether or not the data are appropriate for a given analysis. In general, data that are qualified with anything other than an "R" (used to signify a rejected data point) are suitable for most analyses. However, the qualifications assigned to the data allow the user to assess the appropriateness of the data for a given use. The Stormwater Monitoring Program used its NDPES Stormwater Quality Database to conduct a semi-automated QA/QC evaluation of the current season's data contained in the database. The use of the database allows the Stormwater Monitoring Program to expedite and standardize the QA/QC evaluation of its monitoring data in conjunction with the use of the DQEP and SOPs. After reviewing the qualifications assigned to each qualified data point in the 2007/08 monitoring year data set, the environmental data are considered to be of high quality and sufficient for all future general uses. However, all data qualifiers should be reviewed and considered prior to the use of the data in a specific analysis or application. Environmental data from the 2007/08 monitoring season are presented in Appendix F.

This section provides a discussion of (1) the sample collection procedure for field-initiated QA/QC samples, (2) the QA/QC samples analyzed by the Stormwater Monitoring Program, along with remarks on QA/QC issues of significance observed during the 2007/08 season, and (3) a summary of the 2007/08 QA/QC sample results presented in Table 25 through Table 31 at the end of this section.

Field-Initiated QA/QC Sample Collection

Both environmental and field-initiated QA/QC samples are collected in the field using clean sampling techniques. To minimize the potential for contamination, CRG Marine Laboratories, Inc. cleans all bottles used for composite samples. Only new containers are used for grab sample collection, with the appropriate preservative added to grab bottles by CRG. Intake lines for the automated samplers are cleaned using nitric acid (30% dilution) and distilled water. A dedicated sampling crew is provided by VCWPD to ensure that consistent sample collection and handling techniques are followed during every monitoring event.

Field-initiated QA/QC samples include equipment blanks, field blanks, and field duplicates. Equipment blanks are typically prepared prior to the start of the monitoring season to check that tubing, strainers, and sample containers – especially composite bottles – aren't sources of contamination for the Stormwater Monitoring Program's environmental samples. Automated sampler intake lines (i.e., sample tubing) are cleaned using nitric acid (30% dilution; supplied by CRG) prior to equipment blank collection. Equipment blanks are collected by passing blank water through cleaned tubing and into brand new sample bottles. Equipment blanks are collected using clean techniques, prior to field sample collection, before the sampling equipment has been contaminated by environmental sample water or other sources. After collection, equipment blanks are submitted to the analytical laboratory and analyzed using the same methods as those employed for routine, environmental sample analysis. CRG supplies new, clean sample bottles and blank water for equipment blanks analyzed for total recoverable metals (EPA 200.8m) and trace organic compounds (EPA 625m).

Field blanks are collected using the same techniques as used for environmental sample collection, but instead of sample water, blank water is poured into the sample bottle while in the field. CRG supplied sample bottles and blank water for all field blank analyses except for those associated with bacteriological analyses. In these instances, VCHCA laboratories provided sample bottles and blank water for bacteriological field blank analyses. For metals (EPA 200.8m) and trace organic compounds (including organics, PCBs, and pesticides), the blank water is de-ionized water. The de-ionized water is purified to 18 megOhm quality by CRG by passing it through de-ionized resin beads to remove ionic compounds, such as metals, and then through a carbon filter to remove trace organic compounds.

Duplicate samples – both field duplicates and lab duplicates – are collected in the field using the same techniques as used for all environmental sample collection. For composite samples a larger volume of water is collected during the monitoring event, and then the duplicates are split in the field (when generating a field duplicate) or in the lab (when generating a lab duplicate) while constantly mixing the contents of the composite containers to ensure the production of homogeneous duplicate samples. In the case of grab samples, two samples are collected side-by-side or in immediate succession into separate sample bottles when collecting an environmental sample and its field duplicate. Depending on the volume of water required to perform a particular analysis, a lab duplicate analysis of a grab sample may require the collection of a separate sample, or may be run on a single environmental sample.

QA/QC Sample Analysis and Issues of Significance

The QA/QC evaluation process identifies isolated incidents of out-of-range QA/QC results, but more importantly, identifies potential trends in laboratory and sampling performance. An important and ongoing component of the QA/QC evaluation process is to identify, report, and correct these problems as they arise. The types of QA/QC analyses and evaluations of these results performed during the 2007/08 monitoring season are described below, along with identified QA/QC issues associated with particular QA/QC sample types.

As a member of the Southern California Coastal Water Research Project's (SCCWRP) Stormwater Monitoring Coalition (SMC), VCWPD jointly sponsored the Stormwater Laboratory Intercalibration Study that was conducted by the SMC in 2003. Four analytical laboratories currently employed by the Stormwater Monitoring Program took part in the intercalibration study: CRG Marine Laboratories, Calscience Environmental Laboratories, Weck Laboratories, and Aquatic Bioassay & Consulting Laboratories. The goal of the study was to establish performance-based guidelines for the analysis of stormwater samples through the setting of minimum standards for sensitivity, accuracy, and precision across different analytical laboratories so that individual data sets can be combined with estimated levels of confidence for making regional assessments of stormwater quality. The study's performance-based guidelines are considered key in achieving comparability across laboratories.

In brief, the intercalibration study focused on inter-laboratory comparability between a core group of 15 target analytes including total suspended solids, nutrients, and trace metals. The study set reporting levels for its target constituents that were sufficient to assess if environmental samples contained pollutant concentrations below relevant water quality objectives, such as the California Toxics Rule. The study's authors believed that reporting levels should be technologically achievable, but far enough below water quality objectives that observed exceedances cannot be attributable to methodological uncertainty. The study also set accuracy and precision DQOs for the analysis of stormwater matrices. Laboratory accuracy was judged via the analysis of spiked environmental samples and reference materials, while laboratory precision was based on the reproducibility of replicate sample analyses. It is believed that the study's performance-based guidelines will be useful to stormwater programs in establishing specifications for work assignments or requests for proposals (RFPs) to conduct stormwater analyses. The intercalibration study and resulting guideline/protocols were documented in a Laboratory Guidance Manual for SMC member laboratories.

In April 2006, a new Laboratory Intercalibration Program agreement was signed by SCCWRP, three Regional Water Quality Control Boards, and six municipal parties, including the VCWPD, in order to fill three informational gaps left by the 2003 study. The goal of the new study is to complete three areas of missing information to make the Laboratory Guidance Manual an ongoing and effective document. The new Laboratory Intercalibration Program will include three steps: (1) repeat the laboratory intercalibration for TSS, nutrients, and trace metals; (2) initiate an intercalibration for organic constituents; and (3) create draft contract language for integration into stormwater monitoring programs. The study is expected to be completed in 2009.

Currently the Stormwater Monitoring Program uses established QA/QC limits and information provided by the laboratories to evaluate QA/QC sample results. With regard to the 2007/08 monitoring season, it should be noted that all laboratories analyzing the 15 target analytes considered in the intercalibration study were able to meet or go below the reporting levels set forth by the study. It is believed that the results of the Stormwater Laboratory Intercalibration Study, along with information gathered from the Stormwater Monitoring Program will help to refine QA/QC limits for the Ventura Countywide Stormwater Quality Management Program in the future.

Calculation of QA/QC Success Rates

For each type of QA/QC analysis conducted, a percent success rate is calculated. The success rate is defined as the total number of QA/QC samples of a given type minus the number of samples that fall outside of QA/QC limits – that is, exceed the Stormwater Monitoring Program's DQO for a particular QA/QC sample type – divided by the total number of samples, multiplied by 100%.

$$Success\ Rate = \left(\frac{TNS - NSO}{TNS} \right) * 100\%$$

where: TNS is the total number of QA/QC samples of a given type
NSO is the number of QA/QC samples of a given type that fall outside of specific QA/QC limits

It should be noted that the QA/QC success rate calculated for a given QA/QC sample type may or may not be directly correlated to the number of environmental samples that ultimately require qualification by the Stormwater Monitoring Program due to a QA/QC sample result exceeding its DQO. For example, a detected concentration in a field blank sample may or may not result in the qualification of a *single* environmental sample, and a detected concentration in a method blank sample may or may not result in the qualification of *one or more* environmental samples. Furthermore, a matrix spike RPD result exceeding its DQO will always result in the qualification of the environmental sample collected at the same monitoring site as the matrix spike/matrix spike duplicate (MS/MSD) sample. Each of the following descriptions of QA/QC sample types evaluated by the Stormwater Monitoring Program includes a discussion of the particular QA/QC sample type's DQO, its relationship to environmental samples (one-to-one or one-to-many), and the process by which it is determined if an out-of-control QA/QC sample result will result in the qualification of environmental data.

Equipment Blanks

Equipment blanks, often referred to as pre-season blanks, are collected prior to the monitoring season to test for contamination in sample containers (e.g., jars, bottles, carboys, etc.) and sample equipment (e.g., intake lines, tubing, and strainers). The Stormwater Monitoring Program routinely analyzes pre-season *carboy blanks* by testing for contamination of these large glass bottles used to collect composite samples. The carboys are filled with laboratory-prepared blank water (acidified to pH < 2 for metals analyses) and allowed to stand for a minimum of 24 hours before analysis. Carboy blank analyses are performed to test for contamination of sample containers due to residues left from the manufacturing process (in the case of new carboys) or residues left from the cleaning process (in the case of cleaned, used carboys). Sampling equipment blanks – referred to as *tubing blanks* – are also routinely analyzed by the Stormwater Monitoring Program and consist of laboratory prepared blank water processed through sampler tubing to identify potential contamination of field-collected samples as a result of "dirty" tubing. The blank water (deionized water) used to evaluate contamination of carboys and tubing can also be analyzed in order to check for contamination of this analytical sample medium. Equipment blank "hits" or measured concentrations above the laboratory's quantitation limit (RL, PQL, etc.) for a constituent are assessed and acted upon using the guidelines listed below:

1. The Stormwater Monitoring Program requests that the laboratory confirm the reported results against lab bench sheets or other original analytical instrument output. Any calculation or reporting errors should be corrected and reported by the laboratory in an amended laboratory report.

2. If the previous step does not identify improperly reported results, then the analytical laboratory should be asked to identify any possible sources of contamination in the laboratory.

3. If no laboratory contamination is identified, then a note should be made that documents that the equipment blank results indicate that the sample equipment may have introduced contamination into the blank samples.

When practical, remedial measures are initiated by the Stormwater Monitoring Program to replace or re-clean sampling equipment and re-analyze equipment blank samples in an effort to eliminate field contamination. No environmental samples are qualified by the Stormwater Monitoring Program based on the results of pre-season equipment blank analyses. Only the results of field-initiated and laboratory-initiated QA/QC samples associated with the environmental samples collected for any given monitoring event are used to qualify Stormwater Monitoring Program environmental samples. However, pre-season analyses provide useful information regarding possible sources of environmental sample contamination and insight into how contamination issues might be resolved.

Equipment blank samples were not analyzed prior to the monitoring of the first event (09/21/07) of the 2007/08 monitoring season due to the unanticipated early arrival of the first significant rainfall event of the year. Normally, the sampling season begins on October 1 with equipment blanks taken prior during the latter part of September; however, arrival of the early season storm and related sampling preempted this QA/QC effort.

Field and Lab Duplicates

When duplicates are analyzed, a sample is split into two separate sub-samples and analyzed independently of one another in the laboratory. Field duplicates are split by the sampling crew and provide a measure of the variability of field sampling techniques. Laboratory duplicates are split by the laboratory and provide information on the reproducibility of results by the lab.

The success of a duplicate analysis is measured by the relative percent difference (RPD) between the environmental sample result and the duplicate result. The RPD is calculated using the following equation:

$$RPD = \left(\frac{|ES - D|}{(ES + D)/2} \right) * 100\%$$

where: ES is the environmental sample result
D is the duplicate sample result

Field Duplicate Check – This precision analysis checks the relative percent difference (RPD) between the measured concentration of an analyte in an environmental sample and the measured concentration of the same analyte in its associated field duplicate sample. Calculated RPD values greater than 30% (that also possess an absolute difference greater than or equal to their associated detection limit) are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type. This QA/QC limit was set by the Stormwater Monitoring Program at 30% because the limit could be no more restrictive than the QA/QC limit set for laboratory duplicates (see discussion below). Only 24 of 476 total field duplicates analyzed in 2007/08 fell outside of QA/QC limits, for an overall success rate of 95.0%. Field duplicate results are summarized in Table 17.

Table 17: Field Duplicate Success Rates

Classification	*Total Number*	*Number Outside DQO*	*Success Rate*
Anion	7	1	85.7%
Bacteriological	12	1	91.7%
Conventional	18	1	94.4%
Hydrocarbon	6	0	100%
Metal	52	7	86.5%
Nutrient	15	3	80.0%
Organic	133	8	94.0%
PCB	188	0	100%
Pesticide	115	3	97.4%

Composite field duplicate samples were only collected at A-1 (Event 2) and ME-SCR (Event 6) with bis(2-ethylhexyl)phthalate emerging as the only common field duplicate DQO exceedance issue observed among both sites during the two events. Event 2 (wet event) showed the fewest field duplicate DQO exceedances (8 total, divided among nutrients and EPA 625m trace organics), while Event 6 (dry event) posted the greatest number of exceedances (13 total, divided among anions, conventionals, EPA 2008m metals, and EPA 625m trace organics). G Grab field duplicate samples were collected at A-1 and ME-VR2 during Event 2 and at ME-SCR during Event 6, and showed no overlap in the parameters exceeding the DQO for field duplicate samples among the three monitoring sites. Grab field duplicate samples not meeting the DQO for this QA/QC sample type were limited to ammonia as nitrogen (A-1) and dissolved mercury (ME-VR2) collected during Event 2, and fecal coliform (ME-SCR) collected during Event 6. No trends in either composite or grab field duplicate DQO exceedances were observed when comparing data across monitoring sites and wet and dry monitoring events. Although among detected analytes, it appears that metals and polynuclear aromatic hydrocarbon (PAH) are more often associated with field duplicate DQO exceedances than are other classes of constituents. It should be noted that differences in duplicate sample results are often observed when there is more solid material in one sample of the duplicate pair. When the splitting of a composite sample is performed, the composite sample is continually rocked in a sample pouring stand to provide as much "non-invasive" mixing as possible. However, the splitting process can still result in some variation in the solids content of duplicate samples. Additionally, all field duplicates for the current

monitoring season were collected under storm conditions. Water collected from storm events typically has higher concentrations of suspended solids than does water collected during dry weather events. As a result, the splitting of homogeneous duplicate samples could have been further encumbered due to the high solids content of these environmental samples. All affected environmental data were qualified as "estimated". It should be noted that success rates for conventionals, organics and pesticides were close to 100%.

Lab Duplicate Check – This precision analysis checks the relative percent difference (RPD) between the original measured concentration of an analyte in a sample and a replicate measured concentration of the analyte in the same sample. The original and replicate analyses are the result of "sample splitting" by the laboratory. Calculated RPD values greater than 20 – 30% (depending on laboratory) are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type. CRG Marine Laboratories, Inc. maintains a lab duplicate, RPD QA/QC limit of 30%, while all other laboratories (expect Aquatic Bioassay & Consulting Labs and the Ventura County Health Care Agency) employed by the Stormwater Monitoring Program set their lab duplicate, RPD QA/QC limit between 20 – 25%, depending on analytical method. ABC, Pat-Chem and VCHCA labs do not maintain a QA/QC limit for lab duplicate analyses performed on bacteriological samples. In this instance, the Stormwater Monitoring Program log-transforms bacteriological sample results before calculating RPD values and comparing these to a QA/QC limit of 30%. Only 70 of 1480 total lab duplicates analyzed during the current monitoring season fell outside of QA/QC limits, for an overall success rate of 95.3%. Lab duplicate results are summarized in Table 18.

Table 18: Laboratory Duplicate Success Rates

Classification	*Total Number*	*Number Outside DQO*	*Success Rate*
Anion	13	1	92.3%
Bacteriological	4	1	75.0%
Conventional	50	2	96.0%
Hydrocarbon	6	0	100%
Metal	167	5	97.0%
Nutrient	43	1	97.7%
Organic	462	53	88.5%
PCB	406	1	99.8%
Pesticide	329	6	98.2%

Lab duplicate results were reviewed to determine if any reasons for observed success rates lower than 90% for some classes of constituents could be identified. Placing a higher burden of success on lab duplicate analyses (90%) than field duplicate analyses (75%) is common due to the much higher variability inherent in the collection or splitting of field duplicate samples. Differences among the calculated RPD values of lab duplicate pairs can be attributed to both sample variation, stemming from the sample splitting described above, as well as analytical variation. The lower success rates observed for bacteriologicals (75%) and organics (88.5%) were not considered significant enough to warrant follow-up investigation with the laboratories performing these analyses. It should be noted that the splitting of homogenous samples could have been further encumbered by the high total suspended solids content of the environmental samples (see Receiving Water station water quality results presented in Table 33 and Mass Emission station water quality results presented in Table 40 through Table 42. Figure 19 shows a typical, turbid, wet weather sample collected at Mass Emission site ME-SCR during December 2007. All affected environmental data were qualified as "estimated". It should be noted that success rates for conventionals, metals, nutrients, PCBs, and pesticides were close to 100%.

Field Blanks

Field blank analyses are performed to test for contamination of environmental samples by field sample collection activities. Field blanks use blank water that is assumed to be void of all constituents for which a given set of analyses are to be performed. Filtered and purified de-ionized water is used for metals and trace organics field blanks, while standard de-ionized water is used for all other field blanks. Any constituents detected in field blanks are considered to be sources of contamination in the field. Field blanks are "collected" by pouring water from a laboratory-provided bottle directly into a sample container using clean sampling techniques and without the use of any extraneous equipment. This minimizes the possibility of any contamination of the field blanks.

Figure 19: Wet weather composite sample collected at Mass Emission Station ME-SCR during December 2007 showing high suspended solids content

Field Blank Check – This contamination analysis checks for a "hit" or the detection of an analyte in a field blank sample. A detected field blank concentration is considered an exceedance of the Stormwater Monitoring Program's DQO for this QA/QC sample type. Even though a detected concentration is an indication that contamination has occurred at some point during the field sampling or analytical process, it doesn't necessarily result in the qualification of an environmental sample. If a detected field blank result is greater than 20% of the concentration measured in an environmental sample, then the field blank contamination would result in the qualification of a single environmental sample collected at the same monitoring site as the field blank sample. As shown in Table 19, the majority of field blanks posted a 100% success rate with the exception of Method SM 2340 b (Hardness as $CaCO_3$), Method EPA 1631Em (Mercury), and Method 625m (Organics and Pesticides) blanks. One of three hardness blanks was observed to show contamination for a success rate of 66.7%, while six of eight mercury field blanks analyzed were found to show contamination resulting in a 25.0% success rate for the method. Organics and pesticides field blanks also showed contamination, but posted an overall higher success rate at 78.8%. In contrast, bacteriologicals, trace metals (EPA 200.8m), PCB, and pesticide field blanks posted success rates of 100%, 100%, 100% and 95.7%, respectively, when calculating success rates across the four events (three wet weather and one dry weather) for which field blank samples were collected and analyzed.

Since the detection of an analyte in a field blank sample does not necessarily mean that the contamination impacts a particular environmental result, one must look further to determine if the environmental sample concentration is greater than five times the concentration measured in the detected field blank. Put another way, one must determine if the analyte concentration measured in the blank is greater than 20% of the analyte concentration measured in the associated environmental sample. Only if the blank contamination is greater than 20% of the measured environmental concentration would the environmental sample receive a qualification. For example, a dissolved zinc field blank hit of 0.2 µg/L that is associated with an environmental sample with a measured concentration of 8.0 µg/L would not result in the qualification of the environmental sample because its concentration is 40 times greater than that of the contamination measured in the field blank.

Field blank samples were collected at ME-VR2 (Event 1), ME-CC (Event 2), ME-SCR (Event 3), and ME-CC (Event 5) during the 2007/08 monitoring season. Field contamination of Stormwater Monitoring Program environmental samples as evaluated through field blank analyses is minor with 71 hits out of 740 total field blank samples. This corresponds to an overall "non-detection" success rate of 90.4%; that is, no analyte was detected in 90.4% of the field blank samples. Analyte detections in 48 of the 740 total field blank samples analyzed in 2007/08 resulted in the qualification of environmental samples, for an overall success rate of 93.5%. Of the 48 field blanks showing contamination and having concentrations greater than 20% of that measured in their associated environmental samples, five were from Event 1, 31 were from Event 2, six were from Event 3, and two were from Event 6. Mercury was detected in field blanks from all four of the monitoring events where mercury blanks were

analyzed, while a small number of pesticides (4,4'-DDD, 4,4'-DDE, Chlordane-alpha, Chlorpyrifos, Diazinon and Malathion) were found in a field blank analyzed from Event 2. With regard to organics contamination, field blank analyses from Events 1, 2, 3 and 5 revealed significant, detectable concentrations of phthalate compounds (Bis(2-ethylhexyl)phthalate, Butyl benzyl phthalate, Diethyl phthalate, and Di-n-butylphthalate and Di-n-octylphthalate), an additional base/neutral extractable compound (1,2,4-Trichlorobenzene) and multiple polynuclear aromatic hydrocarbon (PAH) compounds[4]. These 71 field blank detections were not considered indicative of any type of reoccurring contamination issue present during sample collection in the field. The field blanks hits observed for wet weather Events 1 and 3 and dry weather Event 5 are typical of the number of hits observed by the Program during any given monitoring event. However, the large number of field blank hits observed for Event 2 (wet weather) indicates that sample contamination occurred either in the field or in the laboratory, or an environmental sample was erroneously analyzed as a field blank sample. The 48 affected environmental samples were qualified as "upper limit" due to field blank contamination.

Table 19: Field Blank Success Rates

Event ID	Classification	Method	Total Number	Number Detected	Qualified Environ. Samples	Success Rate
2007/08-1	Bacteriological	Enterolert	1	0	0	100%
	Bacteriological	MMO-MUG	2	0	0	100%
	Bacteriological	SM 9221E	1	0	0	100%
	Conventional	SM 2340B	1	1	0	0%
	Metal	EPA 1631E	2	2	1	0%
	Metal	EPA 200.8m	11	0	0	100%
	Organic	EPA 625m	66	11	4	83.3%
	PCB	EPA 625m	54	0	0	100%
	Pesticide	EPA 625m	47	0	0	100%
2007/08-2	Bacteriological	Enterolert	1	0	0	100%
	Bacteriological	MMO-MUG	2	0	0	100%
	Bacteriological	SM 9221E	1	0	0	100%
	Metal	EPA 1631E	2	1	0	50.0%
	Organic	EPA 625m	66	25	25	62.1%
	PCB	EPA 625m	58	0	0	100%
	Pesticide	EPA 625m	47	8	6	83.0%
2007/08-3	Bacteriological	Enterolert	1	0	0	100%
	Bacteriological	MMO-MUG	2	0	0	100%
	Bacteriological	SM 9221E	1	0	0	100%
	Conventional	SM 2340B	1	0	0	100%
	Metal	EPA 1631E	2	1	0	50.0%
	Metal	EPA 200.8m	11	0	0	100%
	Organic	EPA 625m	66	19	6	71.2%
	PCB	EPA 625m	60	0	0	100%
	Pesticide	EPA 625m	47	0	0	100%
2007/08-5	Conventional	SM 2340B	1	0	0	100%
	Metal	EPA 1631E	2	2	1	0%
	Metal	EPA 200.8m	11	0	0	100%
	Organic	EPA 625m	66	1	1	98.5%
	PCB	EPA 625m	60	0	0	100%
	Pesticide	EPA 625m	47	0	0	100%

[4] PAH compounds detected in field blanks: 1-Methylnaphthalene, 1-Methylphenanthrene, 2,6-Dimethylnaphthalene, 2-Methylnaphthalene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Dibenzothiophene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Naphthalene, Perylene, Phenanthrene and Pyrene.

Method Blanks

Method blanks are prepared by the laboratory using blank water, and then analyzed for every batch of environmental samples analyzed. A detected concentration or "hit" in a method blank is an indication of contamination in the analytical process; that is, contamination occurring somewhere in the laboratory. If the result for a single method blank is greater that the *method detection limit* (MDL), or if the average method blank concentration plus two standard deviations of three or more blanks is greater than the *reporting limit* (RL) for a particular analyte, then associated environmental sample results, depending on their measured concentrations, have the potential to be qualified.

Method Blank Check – This contamination analysis checks for "hits" or the detection of an analyte in a method blank. A detected method blank concentration is considered an exceedance of the Stormwater Monitoring Program's DQO for this QA/QC sample type. Even though a detected concentration is an indication that contamination has occurred during the analytical process, it doesn't necessarily result in the qualification of environmental samples. If a detected method blank value is greater than 20% of the concentration measured in associated environmental samples, then the method blank contamination would result in the qualification of one or more environmental samples analyzed in the same QA/QC batch as the out-of-control method blank. Table 20 summarizes only those method blank results having less than 100% success rates. A summary of all method blanks analyzed during the 2007/08 monitoring season is presented in Appendix H. All method blanks except for a single total dissolved solids (TDS) blank analyzed for Event 4 via standard method (SM) 2540 C posted success rates of 100%.

Table 20: Method Blank Success Rates

Event ID	*Classification*	*Method*	*Total Number*	*Number Detected*	*Qualified Environ. Samples*	*Success Rate*[1]
2006/07-4	Conventional	SM 2540 C	1	1	0	0%

1. Only method blanks having less that 100% success rates are summarized in this table. A summary of all method blanks analyzed during the 2007/08 monitoring season is presented in Appendix H.

Similar to field blanks, the detection of an analyte in a method blank sample does not necessarily mean that the contamination impacts environmental results. One must look further to determine if environmental sample concentrations are greater than five times the concentration measured in the detected method blank. Stated differently, one must determine is the analyte concentration measured in the blank is greater than 20% of the analyte concentration measured in the associated environmental samples. Only if the blank contamination is greater than 20% of the measured environmental concentration would the environmental sample receive a qualification. For example, a Butyl benzyl phthalate method blank hit of 0.02 µg/L would result in the qualification of all Butyl benzyl phthalate environmental samples with measured concentrations of less than 0.1 µg/L. A hypothetical environmental sample with a measured concentration of 0.7 µg/L would not be qualified because this concentration far overshadows the 0.02 µg/L contamination measured in the method blank.

Due to the 100% success rate of all but one method blank sample analyzed for Events 1 – 6, and the extremely minor contamination of the single TDS method blank that exceeded its DQO during Event 4, no environmental results required qualification as "upper limit" due to method blank contamination.

Matrix Spikes and Matrix Spike Duplicates

A matrix spike (MS) is an environmental sample that is spiked by the laboratory with a known amount of the constituent being analyzed. Once the analysis is run, the analysis results are compared to the spike amount to determine how much of the spike was detected through the analytical process. The amount of the spike recovered is described as the "percent recovery" of the target analyte. A matrix spike duplicate (MSD) is a duplicate of this analysis that checks whether or not the lab is able to duplicate the results of the initial matrix spike analysis. These analyses help to confirm that the laboratory's instrumentation and procedures are accurate and compliant with typical laboratory performance standards.

For both matrix spikes and matrix spike duplicates, lower and upper limits are placed on the recovery of the spiked analyte by the laboratory performing the analysis. Once percent recoveries are available for both matrix spike and matrix spike duplicate analyses, a relative percent difference can be calculated for the two results. Table 21 below summarizes the matrix spike recovery and matrix spike RPD qualification limits (QA/QC limits) established by the laboratories employed by the Stormwater Monitoring Program. Unless specifically identified in EPA analytical guidance for a particular method, QA/QC limits are usually developed by laboratories using the average percent recovery for an analyte and setting lower and upper limits at two or three standard deviations below and above the average recovery, respectively. Trace organic compound matrix spike recovery rates vary widely among these constituents, and therefore no single recovery acceptance range (i.e., 70 – 130%) can be used for these analytes. Instead, each constituent's recovery is compared to a unique constituent-specific acceptance range.

Table 21: Matrix Spike Qualification Limits

Classification or Constituent	*MS Percent Recovery Limits*		*MS RPD Percent Limit*
	Lower Limit	*Upper Limit*	*Maximum RPD*
Anion	70%	130%	30%
Conventional	50%	150%	30%
Aluminum	50%	140%	30%
Arsenic	70%	130%	30%
Cadmium	75%	130%	30%
Chromium	70%	130%	30%
Chromium VI	70%	130%	30%
Copper	70%	130%	30%
Lead	65%	135%	30%
Mercury	60%	140%	30%
Nickel	70%	130%	30%
Selenium	60%	150%	30%
Silver	50%	155%	30%
Thallium	70%	130%	30%
Zinc	50%	150%	30%
Nutrient (CRG)	70%	130%	30%
TKN (TA)	80%	120%	20%
Organic EPA 625m	variable	variable	30%
PCB EPA 625m	60%	125%	30%
EPA 547	68%	134%	20%
Pesticide EPA 625m	variable	variable	30%
Pesticide EPA 8151A	30%	130%	30%

RPD = Relative Percent Difference

Matrix Spike Recovery Check – This accuracy analysis verifies that secondary spike analyses (such as matrix spike recovery analyses) performed by the laboratory show that the laboratory's instrumentation and procedures are accurate and compliant with typical laboratory performance standards. Matrix spike recovery values (for both MS and MSD analyses) outside of laboratory-determined QA/QC ranges (set with lower and upper limits) are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type.

Matrix spike recovery success rates ranged from 0% (Event 2, EPA 8151A pesticides) to 100% for the majority of matrix spike recovery analyses performed. A summary of success rates for matrix spike recovery samples analyzed during the 2007/08 monitoring season is presented in Appendix I. No particular classifications of constituents or analytical methods appear to be more prone to recovery problems than any other classification or method. Likewise, particular monitoring sites showed no tendency toward recovery problems. Recoveries below the lower QA/QC limit or above the upper QA/QC limit are generally attributed to matrix interference. Matrix interference occurs when substances contained in the sample water, or *matrix*, interfere with the ability of the laboratory instrumentation

to accurately detect a compound being analyzed. Stormwater matrices tend to be "dirtier" than other matrices and are prone to contain substances that cause matrix interference. Matrix spike recoveries above their upper limit resulted in one Event 1, four Event 2, and two Event 5 environmental samples being qualified as "high biased" due to matrix interference. Matrix spike recoveries below their lower limits resulted in four Event 1, 58 Event 2, one Event 3, and one Event 5 environmental samples being qualified as "low biased" due to matrix interference. The large number of Event 2 environmental samples from Mass Emission station ME-SCR that were qualified as "low biased" were most certainly the result of matrix interference as noted by both CRG and Calscience laboratories.

Matrix Spike RPD Check – This precision analysis checks the relative percent difference (RPD) between two related matrix spike recovery results. RPD values greater than 20 – 30% (depending on constituent and analytical method) are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type.

Matrix spike relative percent difference (RPD) success rates ranged from 5.3% (Event 2, EPA 625m organics) to 100% for the vast majority of matrix spike RPD analyses performed. A summary of success rates for matrix spike RPD values calculated during the 2007/08 monitoring season is presented in Appendix J. Matrix spike RPD values calculated from EPA 625m trace organic compound (organics, PCBs, and pesticides) matrix spike recoveries posted an average success rate of 89.8% across all monitoring events, while matrix spike RPD success rates for EPA 8151A pesticides (chlorinated herbicides) were 83.3% over the same averaging period. Historically, EPA 8151A analyses have shown very little susceptibility to matrix interference. However, the pronounced matrix interference observed for samples collected at Mass Emission station ME-SCR during Event 2 had an unusually broad impact on the recovery of a variety of organic and pesticide compounds from the environmental matrix. All other analytical methods showed 100% success in meeting the DQO for a matrix spike RPD evaluation. In general, the greater the matrix interference in individual matrix spike recoveries, especially if one recovery leans low and the other lean high, the greater their relative percent difference. Calculated matrix spike RPD values in excess of their associated QA/QC limit resulted in 17 affected environmental samples being qualified as "estimated".

Surrogate Spikes

Surrogate spikes are compounds added to all trace organics samples by the laboratory to check the efficiency of the organics extraction process when testing samples using gas chromatography (GC) or gas chromatography-mass spectroscopy (GC/MS) analytical methods. Surrogates are compounds that are chemically and analytically similar to the compounds ("target analytes") for which the analysis is being performed. They are added to both laboratory blank water and environmental samples undergoing analyses for trace organic compounds. The success of a particular sample extraction is based on the amount of the surrogate compound that is recovered through the analytical process. The amount of the spike recovered is described as the "percent recovery". Different analytical methods, as well as individual constituents analyzed by those methods, possess different QA/QC limits for the recovery of surrogates. Table 22 summarizes the lower and upper QA/QC limits for the recovery of surrogate compounds via three analytical methods used to measure trace organic compounds by the Stormwater Monitoring Program. Limits displayed in the table represent the lowest and highest possible recoveries for a particular analytical method.

Table 22: Surrogate Spike Recovery Limits

Analytical Method	*Surrogate Recovery Limits*	
	Lower Limit	*Upper Limit*
EPA 625m*	10%	140%
EPA 8151A	0%	123%
EPA 8260B*	74%	146%

*Lower and Upper Limits vary – widest possible range presented.

Results coming from the analysis of surrogate compounds are not commonly used to directly qualify environmental samples when a surrogate result is found to fall outside of its associated QA/QC limits. Instead, surrogate results are typically used to elucidate trends in a laboratory's analysis of organic constituents. High and low surrogate recoveries can inform the laboratory that a particular analytical process is out of control or moving toward that state, and prompt the laboratory to take corrective measures as necessary. However, when other matrix-specific QA/QC sample analyses, such as matrix spike recoveries, are not available for comparison, poor surrogate recoveries can be used to qualify environmental data. For the current monitoring season, surrogate laboratory control spike recoveries

for all trace organic analytical methods across all monitoring events posted success rates of 100%, while surrogate method blank recoveries posted an overall success rate of 98.8% over the same averaging period. In contrast, surrogate matrix spike recovery success rates ranged from 31.8% (Event 2) to 100% (all other events), and surrogate field blank recovery success rates ranged from 87.5% (Events 1 and 2, EPA 625m organics) to 100% (Events 3 – 6). Surrogate environmental recovery results – evaluated in conjunction with matrix spike recovery results – posted a 94.3% success rate. These surrogate recoveries outside of QA/QC limits were all associated with method EPA 625m, but did not show any discernable pattern with regard to associated monitoring site or event. Five of five Event 1 surrogate environmental recovery results from EPA 625m PAH analyses for Receiving Water site W-4 fell below their lower recovery limit resulting in 25 environmental samples being qualified as "low biased" due to environmental sample surrogate recovery being less than the established lower limit for the analyte. Similarly, Event 2 surrogate environmental recoveries from EPA 625m pesticide analyses for Mass Emission site ME-SCR fell below their lower recovery limit resulting in a "low biased" qualification for 19 environmental samples. These low recoveries of surrogate environmental compounds are likely due to matrix interference.

Laboratory Control Spikes

Laboratory control spike (LCS) analyses are used to test the accuracy of the entire laboratory analytical process. These primary spike analyses are performed by the laboratory to certify that the instrumentation and laboratory procedures are accurate and compliant with typical laboratory performance standards. LCS recovery samples can also be run in duplicate similar to matrix spike duplicate analyses. LCS samples are standards prepared internally by the laboratory using a known amount of analyte. A laboratory can also purchase pre-prepared standards called standard reference material (SRM) or certified reference material (CRM). Regardless of how the standard is prepared, it is run through the entire analytical process as if it was an environmental sample. Since the standard contains a known amount of a compound, the results of the analysis can be compared to the expected result and a percent recovery calculated. LCS recoveries are reviewed to determine if the percent recovery is within control limits provided by the laboratory. If a LCS recovery is below the lower QA/QC acceptance limit for a constituent, then an environmental sample is qualified as "low biased". If a LCS recovery is above the upper QA/QC acceptance limit for a constituent, then an environmental sample is qualified as "high biased". In the absence of matrix spike recovery data for a particular monitoring site, a LCS result outside of QA/QC limits would lead to the qualification of all environmental data from the same analytical batch as the out-of-control LCS recovery. However, in instances where in-control matrix spike recovery results exist for an analyte, these matrix spike recovery results would "trump" LCS recovery results. An environmental sample associated with in-control matrix spike results would not be qualified as either "low biased" or "high biased" due to poor LCS recovery. Table 23 shows the lower and upper LCS recovery limits associated with those constituents for which laboratory control spike analyses were performed during the current monitoring season.

Laboratory Control Spike Check – This accuracy analysis verifies that primary spike analyses, such as LCS, SRM, and CRM recovery analyses, performed by a laboratory show that the lab's instrumentation and procedures are accurate and compliant with typical laboratory performance standards. LCS, SRM, and CRM recovery values outside of laboratory-determined ranges are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type.

The success rate of all but two laboratory control spike recovery analysis (including LCS and LCS duplicate recoveries) performed during the 2007/08 monitoring season was 100%. The exceptions were LCS duplicate recovery samples analyzed via EPA 625m for Phorate (Event 2) and Di-n-butylphthalate (Event 4). In each instance the average recovery of the two LCS recoveries was within the acceptance range for the analyte and therefore no environmental data required qualification. A summary of success rates for LCS recovery analyses performed during the 2007/08 monitoring season is presented in Appendix K.

Table 23: Laboratory Control Spike Recovery Limits

Classification	*Constituent(s)*	*LCS Recovery Limits*	
		Lower Limit	*Upper Limit*
Anion	Bromide, Chloride	70	130
Anion	Perchlorate	85	115
Conventional	Total Dissolved Solids	70	130
Conventional	Total Organic Carbon	80	120
Hydrocarbon	Oil and Grease, TRPH	70	130
Metal	Aluminum	50	140
Metal	As, Cr, Cr VI, Cu, Ni, Tl	70	130
Metal	Cadmium	75	130
Metal	Lead	65	135
Metal	Mercury	60	140
Metal	Selenium	60	150
Metal	Silver	50	155
Metal	Zinc	50	150
Nutrient	Ammonia as N, Nitrate as N, Nitrite as N, Orthophosphate as P (Diss), and Total Phosphorus	70	130
Nutrient	TKN	80	120
Organic	Methyl tert-butyl ether (MTBE)	82	118
Pesticide	2,4,5-T	30	130
Pesticide	2,4-D	30	130
Pesticide	2,4-DB	30	130
Pesticide	Glyphosate	71	137

*Lower and Upper Limits vary – widest possible range presented.

Laboratory Control Spike RPD Check – This precision analysis checks the relative percent difference (RPD) between two related laboratory control spikes (LCS), standard reference material (SRM), or certified reference material (CRM) recovery analyses. RPD values greater than 10 – 30% (depending on constituent and analytical method) are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type.

The success rate of all but two LCS RPD value calculated during the 2007/08 monitoring season was 100%. The exceptions were LCS RPD values calculated for Phorate (Event 1) and Endrin aldehyde (Event 4). Considering that laboratory duplicate and matrix spike RPD analyses for Phorate and Endrin aldehyde were observed to be in control for their associated QA/QC batches, the LCS RPD exceedances were determined to be inconsequential. To this end, no environmental samples were qualified based on this particular QA/QC evaluation. A summary of success rates for LCS RPD values calculated during the 2007/08 monitoring season is presented in Appendix L.

Holding Time Exceedances

The large majority of analytical methods used to analyze water quality samples specify a certain time period in which an analysis must be performed in order to ensure confidence in the result provided from the analysis. A sample that remains unanalyzed for too long a period of time sometimes shows analytical results different from those that would have been observed had the sample been analyzed earlier in time. This difference is due to the breakdown, transformation, and/or dissipation of substances in the sample over time. A holding time can be either the time between sample collection and sample preparation (the preparation holding time limit) or between the sample preparation and sample analysis (the analysis holding time limit). If a particular sample doesn't require any pre-analysis preparation, then the analysis holding time is the time between sample collection and sample analysis.

Holding Time Exceedance Check – This analysis determines the elapsed time between sample collection and sample analysis, the elapsed time between sample collection and sample preparation, and the elapsed time between

sample preparation and sample analysis. These elapsed times are then compared to holding time values (typically provided in EPA guidance for analytical methods) to determine if a holding time exceedance has occurred. Elapsed times greater than specified holding time limits are considered to exceed the Stormwater Monitoring Program's DQO for this QA/QC sample type.

The vast majority of holding times were met by laboratories during the current monitoring season. Logistical constraints associated with the delivery of water quality samples to the analytical laboratories resulted in a very small number of samples being analyzed after their respective holding time limits for Event 1. Five dissolved mercury samples analyzed for Event 1 violated their 48-hour preparation holding time limit. However, the elapsed sample preparation time for these samples exceeded the holding time limit by at most 2 hours. Out of a total of 6822 samples (including environmental samples, field blanks, and field duplicates) evaluated for holding time limit exceedances, only these five samples were observed to violate their respective holding time limits for an overall success rate of 99.9%. Those samples showing holding time exceedances did not grossly violate specified holding time limits and therefore were not rejected. All samples affected by holding time violations were qualified as "estimated" due to holding time limit exceedance. Samples evaluated for holding time exceedances during the 2007/08 monitoring season are presented in Appendix M.

Data Qualification Codes

As discussed above, the Stormwater Monitoring Program's QA/QC evaluation process looked for and found various environmental and QA/QC sample results that fell outside of particular data quality objectives or QA/QC limits. In some instances these exceedances of QA/QC limits resulted in the qualification of affected environmental data. Data are literally qualified by attaching specific qualification codes used by the Stormwater Monitoring Program to individual data points as necessary. The various qualification codes assigned to environmental data during the current monitoring season are presented in Table 24.

The codes listed in Table 24 appear in the "Qualifier" data field included in Appendix F that presents all environmental sample results generated by the Stormwater Monitoring Program during the 2007/08 monitoring season. It should be noted that with the exception of holding time exceedances for field blank and field duplicate results, the Stormwater Monitoring Program does not assign qualifications to QA/QC samples. Appendix G presents all QA/QC results generated by the Stormwater Monitoring Program during the 2007/08 monitoring season.

Table 24: Program Data Qualification Codes Associated with 2007/08 Program Data

Qualification Code	*Qualification Description*
EST-FD	Result is considered "estimated" due to field duplicate DQO exceedance.
EST-HT	Result is considered "estimated" due to holding time limit exceedance.
EST-LD	Result is considered "estimated" due to laboratory duplicate DQO exceedance.
EST-MSRPD	Result is considered "estimated" due to matrix spike, RPD DQO exceedance.
HB-MSR	Result is considered "high biased" due to a matrix spike recovery greater than the established upper limit for the analyte. Both matrix spike and matrix spike duplicate results can exceed the upper limit due to matrix interference and therefore result in qualification of environmental data.
LB-MSR	Result is considered "low biased" due to a matrix spike recovery less than the established lower limit for the analyte. Both matrix spike and matrix spike duplicate results can fall below the lower limit due to matrix interference and therefore result in qualification of environmental data.
LB-SRGTR	Result is considered "low biased" due to an environmental sample surrogate recovery less than the established lower limit for the analyte. Environmental sample surrogate recovery results can fall below the lower limit due to matrix interference and therefore result in qualification of environmental data.
UL-FB	Result is considered an "upper limit" of its true concentration due to field blank DQO exceedance (i.e., field blank contamination).
EST*	Result is estimated; numeric value below the RL and above the MDL.

*The EST qualification code is assigned by the analytical laboratory that analyzed the sample, not by the Program.

In summary, a total of 5685 environmental samples (including 482 field duplicate results) were analyzed during the first three events in the 2007/08 monitoring season. Field duplicate analyses are considered to be surrogates of environmental analyses and are therefore included in the calculation of environmental sample totals. The Stormwater Monitoring Program's QA/QC evaluation process identified 243 environmental samples in need of qualification, which translates into the Stormwater Monitoring Program achieving a 95.7% success rate in meeting program data quality objectives. Two hundred twenty-five (225) environmental results were reported as "estimated" by the laboratory upon completion of its sample analysis due to sample concentrations being measured between the method detection limit and quantitation limit. Additionally, nine QA/QC data records were rejected from the current monitoring season's data set. All rejected records were matrix spike recovery and RPD results (associated with Bis(2-ethylhexyl)phthalate and Perylene) from Events 2 and 3 that were insufficiently spiked by the laboratory due to the parameter concentration in the sample exceeding the spike concentration. As a matter of course, insufficiently spiked matrix spike samples are removed from the Stormwater Monitoring Program's QA/QC data set as they cannot be used to evaluate target analyte recovery. Overall, the three wet weather and three dry weather events monitored during the current season produced a high quality data set in terms of the low percentage of qualified data, as well as the low reporting levels achieved by all laboratories analyzing the Stormwater Monitoring Program's water quality samples. Table 25 through Table 31 present the success rates observed for each QA/QC evaluation performed by the Stormwater Monitoring Program during the 2007/08 monitoring season on a classification-by-classification basis.

Table 25: QA/QC Success Rates for Anions

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	77	77	100%
Method Blank (MB)	18	18	100%
Laboratory Control Spike (LCS)	18	18	100%
Laboratory Control Spike Duplicate (LCSD)	18	18	100%
Laboratory Control Spike, RPD (LSCRPD)	18	18	100%
Matrix Spike (MS)	14	14	100%
Matrix Spike Duplicate (MSD)	14	14	100%
Matrix Spike, RPD (MSRPD)	14	14	100%
Laboratory Duplicate (LD)	13	12	92.3%
Field Duplicate (FD)	7	6	85.7%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 26: QA/QC Success Rates for Bacteriologicals

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	112	112	100%
Method Blank (MB)	4	4	100%
Field Blank (FB)	12	12	100%
Laboratory Duplicate (LD)	4	3	75%
Field Duplicate (FD)	12	11	91.7%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 27: QA/QC Success Rates for Conventionals

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	214	214	100%
Method Blank (MB)	35	34	97.1%
Field Blank (FB)	3	2	66.7%
Laboratory Control Spike (LSC)	12	12	100%
Laboratory Control Spike Duplicate (LCSD)	12	12	100%
Laboratory Control Spike, RPD (LCSRPD)	12	12	100%
Matrix Spike (MS)	6	6	100%
Matrix Spike Duplicate (MSD)	6	6	100%
Matrix Spike, RPD (MSRPD)	6	6	100%
Laboratory Duplicate (LD)	50	48	96.0%
Field Duplicate (FD)	18	17	94.4%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 28: QA/QC Success Rates for Hydrocarbons

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	54	54	100%
Method Blank (MB)	12	12	100%
Laboratory Control Spike (LSC)	12	12	100%
Laboratory Control Spike Duplicate (LCSD)	12	12	100%
Laboratory Control Spike, RPD (LCSRPD)	12	12	100%
Laboratory Duplicate (LD)	6	6	100%
Matrix Spike (MS)	4	4	100%
Field Duplicate (FD)	6	6	100%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 29: QA/QC Success Rates for Nutrients

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	183	183	100%
Method Blank (MB)	42	42	100%
Laboratory Control Spike (LCS)	42	42	100%
Laboratory Control Spike Duplicate (LCSD)	36	36	100%
Laboratory Control Spike, RPD (LCSRPD)	36	36	100%
Matrix Spike (MS)	42	40	95.2%
Matrix Spike Duplicate (MSD)	42	40	95.2%
Matrix Spike, RPD (MS RPD)	42	42	100%
Laboratory Duplicate (LD)	43	42	97.7%
Field Duplicate (FD)	15	12	80.0%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 30: QA/QC Success Rates for Metals

QAQC Sample Type	*Total Number*	*Number Successful*	*Success Rate*
Holding Time (HT)*	701	696	99.3%
Method Blank (MB)	150	150	100%
Field Blank (FB)	41	35	85.4%
Laboratory Control Spike (LCS)	9	9	100%
Laboratory Control Spike Duplicate (LCSD)	9	9	100%
Laboratory Control Spike, RPD (LCSRPD)	9	9	100%
Matrix Spike (MS)	76	76	100%
Matrix Spike Duplicate (MSD)	76	76	100%
Matrix Spike, RPD (MSRPD)	76	76	100%
Laboratory Duplicate (LD)	167	162	97.0%
Field Duplicate (FD)	52	45	86.5%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

Table 31: QA/QC Success Rates for Trace Organic Compounds

Method	*QAQC Sample Type*	*Total Number*	*Number Successful*	*Success Rate*
EPA 547	Holding Time (HT)*	21	21	100%
	Method Blank (MB)	6	6	100%
	Laboratory Control Spike (LCS)	6	6	100%
	Matrix Spike (MS)	3	2	100%
	Matrix Spike Duplicate (MSD)	3	2	100%
	Matrix Spike, RPD (MSRPD)	3	2	100%
	Field Duplicate (FD)	1	1	100%
EPA 625m	Holding Time (HT)*	5236	5236	100%
	Method Blank (MB)	1033	1033	100%
	Surrogate Method Blank (SMB)	67	66	98.5%
	Field Blank (FB)	684	620	90.6%
	Surrogate Field Blank (SFB)	44	42	95.5%
	Laboratory Control Spike (LCS)	779	779	100%
	Laboratory Control Spike Duplicate (LCSD)	779	777	99.7%
	Laboratory Control Spike, RPD (LCSRPD)	779	777	99.7%
	Surrogate LCS (SLCS)	66	66	100%
	Surrogate LCS Duplicate (SLCSD)	66	66	100%
	Matrix Spike (MS)	776	723	93.2%
	Matrix Spike Duplicate (MSD)	776	672	86.6%
	Matrix Spike, RPD (MSRPD)	776	697	89.8%
	Surrogate Matrix Spike (SMS)	66	61	92.4%
	Surrogate Matrix Spike Duplicate (SMSD)	66	56	84.8%
	Environmental Sample Surrogates (ESS)	330	309	93.6%
	Laboratory Duplicate (LD)	1197	1137	95.0%
	Field Duplicate (FD)	344	333	96.8%
EPA 8151A	Holding Time (HT)*	220	220	100%
	Method Blank (MB)	60	60	100%
	Surrogate Method Blank (SMB)	6	6	100%
	Laboratory Control Spike (LCS)	18	18	100%
	Laboratory Control Spike Duplicate (LCSD)	18	18	100%
	Laboratory Control Spike, RPD (LCSRPD)	18	18	100%
	Matrix Spike (MS)	12	9	75.0%
	Matrix Spike Duplicate (MSD)	12	9	75.0%
	Matrix Spike, RPD (MSRPD)	12	10	83.3%
	Environmental Sample Surrogates (ESS)	21	21	100%
	Field Duplicate (FD)	20	20	100%
EPA 8260B	Holding Time (HT)*	4	4	100%
	Method Blank (MB)	2	2	100%
	Surrogate Method Blank (SMB)	8	8	100%
	Laboratory Control Spike (LCS)	2	2	100%
	Laboratory Control Spike Duplicate (LCSD)	2	2	100%
	Laboratory Control Spike, RPD (LCSRPD)	2	2	100%
	Environmental Sample Surrogates (ESS)	16	16	100%
	Field Duplicate (FD)	1	1	100%

*Holding Time is not a specific type of QA/QC sample, rather a specific QA/QA evaluation performed by the Stormwater Monitoring Program.

8. Water Quality Results

This section provides a brief description of the Stormwater Monitoring Program's NPDES Stormwater Quality Database, as well as presents the 2007/08 monitoring results from the Land Use, Receiving Water, and Mass Emission monitoring locations. All environmental sample results, as exported from the NPDES Stormwater Quality Database, are included in Appendix F. As mentioned earlier, these data include qualifiers that were assigned to them based on the outcome of the QA/QC data evaluation process described in Section 7.

NPDES Stormwater Quality Database

The Stormwater Monitoring Program manages all of its water chemistry environmental and QA/QC data in its NPDES Stormwater Quality Database (Database). Over the past five years, VCWPD has invested approximately $150,000 to develop and upgrade a water quality database (built using Microsoft Access XP Version 2002) to further expedite, standardize, and enhance the Stormwater Monitoring Program's data management and data analysis activities. Monitoring results for the 2007/08 monitoring year were reported by laboratories in the forms of EDDs and hard copy laboratory reports. As a means of facilitating the proper compilation and formatting of EDDs by laboratories, the Stormwater Monitoring Program produced the *NPDES Stormwater Water Quality Database Data Reporting Protocols* guidance document. This document was distributed to all laboratories providing electronically formatted water chemistry data to the Stormwater Monitoring Program in order to provide these laboratories with appropriate EDD formatting and data population guidance. VCWPD staff automatically imported, as well as hand entered data into the Database and checked the data for accuracy and completeness using the Stormwater Monitoring Program's *Data Quality Evaluation Standard Operating Procedures* guidance document. The Database includes the following features employed by the Stormwater Monitoring Program to manage and evaluate its water chemistry data:

- Automatic importation and cursory evaluation of electronically formatted data
- Key data entry screens for single and multiple record data entry for data reported in hard copy form
- Data viewing/editing screens for the detailed evaluation of newly entered data
- Semi-automated QA/QC evaluation
- Data querying screens
- Automated comparison of the Stormwater Monitoring Program's data to water quality objectives (Basin Plan, Ocean Plan, California Toxics Rule).

The database has allowed the Stormwater Monitoring Program to improve its overall data management effort by providing staff with a robust data management tool for the storage, analysis, and reporting of monitoring data. On a routine basis the reference information used by the Database to carry out its various functions is reviewed to confirm that it is accurate and up-to-date.

There are plans to expand the database beyond the capabilities listed above. Future upgrades to the database will eventually include (1) the ability to perform complex statistical analyses such as trend analysis, and (2) the capability to export electronic data in specific data formats for the purpose of sharing data with regulators and other agencies. The addition of these features to the water quality database will provide additional tools to the Stormwater Monitoring Program that will improve data management and analysis in an effort to enhance the effectiveness of the overall program.

Monitoring Results

Land Use, Receiving Water, and Mass Emission water quality results for the 2007/08 monitoring year were generated from the collection and analysis of composite and grab samples. Results are reported as the concentrations measured from either flow-proportional or time-paced composite samples, or from single grab samples. As mentioned earlier, only samples collected from the ME-CC and ME-VR2 stations are collected as flow-proportional composite samples; all other composites are collected as time-paced samples. In either case, the results can be interpreted as the best available estimate of the event mean concentrations (EMC) for the given storm event.

The following constituents were collected as grab samples, with all other constituents analyzed from composite samples:

- Perchlorate
- E. coli
- Enterococcus
- Fecal Coliform
- Total Coliform
- Conductivity
- pH
- Oil and Grease
- TRPH
- Mercury (total recoverable and dissolved)
- Ammonia-Nitrogen
- MTBE (Land Use and Receiving Water Stations)
- Aquatic Toxicity

Receiving Water and Land Use Site Results

Water quality results for the 2007/08 monitoring season from the Land Use and Receiving Water stations are presented in Table 32 through Table 39.

Table 32: Anion, Conventional, Hydrocarbon, and Nutrient Results from Agricultural Land Use Site A-1

Classification	*Constituent*	*Fraction*	*Units*	*A-1* *Event 2 12/18/07*
Anion	Bromide	n/a	mg/L	7.6
Anion	Chloride	n/a	mg/L	129.37
Anion	Perchlorate	n/a	µg/L	< 2
Conventional	BOD	n/a	mg/L	< 2
Conventional	Conductivity	n/a	µmhos/cm	3350
Conventional	Hardness as CaCO3	Total	mg/L	554.3
Conventional	pH	n/a	pH Units	7.2
Conventional	Total Dissolved Solids	n/a	mg/L	2420
Conventional	Total Organic Carbon	n/a	mg/L	9.4
Conventional	Total Suspended Solids	n/a	mg/L	176
Conventional	Turbidity	n/a	NTU	221
Hydrocarbon	Oil and Grease	n/a	mg/L	< 1
Hydrocarbon	TRPH	n/a	mg/L	< 1
Nutrient	Ammonia as N	n/a	mg/L	0.3 *
Nutrient	Nitrate as N	n/a	mg/L	21.18
Nutrient	Nitrite as N	n/a	mg/L	0.29 *
Nutrient	Orthophosphate as P	n/a	mg/L	0.2531 *
Nutrient	TKN	n/a	mg/L	0.2
Nutrient	Total Phosphorus	Dissolved	mg/L	0.41
Nutrient	Total Phosphorus	Total	mg/L	1.635

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 33: Anion, Conventional, Hydrocarbon, and Nutrient Results from Receiving Water Sites W-3 and W-4

Classification	*Constituent*	*Fraction*	*Units*	*W-3* *Event 2 12/18/07*	*W-4* *Event 1 9/21/07*
Anion	Bromide	n/a	mg/L	0.5	< 0.001
Anion	Chloride	n/a	mg/L	21.72	150.6
Anion	Perchlorate	n/a	µg/L	< 2	< 2
Conventional	BOD	n/a	mg/L	7	25
Conventional	Conductivity	n/a	µmhos/cm	575	2600
Conventional	Hardness as CaCO3	Total	mg/L	70	650.3
Conventional	pH	n/a	pH Units	8	8.1
Conventional	Total Dissolved Solids	n/a	mg/L	254	2719
Conventional	Total Organic Carbon	n/a	mg/L	20.4	25.4
Conventional	Total Suspended Solids	n/a	mg/L	7466.7	3780
Conventional	Turbidity	n/a	NTU	3806	2216
Hydrocarbon	Oil and Grease	n/a	mg/L	1 *	2.3
Hydrocarbon	TRPH	n/a	mg/L	< 1	< 1
Nutrient	Ammonia as N	n/a	mg/L	3	1.2
Nutrient	Nitrate as N	n/a	mg/L	7.81	< 0.01
Nutrient	Nitrite as N	n/a	mg/L	0.27	< 0.01
Nutrient	Orthophosphate as P	n/a	mg/L	0.7969	< 0.0075
Nutrient	TKN	n/a	mg/L	0.3	1.41
Nutrient	Total Phosphorus	Dissolved	mg/L	0.79	0.2
Nutrient	Total Phosphorus	Total	mg/L	8.032	4.752

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 34: Metals Results from Agricultural Land Use Site A-1

Constituent	*Fraction*	*Units*	*A-1* *Event 2 12/18/07*
Aluminum	Dissolved	µg/L	< 5
Arsenic	Dissolved	µg/L	6.2
Cadmium	Dissolved	µg/L	0.5
Chromium	Dissolved	µg/L	2.8
Copper	Dissolved	µg/L	5.8
Lead	Dissolved	µg/L	< 0.05
Mercury	Dissolved	ng/L	2.3
Nickel	Dissolved	µg/L	15.7
Selenium	Dissolved	µg/L	4.7
Silver	Dissolved	µg/L	< 0.5
Thallium	Dissolved	µg/L	< 0.1
Zinc	Dissolved	µg/L	6.3
Aluminum	Total	µg/L	1420
Arsenic	Total	µg/L	7.8
Cadmium	Total	µg/L	1.1
Chromium	Total	µg/L	5.7
Chromium VI	Total	µg/L	< 5
Copper	Total	µg/L	18.4
Lead	Total	µg/L	4.39
Mercury	Total	ng/L	18.2
Nickel	Total	µg/L	21.4
Selenium	Total	µg/L	4.8
Silver	Total	µg/L	< 0.5
Thallium	Total	µg/L	< 0.1
Zinc	Total	µg/L	44.9

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 35: Metals Results from Receiving Water Sites W-3 and W-4

Constituent	*Fraction*	*Units*	*W-3*	*W-4*
			Event 2 12/18/07	*Event 1 9/21/07*
Aluminum	Dissolved	µg/L	12	< 5
Arsenic	Dissolved	µg/L	2.9	5
Cadmium	Dissolved	µg/L	0.2 *	< 0.2
Chromium	Dissolved	µg/L	0.1 *	0.5
Copper	Dissolved	µg/L	10.8	4.2
Lead	Dissolved	µg/L	0.15	0.06
Mercury	Dissolved	ng/L	1.9	7.1 *
Nickel	Dissolved	µg/L	4.9	8.2
Selenium	Dissolved	µg/L	3.8	15.4
Silver	Dissolved	µg/L	< 0.5	< 0.5
Thallium	Dissolved	µg/L	< 0.1	< 0.1
Zinc	Dissolved	µg/L	7.4	8.6
Aluminum	Total	µg/L	6032	11200
Arsenic	Total	µg/L	8.5	26.9
Cadmium	Total	µg/L	2	6.4
Chromium	Total	µg/L	4.2	10.4
Chromium VI	Total	µg/L	< 5	< 5
Copper	Total	µg/L	124.3	148.1
Lead	Total	µg/L	33.39	98.42
Mercury	Total	ng/L	74.6	61.4
Nickel	Total	µg/L	31	56.6
Selenium	Total	µg/L	3.3	16.9
Silver	Total	µg/L	< 0.5	< 0.5
Thallium	Total	µg/L	< 0.1	< 0.1
Zinc	Total	µg/L	164.2	373

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 36: Detected Trace Organic Results from Agricultural Land Use Site A-1

Classification	*Method*	*Constituent*	*Units*	*A-1* *Event 1 12/18/07*
Organic	EPA 625m	1-Methylnaphthalene	µg/L	0.0021 *
Organic	EPA 625m	1-Methylphenanthrene	µg/L	0.0103
Organic	EPA 625m	2,6-Dimethylnaphthalene	µg/L	0.0112
Organic	EPA 625m	2-Methylnaphthalene	µg/L	0.0044 *
Organic	EPA 625m	Anthracene	µg/L	0.0048 *
Organic	EPA 625m	Benzo(a)anthracene	µg/L	0.0058
Organic	EPA 625m	Benzo(b)fluoranthene	µg/L	0.0057
Organic	EPA 625m	Benzo(e)pyrene	µg/L	0.0142
Organic	EPA 625m	Benzo(g,h,i)perylene	µg/L	0.0082
Organic	EPA 625m	Benzo(k)fluoranthene	µg/L	< 0.001 *
Organic	EPA 625m	Biphenyl	µg/L	0.0026 *
Organic	EPA 625m	Bis(2-ethylhexyl)phthalate	µg/L	3.3244 *
Organic	EPA 625m	Butyl benzyl phthalate	µg/L	0.0724
Organic	EPA 625m	Chrysene	µg/L	0.0419
Organic	EPA 625m	Dibenzothiophene	µg/L	0.0138
Organic	EPA 625m	Diethyl phthalate	µg/L	0.4562
Organic	EPA 625m	Di-n-butylphthalate	µg/L	0.1026
Organic	EPA 625m	Di-n-octylphthalate	µg/L	0.0118 *
Organic	EPA 625m	Fluoranthene	µg/L	0.0194
Organic	EPA 625m	Indeno(1,2,3-cd)pyrene	µg/L	0.0091
Organic	EPA 625m	Naphthalene	µg/L	0.0037 *
Organic	EPA 625m	Pentachlorophenol	µg/L	0.187
Organic	EPA 625m	Perylene	µg/L	0.0179
Organic	EPA 625m	Phenanthrene	µg/L	0.0173
Organic	EPA 625m	Phenol	µg/L	0.189 *
Organic	EPA 625m	Pyrene	µg/L	0.0257
Organic	EPA 625m	Total Detectable PAHs	µg/L	0.2181
Pesticide	EPA 625m	2,4'-DDD	µg/L	0.0405
Pesticide	EPA 625m	2,4'-DDE	µg/L	< 0.001 *
Pesticide	EPA 625m	2,4'-DDT	µg/L	0.0131
Pesticide	EPA 625m	4,4'-DDD	µg/L	0.1288
Pesticide	EPA 625m	4,4'-DDE	µg/L	0.6345
Pesticide	EPA 625m	4,4'-DDT	µg/L	0.0893
Pesticide	EPA 625m	Chlordane-gamma	µg/L	0.0035 *
Pesticide	EPA 625m	Chlorpyrifos	µg/L	0.1634
Pesticide	EPA 625m	Diazinon	µg/L	0.0232 *
Pesticide	EPA 547	Glyphosate	µg/L	11
Pesticide	EPA 625m	Malathion	µg/L	0.2126
Pesticide	EPA 625m	Total Detectable DDTs	µg/L	0.9062

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 37: Detected Trace Organic Results from Receiving Water Sites W-3 and W-4

Classification	Method	Constituent	Units	W-3 Event 2 12/18/07	W-4 Event 1 9/21/07
Organic	EPA 625m	1,2,4-Trichlorobenzene	µg/L	0.012 *	ND
Organic	EPA 625m	1-Methylnaphthalene	µg/L	0.0058	0.129 *
Organic	EPA 625m	1-Methylphenanthrene	µg/L	0.0255	0.0149 *
Organic	EPA 625m	2,3,5-Trimethylnaphthalene	µg/L	0.0065	0.0151 *
Organic	EPA 625m	2,6-Dimethylnaphthalene	µg/L	0.0124	0.1566 *
Organic	EPA 625m	2-Methylnaphthalene	µg/L	0.0082	0.2624 *
Organic	EPA 625m	Acenaphthene	µg/L	ND	0.0065 *
Organic	EPA 625m	Acenaphthylene	µg/L	ND	< 0.001 *
Organic	EPA 625m	Anthracene	µg/L	ND	0.01 *
Organic	EPA 625m	Benzo(a)anthracene	µg/L	0.0193	0.0219 *
Organic	EPA 625m	Benzo(a)pyrene	µg/L	0.0128	0.0279 *
Organic	EPA 625m	Benzo(b)fluoranthene	µg/L	0.035	0.0378 *
Organic	EPA 625m	Benzo(e)pyrene	µg/L	0.03	0.0382 *
Organic	EPA 625m	Benzo(g,h,i)perylene	µg/L	ND	0.0232 *
Organic	EPA 625m	Benzo(k)fluoranthene	µg/L	0.0082	0.0159 *
Organic	EPA 625m	Biphenyl	µg/L	0.0109	0.0415 *
Organic	EPA 625m	Bis(2-ethylhexyl)phthalate	µg/L	2.7122	2.7549
Organic	EPA 625m	Butyl benzyl phthalate	µg/L	0.2392	0.2064
Organic	EPA 625m	Chrysene	µg/L	0.0441	0.0776 *
Organic	EPA 625m	Dibenz(a,h)anthracene	µg/L	ND	0.0022 *
Organic	EPA 625m	Dibenzothiophene	µg/L	0.0037 *	< 0.001 *
Organic	EPA 625m	Diethyl phthalate	µg/L	0.5378	1.1588
Organic	EPA 625m	Dimethyl phthalate	µg/L	ND	0.1185
Organic	EPA 625m	Di-n-butylphthalate	µg/L	0.1717	ND
Organic	EPA 625m	Di-n-octylphthalate	µg/L	0.0316	0.348
Organic	EPA 625m	Fluoranthene	µg/L	0.0423	0.0697 *
Organic	EPA 625m	Fluorene	µg/L	0.0057	0.0334 *
Organic	EPA 625m	Indeno(1,2,3-cd)pyrene	µg/L	ND	0.0108 *
Organic	EPA 625m	Isophorone	µg/L	ND	0.06
Organic	EPA 625m	Naphthalene	µg/L	0.0082	0.0867 *
Organic	EPA 625m	Perylene	µg/L	0.0076	0.0078 *
Organic	EPA 625m	Phenanthrene	µg/L	0.039	0.0546 *
Organic	EPA 625m	Phenol	µg/L	0.343	0.108
Organic	EPA 625m	Pyrene	µg/L	0.0395	0.0673 *
Organic	EPA 625m	Total Detectable PAHs	µg/L	0.3647	1.211
Pesticide	EPA 625m	2,4'-DDD	µg/L	0.0929	0.1525
Pesticide	EPA 625m	2,4'-DDE	µg/L	0.0422	0.0651
Pesticide	EPA 625m	2,4'-DDT	µg/L	0.031	ND
Pesticide	EPA 625m	4,4'-DDD	µg/L	0.3239	0.5578
Pesticide	EPA 625m	4,4'-DDE	µg/L	2.4776	2.147
Pesticide	EPA 625m	4,4'-DDT	µg/L	0.1848	0.1237
Pesticide	EPA 625m	Chlordane-alpha	µg/L	0.0234	0.0342
Pesticide	EPA 625m	Chlordane-gamma	µg/L	0.0163	0.0391
Pesticide	EPA 625m	Chlorpyrifos	µg/L	3.4021	ND
Pesticide	EPA 625m	cis-Nonachlor	µg/L	ND	0.0074
Pesticide	EPA 625m	Diazinon	µg/L	0.0615	ND
Pesticide	EPA 547	Glyphosate	µg/L	6.1	22
Pesticide	EPA 625m	Total Detectable DDTs	µg/L	3.1524	3.0461
Pesticide	EPA 625m	trans-Nonachlor	µg/L	0.0138	0.0249

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 38: Bacteriological Results from Agricultural Land Use Site A-1

Constituent	*Units*	*A-1* *Event 2 12/18/07*
E. Coli	MPN/100 mL	7270
Enterococcus	MPN/100 mL	7380
Fecal Coliform	MPN/100 mL	5000
Total Coliform	MPN/100 mL	248,100

Table 39: Bacteriological Results from Receiving Water Sites W-3 and W-4

Constituent	*Units*	*W-3* *Event 2 12/18/07*	*W-4* *Event 1 9/21/07*
E. Coli	MPN/100 mL	12997	7270
Enterococcus	MPN/100 mL	20050	3440
Fecal Coliform	MPN/100 mL	16000	24000
Total Coliform	MPN/100 mL	1,413,600	8,664,000

Mass Emission Site Results

Water quality results for the 2007/08 monitoring season from the Mass Emission stations are presented in Table 40 through Table 51.

Table 40: Anion, Conventional, Hydrocarbon, and Nutrient Results from Mass Emission Site ME-CC

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Constituent – Fraction (mg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Anion						
Bromide	< 0.001	0.2	0.2	1.9	0.5	0.4
Chloride	158.8	60.1	35.86	175.52	90.42	179.26
Perchlorate	< 2	< 2	< 2	< 0.36	< 0.36	< 0.36
Conventional						
BOD	12	8	8	2	< 2	< 1
Conductivity (µmhos/m)	1560	780	407	1475	1515	1438
Hardness as $CaCO_3$ - Total	253.9	92.3	63.8	229.4	236.1	222.6
pH (pH Units)	7.8	7.9	7.9	7.9	8.2	8.2
Total Dissolved Solids	943	222 *	221	934	832	882
Total Organic Carbon	6.9	13.1	20.7	5.3	5.4	5.2
Total Suspended Solids	428	890	1170	8.7	7.3	2.7 *
Turbidity (NTU)	333	742	1096	6.8	5.1	2.5
Hydrocarbon						
Oil & Grease	1.6	1.4 *	< 1	< 1	< 1	< 1
TRPH	< 1	1.7 *	< 1	< 1	1.3 *	< 1
Nutrient						
Ammonia as N	0.45	0.6	0.25	0.3	0.08	0.06
Nitrate as N	< 0.01	1.6 *	2.67	7.15	6.24	7.5
Nitrite as N	< 0.01	< 0.01	0.03 *	< 0.01	0.05	0.04 *
Orthophosphate as P (Diss)	0.0075	0.9745	0.2135	1.8002	1.6553	2.4397
TKN	0.36	0.23	0.78	0.38	0.13	0.31
Total Phosphorus – Dissolved	0.66	1.1	0.61	1.94	2.02	2.19
Total Phosphorus – Total	2.112	3.482	3.142	2.059	1.931	2.195

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 41: Anion, Conventional, Hydrocarbon, and Nutrient Results from Mass Emission Site ME-VR2

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Constituent – Fraction (mg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Anion						
Bromide	< 0.001	0.4	0.5	0.4	0.2	0.2 *
Chloride	135.9	301.56	22.53	34.68	37.12	35.44
Perchlorate	< 2	< 2	< 2	< 0.36	< 0.36	< 0.36
Conventional						
BOD	10	3 *	7.1	3.2	45	< 1
Conductivity (µmhos/m)	1040	1169	1120	888	962	874
Hardness as $CaCO_3$ - Total	289.2	328.8	173	164.8	171.9	156.4
pH (pH Units)	8	7.8	8	8.2	8.3	8.1
Total Dissolved Solids	1139	1326	827	646	562	602
Total Organic Carbon	6.4	5.5	28.4	1.9	6	1.7
Total Suspended Solids	4	48	12500	< 0.5	1 *	0.7 *
Turbidity (NTU)	3.9	48.3	7012	< 1	< 1	< 1
Hydrocarbon						
Oil & Grease	< 1	< 1	< 1	< 1	< 1	< 1
TRPH	< 1	1.3 *	< 1	< 1	< 1	< 1
Nutrient						
Ammonia as N	0.06	0.06	0.27	0.03 *	0.04	0.03 *
Nitrate as N	< 0.01	0.16	4.4	2.21	0.61	0.28
Nitrite as N	< 0.01	< 0.01	0.08	< 0.01	0.03 *	0.02 *
Orthophosphate as P (Diss)	< 0.0075	< 0.0075	0.3148	< 0.0075	0.0587	0.0323 *
TKN	0.22	#	0.64	0.31	0.11	0.19
Total Phosphorus – Dissolved	0.04	0.06	0.15	< 0.016	< 0.016	< 0.016
Total Phosphorus – Total	0.098	0.231	7.075	< 0.016	< 0.016	< 0.016

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.
– Insufficient sample volume resulted in no analysis for this constituent because of its position on the priorities list.

Table 42: Anion, Conventional, Hydrocarbon, and Nutrient Results from Mass Emission Site ME-SCR

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Constituent – Fraction (mg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Anion						
Bromide	< 0.001	0.5	0.4	1.2	0.4	0.4 *
Chloride	56.3	65.65	25.64	44.68	62.21	60.62
Perchlorate	< 2	< 2	< 2	< 0.36	< 0.36	< 0.36
Conventional						
BOD	1	16.5	6.4	< 0.58	72.4	< 1
Conductivity (µmhos/m)	1280	1957	662	1245	1462	1359
Hardness as $CaCO_3$ - Total	258	253.3	141.9	235.2	269.9	256.2
pH (pH Units)	8	7.9	8	8.1	8.3	8.4
Total Dissolved Solids	911	1032	519	944	1006	1038
Total Organic Carbon	3.7	10.6	16.6	2.6	11.8	3
Total Suspended Solids	11.8	15733.3	8700	1.1 *	8	*
Turbidity (NTU)	5.1	3303	5148	3.2	4.6	4.9
Hydrocarbon						
Oil & Grease	< 1	1.9 *	< 1	< 1	< 1	1.4 *
TRPH	< 1	1 *	< 1	< 1	< 1	< 1
Nutrient						
Ammonia as N	0.03	13.5	0.45	0.11	0.21	0.16
Nitrate as N	< 0.01	0.8	1.68	1.01	1.09	0.98
Nitrite as N	< 0.01	< 0.01	0.13	0.1	0.15	0.15
Orthophosphate as P (Diss)	< 0.0075	0.2581	0.3307	2.9865	0.2353	0.1152
TKN	0.19	0.26	0.48	0.19	0.09	0.26
Total Phosphorus – Dissolved	0.08	0.19	0.1	0.11	0.18	0.15
Total Phosphorus – Total	0.102	25.938	8.498	0.126	0.209	0.156

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 43: Metals Results from Mass Emission Site ME-CC

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent – Fraction (µg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Aluminum – Total	2219	3097	6644	65	21	33
Arsenic – Total	5.8	5.9	4.4	3.3	4	4.5
Cadmium – Total	1.1	1.7 *	2.7	0.2 *	0.2 *	0.2 *
Chromium – Total	5	5.7	14.6	0.5	0.4 *	0.3 *
Chromium VI – Total	< 5	< 5	37	6 *	< 5	< 5
Copper – Total	21	37.8 *	49.6	1.9	1.7	1.8
Lead – Total	6.69	13.74	14.58	0.1	< 0.05	0.07 *
Mercury – Total (ng/L)	28.7	40.9	176.2	3.7	5.9 *	4.5
Nickel – Total	19.9	21.3	38.7	4.4	5.3	5.4
Selenium – Total	2.9	1.5	1.4	2.8	2.2	2.1
Silver – Total	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Total	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zinc – Total	69.1	110.5 *	129.2	16.6	12.7	15.8
Aluminum – Dissolved	< 5	< 5	19	< 5	< 5	< 5
Arsenic – Dissolved	4.9	3	2.8	3.4	4.2	4
Cadmium – Dissolved	0.3	0.2 *	0.2 *	0.2 *	0.2 *	0.2 *
Chromium – Dissolved	0.4	0.2 *	0.4 *	0.3 *	0.3 *	0.3 *
Copper – Dissolved	5.3	3.4	3.4	1.9	1.7	1.5
Lead – Dissolved	0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Mercury – Dissolved (ng/L)	7.9 *	1.6	2.1 *	2.5	7.8	3.3
Nickel – Dissolved	8.6	3.5	2.8	4.3	5.2	5.4
Selenium – Dissolved	2.8	1.2	1.3	2.4	2	1.7
Silver – Dissolved	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Dissolved	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zinc – Dissolved	19.6	7.1	3.7	16.8	12.8	15.7

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 44: Metals Results from Mass Emission Site ME-VR2

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent – Fraction (µg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Aluminum – Total	18	208	22340	< 5	< 5	< 5
Arsenic – Total	1.7	2.4	23.4	0.4 *	0.5	0.7
Cadmium – Total	< 0.2	0.3 *	10.2	< 0.2	< 0.2	< 0.2
Chromium – Total	0.2	0.6	34.4	0.1 *	0.1 *	0.1 *
Chromium VI – Total	< 5	< 5	< 5	6 *	< 5	< 5
Copper – Total	2.2	3.4	135.9	1.2	< 0.4	< 0.4
Lead – Total	0.09	0.73	53.43	0.05 *	< 0.05	< 0.05
Mercury – Total (ng/L)	9.2 *	6.7	121	2.7	3.5	2.8
Nickel – Total	11.5	28.3	235.4	1.6	0.9	0.6
Selenium – Total	1.3	1.1	9.3	2.8	2.1	2.4
Silver – Total	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Total	< 0.1	< 0.1	0.2 *	< 0.1	< 0.1	< 0.1
Zinc – Total	9.6	16.5	217.5	1.1	< 0.1	0.3 *
Aluminum – Dissolved	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic – Dissolved	1.6	0.7	1.9	0.4 *	0.4 *	0.2 *
Cadmium – Dissolved	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium – Dissolved	0.2	0.1 *	0.2 *	0.1 *	0.1 *	0.1 *
Copper – Dissolved	2	2	5.5	1.2	< 0.4	< 0.4
Lead – Dissolved	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Mercury – Dissolved (ng/L)	4.3 *	< 0.5 *	3.4	1.6	3.3	2.2
Nickel – Dissolved	11.1	27.3	6.4	1.2	0.8	0.7
Selenium – Dissolved	1.1	1.1	9.4	2.8	2.5	2.3
Silver – Dissolved	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Dissolved	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zinc – Dissolved	14.1	3.8	0.6	1	< 0.1	0.6

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 45: Metals Results from Mass Emission Site ME-SCR

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent – Fraction (µg/L except where noted)	***Event 1 9/21/07***	***Event 2 12/18/07***	***Event 3 1/23/08***	***Event 4 4/17/08***	***Event 5 5/21/08***	***Event 6 6/12/08***
Aluminum – Total	94	14680	15420	*	22	*
Arsenic – Total	1.3	18.4	7.4	1.1	1.1	1.4
Cadmium – Total	< 0.2	8.1	5.3	< 0.2	< 0.2	< 0.2
Chromium – Total	0.2	10.5	16.2	0.2 *	0.1 *	*
Chromium VI – Total	< 5	12	< 5	6 *	< 5	< 5
Copper – Total	2.8	110.6	50.5	1	1.8	1.5 *
Lead – Total	0.13	43	22.84	0.06 *	< 0.05	< 0.05 *
Mercury – Total (ng/L)	14.6	18.5	322.2	3.2	5.2	4
Nickel – Total	2	90.8	74.6	1.1	1.6	1.4
Selenium – Total	2.5	7.4	4.3	5.2	6.4	6.3
Silver – Total	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Total	< 0.1	0.2 *	0.2 *	< 0.1	< 0.1	< 0.1
Zinc – Total	2	175.2	150.3	1.7	1	1 *
Aluminum – Dissolved	< 5	< 5	< 5	< 5	< 5	< 5
Arsenic – Dissolved	1.4	1.1	0.9	0.9	1	1
Cadmium – Dissolved	< 0.2	0.2 *	< 0.2	< 0.2	< 0.2	< 0.2
Chromium – Dissolved	0.1	< 0.1	0.1 *	0.1 *	0.1 *	0.1 *
Copper – Dissolved	2.1	2.2	2.3	1	1.2	1.1
Lead – Dissolved	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05 *
Mercury – Dissolved (ng/L)	4.8 *	1	2.5	1.7	5.8	2.8
Nickel – Dissolved	1.8	4.2	2.2	1	1.4	1.4
Selenium – Dissolved	2.3	6.5	4.4	5.1	6.1	5.8
Silver – Dissolved	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Thallium – Dissolved	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Zinc – Dissolved	6.2	0.6	0.3 *	1.3	0.8	0.6 *

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 46: Detected Trace Organic Results from Mass Emission Site ME-CC

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent (µg/L)	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*
EPA 625m Organics						
1-Methylnaphthalene	0.0033	0.0062 *	0.0091	0.0022 *	ND	0.004 *
1-Methylphenanthrene	< 0.001 *	0.0234 *	ND	ND	ND	ND
2,3,5-Trimethylnaphthalene	0.0045	ND	0.0228 *	ND	ND	ND
2,6-Dimethylnaphthalene	0.0045 *	0.0089 *	0.0074	ND	0.0013 *	ND
2-Methylnaphthalene	0.0108	0.0061 *	0.0104 *	0.0072	0.0018 *	0.0113
Acenaphthene	0.0119 *	0.0024 *	0.0035 *	0.0063	ND	ND
Acenaphthylene	ND	0.002 *	0.002 *	ND	ND	ND
Anthracene	0.004	0.0074 *	0.0058 *	ND	ND	ND
Benzo(a)anthracene	0.0104	0.0344 *	0.0193	ND	ND	ND
Benzo(a)pyrene	0.0136	0.0499 *	0.0193 *	ND	ND	ND
Benzo(b)fluoranthene	0.0184	0.1078 *	0.0349 *	ND	ND	ND
Benzo(e)pyrene	0.0225	0.0919 *	0.0372 *	ND	ND	ND
Benzo(g,h,i)perylene	0.0177	0.0705 *	0.065 *	ND	ND	ND
Benzo(k)fluoranthene	0.008	0.0736 *	0.0164 *	ND	ND	ND
Biphenyl	0.0138	0.0059	0.0052 *	0.004 *	ND	0.0011 *
Bis(2-ethylhexyl)phthalate	2.0658 *	3.1768 *	3.0717 *	ND	0.144	ND
Butyl benzyl phthalate	0.083	0.3101 *	0.2265	ND	0.045 *	0.026 *
Chrysene	0.0276	0.1163 *	0.0459	0.001 *	0.0013 *	0.122 *
Dibenz(a,h)anthracene	0.0059 *	0.0038 *	< 0.001 *	ND	ND	ND
Dibenzothiophene	ND	0.0123 *	ND	ND	ND	ND
Diethyl phthalate	0.7304	1.4976 *	2.5334	5.1177	3.286	ND
Dimethyl phthalate	0.0745 *	ND	0.0822 *	0.1305	0.077	ND
Di-n-butylphthalate	0.1281	0.121 *	0.1073	ND	ND	0.112
Di-n-octylphthalate	0.0596	0.2112 *	0.1403 *	ND	ND	ND
Fluoranthene	0.0277	0.1159 *	0.062	ND	ND	ND
Fluorene	ND	0.0027 *	0.0063 *	ND	0.0012 *	ND
Indeno(1,2,3-cd)pyrene	0.0083 *	0.0676 *	0.0457 *	ND	ND	ND
Naphthalene	0.0098 *	0.0117 *	0.0122 *	0.0078	0.0074 *	0.0239
Perylene	0.0161 *	0.0324 *	0.0213	ND	ND	ND
Phenanthrene	0.0143	0.0361 *	0.0316	ND	0.0015 *	ND
Phenol	ND	ND	ND	0.363	0.147 *	0.236
Pyrene	0.0305	0.1204 *	0.0631	ND	ND	ND
Total Detectable PAHs	0.2836	1.0096	0.5444	0.0285	0.0145	0.0403
EPA 625m PCBs						
PCB 095	ND	0.0011 *	ND	ND	ND	ND
PCB 095	ND	0.0011 *	ND	ND	ND	ND
EPA 547 Pesticides						
Glyphosate	18	ND	ND	ND	ND	ND
EPA 625m Pesticides						
2,4'-DDD	ND	0.0181	0.0062 *	ND	ND	ND
2,4'-DDT	ND	ND	0.01	ND	ND	ND
4,4'-DDD	0.0611	0.0477 *	0.0236	ND	ND	ND
4,4'-DDE	0.1681	0.451 *	0.2321	ND	ND	0.0041 *
4,4'-DDT	ND	0.0349	0.0549	ND	ND	ND
BHC-gamma (Lindane)	ND	ND	ND	ND	0.0099	ND
Chlordane-alpha	ND	0.0048 *	0.0075	ND	ND	ND
Chlordane-gamma	ND	0.0049 *	0.0031 *	ND	ND	ND
Chlorpyrifos	ND	0.2399 *	0.0847	0.017	ND	0.0056
cis-Nonachlor	ND	ND	< 0.001 *	ND	ND	ND
Demeton-O	< 0.001 *	ND	ND	ND	ND	ND

Table 46 (Continued): Detected Trace Organic Results from Mass Emission Site ME-CC

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent (µg/L)	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*
EPA 625m Pesticides						
Diazinon	ND	0.0561 *	0.0437	ND	ND	ND
Disulfoton	< 0.001 *	ND	ND	ND	ND	ND
Fenchlorophos (Ronnel)	< 0.002 *	ND	ND	ND	ND	ND
Fenthion	<0.002 *	ND	ND	ND	ND	ND
Malathion	ND	0.1685 *	ND	ND	ND	ND
Total Detectable DDTs	0.2292	0.5517	0.3268	ND	ND	0.0041
trans-Nonachlor	ND	0.0061	0.0027 *	ND	ND	ND

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 47: Detected Trace Organic Results from Mass Emission Site ME-VR2

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent (µg/L)	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*
EPA 625m Organics						
1-Methylnaphthalene	0.0061 *	0.006	0.487	0.0038 *	0.003 *	0.0021 *
1-Methylphenanthrene	ND	ND	0.3636	ND	ND	ND
2,3,5-Trimethylnaphthalene	ND	ND	0.4569	ND	ND	ND
2,6-Dimethylnaphthalene	ND	0.0054	0.9331	ND	0.0079	ND
2-Methylnaphthalene	0.0103 *	0.0061	0.5649	0.0059	0.0049 *	0.0026 *
Acenaphthene	0.0035	ND	0.0551	0.0048 *	ND	ND
Benzo(a)anthracene	ND	ND	0.0482	ND	ND	ND
Benzo(a)pyrene	ND	ND	0.0366	0.0023 *	ND	ND
Benzo(b)fluoranthene	ND	ND	0.0726	ND	ND	ND
Benzo(e)pyrene	ND	ND	0.0847	0.0033 *	ND	ND
Benzo(g,h,i)perylene	ND	ND	0.0797	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	0.0313	0.0011 *	ND	ND
Biphenyl	0.0042 *	0.0038 *	0.0282	0.0011 *	ND	ND
Bis(2-ethylhexyl)phthalate	5.5647 *	0.7965	2.7506	0.6017	0.614	ND
Butyl benzyl phthalate	0.0468 *	0.1163	0.0811	ND	0.029 *	ND
Chrysene	ND	ND	0.1584	ND	ND	ND
Dibenz(a,h)anthracene	ND	ND	0.0254	0.001 *	ND	ND
Dibenzothiophene	ND	ND	0.0809	ND	ND	ND
Diethyl phthalate	0.4329	1.4278	0.8231	1.0975	0.818	1.031
Dimethyl phthalate	0.0512 *	0.0733 *	ND	0.0712 *	0.05 *	0.064 *
Di-n-butylphthalate	0.1685 *	ND	ND	ND	ND	0.076 *
Fluoranthene	ND	ND	0.129	ND	ND	ND
Fluorene	ND	ND	0.1704	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	0.0332	ND	ND	ND
Naphthalene	0.0362 *	0.0059	0.0984	0.0102	0.0124	0.007
Perylene	ND	ND	0.2727	ND	ND	ND
Phenanthrene	0.0016 *	ND	0.382	0.0013 *	ND	ND
Phenol	0.29	ND	ND	1.169	0.681	0.569
Pyrene	ND	ND	0.1219	ND	ND	ND
Total Detectable PAHs	0.0619	0.0272	4.7142	0.0338	0.0282	0.007
EPA 625m Pesticides						
Malathion	ND	ND	ND	0.019	ND	ND

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 48: Detected Trace Organic Results from Mass Emission Site ME-SCR

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Constituent (µg/L)	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*
EPA 625m Organics						
1,2,4-Trichlorobenzene	ND	< 0.01 *	0.016 *	ND	ND	ND
1-Methylnaphthalene	0.0037	0.0426 *	0.0809	0.0015 *	0.0011 *	ND
1-Methylphenanthrene	0.002	0.0706 *	0.0546	ND	ND	ND
2,3,5-Trimethylnaphthalene	ND	0.0315 *	0.0281	ND	ND	ND
2,6-Dimethylnaphthalene	ND	0.0584 *	0.0714	ND	0.0062	ND
2-Methylnaphthalene	0.0072	0.0319 *	0.0805	0.0034 *	0.0028 *	ND
Acenaphthene	0.0055	0.0088 *	0.015	ND	ND	ND
Benzo(a)anthracene	ND	0.0272 *	0.0272	ND	ND	ND
Benzo(a)pyrene	ND	0.0176 *	0.0209 *	ND	ND	ND
Benzo(b)fluoranthene	ND	0.0199 *	0.038	ND	ND	ND
Benzo(e)pyrene	ND	0.0458 *	0.0527	ND	ND	ND
Benzo(g,h,i)perylene	ND	0.0321 *	0.0511 *	0.0027 *	ND	ND
Benzo(k)fluoranthene	ND	0.026 *	0.0154	ND	ND	ND
Biphenyl	0.0019	0.0333 *	0.0581	0.0026 *	ND	ND
Bis(2-ethylhexyl)phthalate	4.0051	1.3923 *	0.3735 *	0.1684 *	0.72 *	2.142 *
Butyl benzyl phthalate	0.0412 *	0.0912 *	0.1168	ND	0.074 *	0.072 *
Chrysene	ND	0.1199 *	0.0749	ND	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND	0.001 *	ND	ND
Dibenzothiophene	ND	0.0397 *	0.0298	ND	ND	ND
Diethyl phthalate	1.1662	0.1637 *	0.2294	2.0457	2.348 *	1.458
Dimethyl phthalate	0.0583 *	< 0.05 *	ND	0.0862	0.072 *	0.055 *
Di-n-butylphthalate	0.1204	< 0.075 *	ND	ND	ND	0.147
Di-n-octylphthalate	ND	0.021 *	ND	ND	ND	ND
Fluoranthene	0.0027	0.0474 *	0.0484	ND	ND	0.001 *
Fluorene	ND	0.0139 *	0.0141	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	0.001 *	ND	ND
Naphthalene	0.0164	0.0335 *	0.0728 *	0.0068	0.0042 *	0.0061 *
Perylene	ND	1.2885 *	0.8591	ND	ND	ND
Phenanthrene	0.0027	0.0947 *	0.1625	0.0017 *	ND	ND
Phenol	0.35	< 0.1 *	0.268	0.66	0.76	0.465
Pyrene	ND	0.0795 *	0.0735	ND	ND	0.0202 *
Total Detectable PAHs	0.0421	2.1628	1.9461	0.0231	0.0143	0.0312
EPA 625m PCBs						
PCB 153	ND	0.0064 *	ND	ND	ND	ND
PCB 209	ND	ND	0.0036 *	ND	ND	ND
Total Detectable PCBs	0	0.0064	0.0036	ND	ND	ND
EPA 625m Pesticides						
4,4'-DDE	ND	< 0.001 *	0.0167	ND	ND	ND
Diazinon	ND	ND	ND	ND	ND	0.0077
Malathion	0.0337	< 0.003 *	ND	< 0.003 *	ND	ND
Total Detectable DDTs	0	0 *	0.0167	ND	ND	ND
Toxaphene	ND	ND	ND	< 0.01 *	ND	ND

*See Appendix F for a description of the data qualifier(s) associated with this sample result.
"<" – Constituent not detected above specified detection limit.

Table 49: Bacteriological Results from Mass Emission Site ME-CC

Event Type	Wet	Wet	Wet	Dry	Dry	Dry
Constituent ~ MPN/100 mL	Event 1 9/21/07	Event 2 12/18/07	Event 3 1/23/08	Event 4 4/17/08	Event 5 5/21/08	Event 6 6/12/08
E. Coli	11,199	2,481	8,664	63	517	169
Enterococcus	4,060	10,130	11,100	< 10	365	< 10
Fecal Coliform	16,000	2,700	24,000	80	900	240
Total Coliform	579,400	155,310	816,400	12997	1986	15531

Table 50: Bacteriological Results from Mass Emission Site ME-VR2

Event Type	Wet	Wet	Wet	Dry	Dry	Dry
Constituent ~ MPN/100 mL	Event 1 9/21/07	Event 2 12/18/07	Event 3 1/23/08	Event 4 4/17/08	Event 5 5/21/08	Event 6 6/12/08
E. Coli	109	5,475	2,755	< 10	131	52
Enterococcus	99	7,380	6,240	< 10	61	20
Fecal Coliform	130	1,700	3,200	2	70	30
Total Coliform	4,611	241,920	104,620	2098	1414	2359

Table 51: Bacteriological Results from Mass Emission Site ME-SCR

Event Type	Wet	Wet	Wet	Dry	Dry	Dry
Constituent ~ MPN/100 mL	Event 1 9/21/07	Event 2 12/18/07	Event 3 1/23/08	Event 4 4/17/08	Event 5 5/21/08	Event 6 6/12/08
E. Coli	120	9,208	2,909	< 10	19	< 10
Enterococcus	406	13,700	10,130	10	21	10
Fecal Coliform	170	5,000	2,800	4 *	14	7 *
Total Coliform	21,870	241,920	547,500	2046	1414	1860

Aquatic Toxicity Results

The NPDES permit specifies that acute toxicity monitoring must occur during at least one storm per year at Land Use and Receiving Water sites until baseline information has been collected. The permit also requires that chronic toxicity tests be conducted at Mass Emission sites for two wet weather events and one dry weather event per monitoring season. In keeping with these requirements, acute toxicity tests were performed on samples collected at Land Use and Receiving Water sites in September 2007 (Event 1) and December 2997 (Event 2) – A-1 (Wood_ and W-3 (La Vista) sites were dry during the September 2007 event, but adequate flow was present at both sites to collect samples during the December 2007 event. Chronic toxicity testing was conducted on samples collected at Mass Emission sites during two wet weather events in September and December 2007 (Events 1 and 2) and one dry weather event in May 2008 (Event 5). Results for acute and chronic toxicity tests are summarized in Table 52 and Table 53, respectively.

Acute Toxicity

Acute toxicity tests were performed using *Ceriodaphnia dubia* as the test organism. Test results are summarized in Table 52. Results for acute toxicity are reported as the LC50, which is the concentration of sample that produces death in 50% of test organisms exposed. Because the concentration of pollutants is unknown in environmental samples, concentration is expressed as a dilution percentage of the original sample, with 100% equal to the undiluted sample. An LC50 result, or dilution percentage, reported as less than 100% indicates that the undiluted sample caused >50% mortality to exposed test organisms and required dilution to achieve LC50. An LC50 result of greater than 100% indicates that the sample would have to be more concentrated than it was at the time of sample collection to achieve the LC50. Results are also reported in units of TUa. When the percent survival in 100% sample falls between 0 and 49, the TUa is calculated by dividing 100 by the LC50. When the percent survival in 100% sample

falls between 50 and 100, the analyzing laboratory calculated the TUa using the following equation from the California Ocean Plan[5]:

$$TUa = \frac{\log(100-S)}{1.7}$$

where: S = percent survival in 100% sample. If S > 99, TUa shall be reported as zero.

Acute toxicity (as demonstrated by a TUa >1.0) was observed only at Receiving Water site W-3 (La Vista) for the sample collected during Event 2, as shown in Table 52. Although the permit requires that a TIE be initiated for each sample with a TUa >1.0, the footnote notifying the toxicity laboratory of this requirement was inadvertently omitted from the chain-of-custody, and the TIE for the sample collected at W-3 (La Vista) was therefore not performed. Standard operating procedures have since been modified by having multiple staff members check the pre-printed chains-of-custody. This effort will reduce the likelihood of this type of communication error in the future.

Table 52: Acute Toxicity Results from Land Use and Receiving Water Sites

Station	Event No. – Event Type	Sample Date	Acute Ceriodaphnia Survival	
			LC50 – Dilution %	TUa
A-1 (Wood)	Event2 – Wet	12/18/2007	>100.00	0.00
I-2 (Ortega)	NS	------	------	------
R-1 (Swan)	NS	------	------	------
W-3 (La Vista)	Event 2 – Wet	12/18/2007	12.50%	8.00
W-4 (Revolon)	Event 1 – Wet	09/22/2007	>100.00%	0.91

NS = Not Sampled; no flow present.

Chronic Toxicity

Chronic toxicity tests were conducted using Purple Sea Urchin (*Strongylocentrotus purpuratus*) as the test species. Chronic toxicity results are reported in several ways: the IC50 is the sample concentration, or dilution percentage, at which an inhibitory response (in this case, decreased fertilization relative to the control) is observed in 50% of the exposed test organisms. The NOEC is the concentration of sample at which there exists no observable effect on test organisms. An IC50 dilution or NOEC dilution reported as greater than 100% indicates that the sample would have to be more concentrated than it was at the time of sample collection to achieve the indicated effect. Results are also reported in units of TUc, which is calculated as 100 divided by the NOEC. Results are summarized in Table 53.

Table 53: Chronic Toxicity Results from Mass Emission Sites

Station	Event No. – Event Type	Sample Date	Chronic Purple Sea Urchin Fertilization Bioassay		
			IC50 Dilution	NOEC Dilution	TUc
ME-CC	Event 1 – Wet	09/22/2007	>100.00%	100.00%	1.00
ME-CC	Event 2 – Wet	12/19/2007	>100.00%	100.00%	1.00
ME-CC	Event 5 – Dry	05/21/2008	>100.00%	100.00%	1.00
ME-SCR	Event 1 – Wet	09/22/2007	>100.00%	100.00%	1.00
ME-SCR	Event 2 – Wet	12/19/2007	>100.00%	100.00%	1.00
ME-SCR	Event 5 – Dry	05/21/2008	>100.00%	100.00%	1.00
ME-VR2	Event 1 – Wet	09/22/2007	76.95%	<6.25%	>16.00
ME-VR2	Event 2 – Wet	12/19/2007	>100.00%	100.00%	1.00
ME-VR2	Event 5 – Dry	05/21/2008	>100.00%	100.00%	1.00

[5] California Ocean Plan. State Water Resources Control Board. 2005.

The NPDES permit specifies that a TIE must be initiated if two consecutive wet weather samples (or a single dry weather sample) exhibit toxicity; however, a numeric trigger for chronic toxicity is not specified in the permit. For the purposes of the Stormwater Monitoring Program, a numeric chronic toxicity trigger of >1.0 TUc was selected.

Chronic toxicity was detected only in the ME-VR2 sample collected during the September 2007 wet event. However, because two consecutive wet weather samples did not exhibit toxicity, results from the September 2007 wet event did not trigger TIE initiation. ABC's toxicity testing reports for the 2007/08 monitoring season are provided in Appendix N.

As mentioned above, very high chronic toxicity was detected in the ME-VR2 sample collected during the September 2007 wet event (Event 1). Because this type of toxicity is unusual for this site, the Monitoring Program initiated follow-up sampling to investigate this occurrence. The investigation effort included collection of grab samples for organic, metal and pesticide analyses during the following event with the intention of having them analyzed only if the concomitant toxicity grab sample produced an observable effect on the test organism. When the laboratory reported 100% fertilization in the chronic sea urchin fertilization bioassay, the extra samples were discarded.

9. Data Analysis and Discussion

This section summarizes the estimated mass loadings from the ME-CC and ME-VR2 Mass Emission stations and provides a comparison of the Stormwater Monitoring Program's 2007/08 data to water quality objectives. The purpose of stormwater monitoring is to characterize water quality conditions that can be used to assess water quality improvements and to help direct the efforts of the Stormwater Management Program. Mass loadings were calculated to track conditions in the watershed. Analysis of the data is needed in order to provide a comparison with water quality objectives and assist in the identification of any pollutants or sources that may be problematic in the watershed. The applicability of relevant water quality objectives is discussed in detail later in this section.

Mass Loadings

Mass loadings were estimated for constituents detected at the ME-CC and ME-VR2 Mass Emission sites during the 2007/08 monitoring season. Mass loadings could not be calculated at the ME-SCR station because total wet weather flow could not be accurately measured, as discussed in Section 4. To recap, the Santa Clara River flows through two possible routes during wet weather conditions. One route is through the river diversion gate structure where the majority of wet weather flow passes. The other route is over the diversion dam, a situation which occurs only during high flows generated by large storm events. At the moment, wet weather flow can only be measured at the diversion dam because there is no flow meter installed at the river diversion gate. There are technical challenges involved with measuring flow at the river diversion gate since floating debris and sediment can interfere with flow measurement. VCWPD is currently investigating flow meters capable of measuring flow in the diversion gate structure under these conditions.

Mass loads were calculated by using the average flow (measured in cubic feet per second, cfs) estimated over the duration of a monitoring event and the concentrations of detected constituents. Event duration is defined as the number of hours elapsed between the first aliquot distributed into the first sample bottle collected through the last aliquot distributed into the last sample bottle collected by a composite sampler. Storm events monitored during 2007/08 at the ME-CC and ME-VR2 stations lasted from just over 23 hours (Event 2 at ME-CC) to just over 2 days (Event 1 at ME-CC). Based on the average flow rate for an event, loadings were calculated in lbs/event to allow for comparisons between sites as well as between events (see example below). These mass loading estimates are presented in Table 54 and Table 55.

Example Mass Loading Calculation

A mass loading calculation is shown below for an Event 1 Total Copper concentration measured at ME-CC (Event Duration = 49 hours 0 minutes = 49.00 hours).

Total Copper Concentration
21 µg/L or 0.021 mg/L (Table 43)

Average Flow Rate for Monitoring Event
54.49 cfs (Table 6)

54.49 cfs x 7.48 gal/cf x 3.785 liters/gal = 1542.71 liters/sec

Load = Concentration x Volume
1542.71 liters/sec x 0.021 mg/L = 32.40 mg/sec

32.40 mg/sec x 60 sec/min x 60 min/hr x 49.00 hr/event x 1 kg/10^6 mg = 5.71 kg/event

5.71 kg/event x 2.2 lb/kg = **12.58 lbs/event**

Table 54: ME-CC Estimated Mass Loadings

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Event #	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/21/08***
Event Duration (hours)	***49.00***	***23.32***	***37.12***	***23.83***	***26.42***	***24.96***
All results reported in lbs./event						
Anion						
Bromide	ND	560	1230	370	44.0	31.7
Chloride	95100	168000	221000	34160	7960	14200
Conventional						
BOD	7180	22400	49200	389	ND	ND
Total Dissolved Solids	565000	621000	1360000	182000	73300	69900
Total Organic Carbon	4130	36700	127000	1030	476	412
Total Suspended Solids	256000	2490000	7200000	1690	643	214
Hydrocarbon						
Oil and Grease	958	3920	ND	ND	ND	ND
TRPH	ND	4760	ND	ND	114	ND
Metal						
Aluminum - Total	1330	8670	40900	12.7	1.8	2.6
Arsenic - Total	3.5	16.5	27.1	0.64	0.35	0.36
Cadmium - Total	0.66	4.8	16.6	0.04	0.02	0.02
Chromium - Total	3	16	89.8	0.10	0.04	0.02
Chromium VI - Total	ND	ND	228	1.2	0	0
Copper - Total	12.6	106	305	0.37	0.15	0.14
Lead - Total	4	38.5	89.7	0.02	0	0.006
Mercury - Total	0.02	0.11	1.08	0.0007	0.0005	0.0004
Nickel - Total	11.9	59.6	238	0.86	0.47	0.43
Selenium - Total	1.7	4.2	8.6	0.54	0.19	0.17
Zinc - Total	41.4	309	795	3.2	1.1	1.3
Nutrient						
Ammonia as N	269	1680	1540	58.4	7.0	4.8
Nitrate as N	ND	4480	16400	1390	550	595
Nitrite as N	ND	ND	185	ND	4.4	3.2
Orthophosphate as P (Diss)	4.5	2730	1310	350	146	193
TKN	216	644	4800	74.0	11.4	24.6
Total Phosphorus - Total	1260	9750	19300	401	170	174
Organic						
1-Methylnaphthalene	0.002	0.02	0.06	0.0004	ND	0.0003
1-Methylphenanthrene	ND	0.07	ND	ND	ND	ND
2,3,5-Trimethylnaphthalene	0.003	ND	0.14	ND	ND	ND
2,6-Dimethylnaphthalene	0.003	0.02	0.05	ND	0.0001	ND
2-Methylnaphthalene	0.006	0.02	0.06	0.001	0.0002	0.0009
Acenaphthene	0.007	0.007	0.02	ND	ND	ND
Acenaphthylene	ND	0.006	0.01	0.001	ND	ND
Anthracene	0.002	0.02	0.04	ND	ND	ND
Benzo(a)anthracene	0.006	0.1	0.12	ND	ND	ND
Benzo(a)pyrene	0.008	0.14	0.12	ND	ND	ND
Benzo(b)fluoranthene	0.01	0.3	0.21	ND	ND	ND
Benzo(e)pyrene	0.01	0.26	0.23	ND	ND	ND
Benzo(g,h,i)perylene	0.01	0.2	0.4	ND	ND	ND
Benzo(k)fluoranthene	0.005	0.21	0.1	ND	ND	ND
Biphenyl	0.008	0.02	0.03	0.0008	ND	0.0001
Bis(2-ethylhexyl)phthalate	1.2	8.9	18.9	ND	0.01	ND
Butyl benzyl phthalate	0.05	0.87	1.4	ND	0.004	0.002

Table 54 (Continued): ME-CC Estimate Mass Loadings

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Event #	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/21/08***
Event Duration (hours)	***49.00***	***23.32***	***37.12***	***23.83***	***26.42***	***24.96***
	All results reported in lbs./event					
Organic						
Chrysene	0.02	0.33	0.28	0.0002	0.0001	0.01
Dibenz(a,h)anthracene	0.004	0.01	ND	ND	ND	ND
Dibenzothiophene	ND	0.03	ND	ND	ND	ND
Diethyl phthalate	0.44	4.2	15.6	1.0	0.29	ND
Dimethyl phthalate	0.04	ND	0.51	0.03	0.007	ND
Di-n-butylphthalate	0.08	0.34	0.66	ND	ND	0.009
Di-n-octylphthalate	0.04	0.59	0.86	ND	ND	ND
Fluoranthene	0.02	0.32	0.38	ND	ND	ND
Fluorene	ND	0.008	0.04	ND	0.0001	ND
Indeno(1,2,3-cd)pyrene	0.005	0.19	0.28	ND	ND	ND
Naphthalene	0.006	0.03	0.08	0.002	0.0007	0.002
Perylene	0.01	0.09	0.13	ND	ND	ND
Phenanthrene	0.009	0.1	0.19	ND	0.0001	ND
Phenol	ND	ND	ND	0.07	0.01	0.02
Pyrene	0.02	0.34	0.39	ND	ND	ND
PCB						
PCB 095	ND	0.003	ND	ND	ND	ND
Pesticide						
2,4'-DDD	ND	0.05	0.04	ND	ND	ND
2,4'-DDT	ND	ND	0.06	ND	ND	ND
4,4'-DDD	0.04	0.13	0.15	ND	ND	ND
4,4'-DDE	0.1	1.3	1.4	ND	ND	0.0003
4,4'-DDT	ND	0.1	0.34	ND	ND	ND
BHC-gamma (Lindane)	ND	ND	ND	ND	0.0009	ND
Chlordane-alpha	ND	0.01	0.05	ND	ND	ND
Chlordane-gamma	ND	0.01	0.02	ND	ND	ND
Chlorpyrifos	ND	0.67	0.52	0.003	ND	0.0004
Diazinon	ND	0.16	0.27	ND	ND	ND
Glyphosate	10.8	ND	ND	ND	ND	ND
Malathion	ND	0.47	ND	ND	ND	ND
trans-Nonachlor	ND	0.02	0.02	ND	ND	ND

ND – Constituent not detected, and therefore no estimated mass loading was calculated.

Table 55: ME-VR2 Estimated Mass Loadings

Event Type	***Wet***	***Wet***	***Wet***	***Dry***	***Dry***	***Dry***
Event #	***Event 1***	***Event 2***	***Event 3***	***Event 4***	***Event 5***	***Event 6***
Date	***9/21/07***	***12/18/07***	***1/23/08***	***4/17/08***	***5/21/08***	***6/12/08***
Event Duration (hours)	***23.73***	***34.82***	***43.05***	***23.58***	***23.82***	***23.58***
			All results reported in lbs./event			
Anion						
Bromide	ND	12.5	1660	58.5	17.5	8.1
Chloride	1140	9390	74800	5070	3250	1430
Conventional						
BOD	83.6	93.4	23600	468	3940	ND
Total Dissolved Solids	9530	41300	2740000	94500	49200	24200
Total Organic Carbon	53.5	171	94200	278	526	68.5
Total Suspended Solids	33.5	1490	41500000	ND	87.6	28.2
Hydrocarbon						
TRPH	ND	40.5	ND	ND	ND	ND
Metal						
Aluminum – Total	0.15	6.5	74100	ND	ND	ND
Arsenic – Total	0.01	0.07	77.6	0.06	0.04	0.03
Cadmium – Total	ND	0.009	33.8	ND	ND	ND
Chromium – Total	0.002	0.02	114	0.01	0.009	0.004
Chromium VI – Total	ND	ND	ND	0.88	ND	ND
Copper – Total	0.02	0.11	451	0.18	ND	ND
Lead – Total	0.0008	0.02	177	0.007	ND	ND
Mercury – Total	0.0001	0.0002	0.4	0.0004	0.0003	0.0001
Nickel – Total	0.1	0.88	781	0.23	0.08	0.02
Selenium – Total	0.01	0.03	30.9	0.41	0.18	0.1
Thallium - Total	ND	ND	0.66	ND	ND	ND
Zinc – Total	0.08	0.51	722	0.16	ND	0.01
Nutrient						
Ammonia as N	0.5	1.9	896	4.4	3.5	1.2
Nitrate as N	ND	5	14600	323	53.4	11.3
Nitrite as N	ND	ND	265	ND	2.6	0.81
Orthophosphate as P (Diss)	ND	ND	1040	ND	5.1	1.3
TKN	1.8	#	2120	45.4	9.64	7.65
Total Phosphorus – Total	0.82	7.2	23500	ND	ND	ND
Organic						
1-Methylnaphthalene	0.006	ND	ND	ND	ND	ND
1-Methylphenanthrene	0.02	ND	ND	ND	ND	ND
2,3,5-Trimethylnaphthalene	0.02	ND	ND	ND	ND	ND
2,6-Dimethylnaphthalene	0.02	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.02	ND	0.001	ND	ND	ND
Acenaphthene	0.02	ND	0.001	ND	ND	ND
Benzo(a)anthracene	0.02	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.007	0.002	ND	ND	ND	ND
Benzo(b)fluoranthene	8.7	3.2	0.04	0.2	0.2	0.3
Benzo(e)pyrene	0.12	0.03	0.02	0.002	ND	0.001
Benzo(g,h,i)perylene	0.04	ND	0.001	ND	ND	0.0001
Benzo(k)fluoranthene	0.01	ND	ND	ND	ND	ND
Biphenyl	0.02	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	0.02	ND	ND	ND	ND	ND
Butyl benzyl phthalate	0.02	ND	0.001	ND	ND	ND
Chrysene	ND	ND	0.53	ND	ND	ND

Table 55 (Continued): ME-VR2 Estimate Mass Loadings

Event Type	*Wet*	*Wet*	*Wet*	*Dry*	*Dry*	*Dry*
Event # *Date* *Event Duration (hours)*	*Event 1* *9/21/07* *23.73*	*Event 2* *12/18/07* *34.82*	*Event 3* *1/23/08* *43.05*	*Event 4* *4/17/08* *23.58*	*Event 5* *5/21/08* *23.82*	*Event 6* *6/12/08* *23.58*
All results reported in lbs./event						
Organic						
Dibenz(a,h)anthracene	ND	ND	0.08	0.0001	ND	ND
Dibenzothiophene	ND	ND	0.27	ND	ND	ND
Diethyl phthalate	0.004	0.04	2.7	0.16	0.07	0.04
Dimethyl phthalate	0.0004	0.002	ND	0.01	0.004	0.003
Di-n-butylphthalate	0.001	ND	ND	ND	ND	0.003
Fluoranthene	ND	ND	0.43	ND	ND	ND
Fluorene	ND	ND	0.57	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	0.11	ND	ND	ND
Naphthalene	0.0003	0.0002	0.33	0.001	0.001	0.0003
Perylene	ND	ND	0.9	ND	ND	ND
Phenanthrene	0.00001	ND	1.3	0.0002	ND	ND
Phenol	0.002	ND	ND	0.17	0.06	0.02
Pyrene	ND	ND	0.4	ND	ND	ND
Pesticide						
Malathion	ND	ND	ND	0.003	ND	ND

ND – Constituent not detected, and therefore no estimated mass loading was calculated.

– Insufficient sample volume resulted in no analysis for this constituent because of its position on the priorities list.

Water Quality Objective Comparisons

Pursuant to Part 2.C of the Countywide NPDES Permit the co-permittees are required to determine whether discharges from their municipal separate storm sewer system are causing or contributing to an exceedance of water quality standards. This determination is impacted by a number of factors including: duration of the storm event, averaging periods, mixing zones, representative samples, impacted beneficial uses, etc. Currently, neither USEPA nor the State has established procedures for making this type of determination. In spite of these limitations the co-permittees have conducted a preliminary assessment of receiving water and discharge monitoring data to identify potential water quality issues. Correspondence between the Stormwater Management Program and the Regional Board on the topic of water quality objective comparisons, as well as several other issues, is presented in Appendix P.

There are several steps involved in analyzing data to assess water quality improvements. The first step involves comparing analytical results from Mass Emission and Receiving Water stations to the applicable surface water quality objectives established in the Los Angeles Region 4 Basin Plan (Basin Plan) and the California Toxics Rule (CTR). Each plan includes a discussion of the applicability of their objectives based on the type of water (freshwater or saltwater) and the beneficial uses that are being protected. For the purposes of this analysis, all of the water quality objectives were evaluated.

Since the Stormwater Monitoring Program's monitoring sites are representative of larger drainage areas, the comparison of water quality data from Mass Emission and Receiving Water stations to water quality objectives will identify pollutants that may pose a problem to the overall watershed. More specifically, water quality data from the three Mass Emission sites are representative of water quality conditions in the three major watersheds (Calleguas Creek, Santa Clara River, and Ventura River) in Ventura County. The second step in analyzing data to assess water quality in Ventura County includes comparing Land Use data to these same objectives. The third step involves comparing Land Use water quality objective exceedances to Receiving Water and Mass Emission exceedances. Land Use sites are representative of drainage areas that are specific to either one of three land use types: residential,

agricultural or industrial. These sites also allow the Stormwater Monitoring Program to identify the possible sources of problematic constituents based on the land use (i.e. agriculture, residential, industrial sources).

Based on the analysis, a list of potentially problematic constituents, or pollutants of concern (POCs), can be identified. The beneficial uses potentially impacted by the receiving water exceedances of these POCs can be identified and the impacts of stormwater discharges can be assessed. In summary, the water quality objective comparison is composed of the following four steps:

- Compare Mass Emission and Receiving Water data with water quality objectives
- Compare Land Use discharge data with water quality objectives
- Compare Land Use water quality objective exceedances to Receiving Water and Mass Emission exceedances
- Identify potentially problematic constituents

Mass Emission and Receiving Water Analysis

The 2007/08 monitoring data from the Mass Emission and Receiving Water stations were analyzed and compared to the water quality objectives to determine the frequency of exceedances of objectives and identify potential pollutants of concern.

The most appropriate standards for comparison to stormwater (i.e., wet weather) discharges are short-term acute freshwater objectives. Stormwater events usually occur over the span of a few hours to a day. As a result, exposure to the concentrations above the objectives only occurs for a short period of time. For this reason, longer term objectives (i.e., chronic exposure objectives) may not be as applicable for wet events. Acute criteria better reflect the short-term event exposure experienced by organisms during precipitation runoff events. Additionally, freshwater objectives are the most appropriate because the monitoring stations discharge to inland, freshwater receiving waters.

For the analysis of wet weather (storm) data (Events 1 – 3), the Basin Plan objectives and the acute, freshwater objectives in the California Toxics Rule (CTR) were used. For some constituents, the California Toxics Rule does not contain acute objectives. In these cases, the California Toxics Rule Human Health (Organisms Only) objectives were used in the wet weather comparisons. The CTR Human Health (Organisms Only) objectives were used here because these constituents have no other objectives for comparison. These objectives were used even though they are based on long-term risks to human health that cannot be directly correlated to stormwater discharges. CTR chronic criteria were not used for wet weather analyses because acute criteria better reflect the short-term storm event exposure experienced by organisms, as compared to the long-term exposure considered by chronic criteria.

For the analysis of dry weather data (Events 4-6), the Basin Plan objectives and the chronic, freshwater objectives in the CTR were used. For some constituents, the CTR does not contain chronic objectives. In these cases, the CTR Human Health (Organisms Only) objectives were used in the dry weather comparisons. The CTR Human Health (Organisms Only) objectives were used here because these constituents have no other objectives for comparison.

Objectives in the CTR for metals are calculated based on the hardness of the water in which metals concentrations are being evaluated. This analysis used the hardness value measured at a particular site during a particular monitoring event for calculating a certain metals objective, except when the measured hardness was greater than 400 mg/L. The CTR sets a hardness cap of 400 mg/L for calculating the objectives, so any measured hardness value above 400 mg/L was set equal to 400 mg/L for the purposes of the calculation.

through Table 58 present water quality objective exceedances at Mass Emission stations based on an analysis of the 2007/08 wet weather and dry weather stormwater monitoring data. Table 59 through Table 61 show water quality objective exceedances at the Mass Emission stations during dry weather monitoring events. Table 62 and

Table 63 present water quality objective exceedances detected at Receiving Water sites W-3 and W-4, respectively, based on an analysis of the Event 1 and Event 2 wet weather monitoring data collected at these locations.

Table 56: Water Quality Objective Exceedances at Mass Emission Site ME-CC Observed During Wet Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Bacterio-logical	E. Coli (MPN/100 mL)	11199	2481	8664	235		
Bacterio-logical	Enterococcus (MPN/100 mL)	4060	10130	11100		104	
Bacterio-logical	Fecal Coliform (MPN/100 mL)	16000	2700	24000	400	400	
Bacterio-logical	Total Coliform (MPN/100 mL)	579400	155310	816400		10000	
Conven-tional	Total Dissolved Solids (mg/L)	943			850		
Metal	Aluminum - Total	2219	3097	6644	1000		
Metal	Chromium - Total			14.6		8	
Metal	Copper - Total	21	37.8	49.6		12	
Metal	Lead - Total		13.74	14.58		8	
Metal	Mercury - Total			0.1762		0.16	0.051^
Metal	Nickel - Total		21.3	38.7		20	
Metal	Zinc - Total		110.5	129.2		80	
Organic	Benzo(a)pyrene		0.0499				0.049^
Organic	Benzo(b)fluoranthene		0.1078				0.049^
Organic	Benzo(k)fluoranthene		0.0736				0.049^
Organic	Chrysene		0.1163				0.049^
Organic	Indeno(1,2,3-cd)pyrene		0.0676				0.049^
Organic	PAHs	0.1587	0.6925	0.3568		0.0088	
PCB	PCBs		0.0011				0.00017^
Pesticide	4,4'-DDD	0.0611	0.0477	0.0236			0.00084^
Pesticide	4,4'-DDE	0.1681	0.451	0.2321			0.00059^
Pesticide	Chlordane		0.0158	0.0133		0.000023	
Pesticide	DDT	0.2292	0.5517	0.3268		0.00017	

Blank cells denote no exceedance of a water quality objective.

"^" – CTR Human Health objective for consumption of organisms only.

Table 57: Water Quality Objective Exceedances at Mass Emission Site ME-VR2 Observed During Wet Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Anion	Chloride (mg/L)	135.9	301.56		60		
Bacterio-logical	E. Coli (MPN/100 mL)	5475		2755	235		
Bacterio-logical	Enterococcus (MPN/100 mL)	7380		6240		104	
Bacterio-logical	Fecal Coliform (MPN/100 mL)	1700		3200	400	400	
Bacterio-logical	Total Coliform (MPN/100 mL)	241920		104620		10000	
Conven-tional	Total Dissolved Solids (mg/L)	1139	1326		1000		
Metal	Aluminum - Total			22340	1000		
Metal	Cadmium - Total			10.2	5	4	
Metal	Chromium - Total			34.4		8	
Metal	Copper - Total			135.9		12	
Metal	Lead - Total			53.43		8	
Metal	Mercury - Total			0.121			0.051^
Metal	Nickel - Total		28.3	235.4	100	20	
Metal	Zinc - Total			217.5		80	
Organic	Benzo(b)fluoranthene			0.0726			0.049^
Organic	Bis(2-ethylhexyl)phthalate	5.5647			4	3.5	
Organic	Chrysene			0.1584			0.049^
Organic	PAHs			1.1597		0.0088	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 58: Water Quality Objective Exceedances at Mass Emission Site ME-SCR Observed During Wet Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 1 9/21/07*	*Event 2 12/18/07*	*Event 3 1/23/08*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Bacterio-logical	E. Coli (MPN/100 mL)		9208	2909	235		
Bacterio-logical	Enterococcus (MPN/100 mL)	406	13700	10130		104	
Bacterio-logical	Fecal Coliform (MPN/100 mL)		5000	2800	400	400	
Bacterio-logical	Total Coliform (MPN/100 mL)	21870	241920	547500		10000	
Conven-tional	Total Dissolved Solids (mg/L)						
Metal	Aluminum - Total		14680	15420	1000		
Metal	Cadmium - Total		8.1	5.3	5	4	
Metal	Chromium - Total		10.5	16.2		8	
Metal	Copper - Total		110.6	50.5		12	
Metal	Lead - Total		43	22.84		8	
Metal	Mercury - Total			0.3222		0.16	0.051^
Metal	Nickel - Total		90.8	74.6		20	
Metal	Zinc - Total		175.2	150.3		80	
Nutrient	Ammonia as N		13500		10100	2400	
Organic	Bis(2-ethylhexyl)phthalate	4.0051			4	3.5	
Organic	Chrysene		0.1199	0.0749			0.049^
Organic	PAHs		0.4308	0.4947		0.0088	
PCB	PCBs		0.0064	0.0036			0.00017^
Pesticide	4,4'-DDE			0.0167			0.00059^
Pesticide	DDT			0.0167		0.00017	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 59: Water Quality Objective Exceedances at Mass Emission Site ME-CC Observed During Dry Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*	*Basin Plan Obj.*	*Ocean Plan 6-Month Median*	*CTR FW Obj.*
Anion	Chloride (mg/l)	175.52		179.26	150		
Bacterio-logical	E. coli (MPN/100 mL)		517		235		
Bacterio-logical	Enterococcus (MPN/100 mL)		365.4			104	
Bacterio-logical	Fecal Coliform (MPN/100 mL)		900		400	400	
Bacterio-logical	Total Coliform (MPN/100 mL)	12997		15531		10000	
Conven-tional	Total Dissolved Solids	934		882	850		
Metal	Nickel - Total		5.3	5.4		5	
Pesticide	4,4'-DDE			0.0041			0.00059^
Pesticide	DDT			0.0041		0.00017	
Pesticide	HCH		0.0099			0.004	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 60: Water Quality Objective Exceedances at Mass Emission Site ME-VR2 Observed During Dry Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*	*Basin Plan Obj.*	*Ocean Plan 6-Month Median*	*CTR FW Obj.*
None	*None*						

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 61: Water Quality Objective Exceedances at Mass Emission Site ME-SCR Observed During Dry Weather Monitoring Events

Classification	*Constituent (in µg/L except where noted)*	*Event 4 4/17/08*	*Event 5 5/21/08*	*Event 6 6/12/08*	*Basin Plan Obj.*	*Ocean Plan 6-Month Median*	*CTR FW Obj.*
Metal	Selenium - Total	5.2	6.4	6.3			5
Organic	PAHs			0.0202		0.0088	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 62: Water Quality Objective Exceedances at Receiving Water Site W-3 Observed During Wet Weather Monitoring Event

Classification	*Constituent (in µg/L except where noted)*	*Event 2 12/18/07*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Bacteriological	E. Coli (MPN/100 mL)	12997	235		
Bacteriological	Enterococcus (MPN/100 mL)	20050		104	
Bacteriological	Total Coliform (MPN/100 mL)	16000	400	400	
Conventional	Total Dissolved Solids (mg/L)	1413600		10000	
Metal	Aluminum - Total	6032	1000		
Metal	Copper - Dissolved	10.8			9.6^
Metal	Copper - Total	124.3		12	
Metal	Lead - Total	33.39		8	
Metal	Mercury - Total	0.0746			0.051^
Metal	Nickel - Total	31		20	
Metal	Zinc - Total	164.2		80	
Nutrient	Ammonia as N	3000		2400	
Organic	PAHs	0.2036		0.0088	
Pesticide	4,4'-DDD	0.3239			0.00084^
Pesticide	4,4'-DDE	2.4776			0.00059^
Pesticide	Chlordane	0.0535		0.000023	
Pesticide	DDT	3.1524		0.00017	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Table 63: Water Quality Objective Exceedances at Receiving Water Site W-4 Observed During Wet Weather Monitoring Event

Classification	*Constituent (in µg/L except where noted)*	*Event 1 9/21/07*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Bacteriological	E. Coli (MPN/100 mL)	7270	235		
Bacteriological	Enterococcus (MPN/100 mL)	3440		104	
Bacteriological	Fecal Coliform (MPN/100 mL)	24000	400	400	
Bacteriological	Total Coliform (MPN/100 mL)	8664000		10000	
Conventional	Total Dissolved Solids (mg/L)	2719	500		
Metal	Aluminum - Total	11200	1000		
Metal	Cadmium - Total	6.4	5	4	
Metal	Chromium - Total	10.4		8	
Metal	Copper - Total	148.1		12	
Metal	Lead - Total	98.42		8	
Metal	Mercury - Total	0.0614			0.051^
Metal	Nickel - Total	56.6		20	
Metal	Zinc - Total	373		80	
Organic	Chrysene	0.0776			0.049^
Organic	PAHs	0.3826		0.0088	
Pesticide	4,4'-DDD	0.5578			0.00084^
Pesticide	4,4'-DDE	2.147			0.00059^
Pesticide	Chlordane	0.1056		0.000023	
Pesticide	DDT	3.0461		0.00017	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Land Use Discharge Analysis

In order to assess whether or not discharges from the stormwater system are contributing to the exceedances of objectives identified in the receiving waters, Land Use discharge data were analyzed in the same manner as the Mass Emission and Receiving Water data.

The 2007/08 monitoring data from the Agricultural Land Use station A-1 were compared to the Basin Plan and California Toxics Rule objectives previously described. Although the Stormwater Monitoring Program's Land Use stations are not always located in each of the watersheds for which Receiving Water samples are collected, the sites were chosen to provide representative data to be used to describe the water quality of discharges from urban and agricultural areas in Ventura County. As a result, for this analysis, the Land Use objective exceedances are compared to the receiving water objectives exceedances in all watersheds even if they are not specifically located in that watershed. This comparison allows the Stormwater Monitoring Program to determine whether certain land use types may be contributing to the objectives exceedances in receiving waters.

Table 64 presents water quality objective exceedances at agricultural Land Use site A-1 based on an analysis of the wet weather stormwater monitoring data collected there during Event 1.

Table 64: Water Quality Objective Exceedances at Agricultural Land Use Site A-1 Observed During Wet Weather Monitoring Event

Classification	*Constituent (in µg/L except where noted)*	*Event 2 12/18/07*	*Basin Plan Obj.*	*Ocean Plan Daily Max*	*CTR FW Obj.*
Bacteriological	E. Coli (MPN/100 mL)	7270	235		
Bacteriological	Enterococcus (MPN/100 mL)	7380		104	
Bacteriological	Fecal Coliform (MPN/100 mL)	5000	400	400	
Bacteriological	Total Coliform (MPN/100 mL)	248100		10000	
Conventional	Total Dissolved Solids (mg/L)	2420	500		
Metal	Aluminum - Total	1420	1000		
Metal	Copper - Total	18.4		12	
Metal	Nickel - Total	21.4		20	
Nutrient	Nitrate as N	21.18	10		
Organic	PAHs	0.1185		0.0088	
Pesticide	4,4'-DDD	0.1288			0.00084^
Pesticide	4,4'-DDE	0.6345			0.00059^
Pesticide	Chlordane	0.0035		0.000023	
Pesticide	DDT	0.9062		0.00017	

Blank cells denote no exceedance of a water quality objective.
"^" – CTR Human Health objective for consumption of organisms only.

Potential Problematic Constituents

A review of Table 56 through Table 64 provides the following observations with respect to potential problematic constituents measured in wet and dry weather runoff.

Bacteriological

All Receiving Water and Mass Emission sites recorded concentrations greater than water quality objectives for *E. coli*, Enterococcus, Fecal Coliform, and Total Coliform during wet weather events. Likewise, runoff from the A-1 agricultural Land Use site exceeded bacteriological objectives for these same four bacteria. Dry weather monitoring revealed exceedances of water quality objectives for these bacteria during one or more non-storm events monitored at Mass Emission station ME-CC. It should be noted that the inclusion of new Enterococcus (104 MPN/100 mL) and Fecal Coliform (400 MPN/100 mL) objectives in the revised 2005 California Ocean Plan resulted in the recording of these two parameters as existing at concentrations above their respective Ocean Plan objective at most monitoring locations. Consistent with previous pollutant of concern identification efforts by the Ventura Countywide Stormwater Quality Program (presented most recently in the 2002/03 Annual Monitoring Report) bacteria pose a potential problem for water quality protection and warrant special consideration by the Program.

Conventionals

Mass Emission stations ME-CC and ME-VR2, Receiving Water sites W-3 and W-4, and the agricultural Land Use site A-1 showed total dissolved solids concentrations above Basin Plan objectives during one or more wet weather events. Similarly, total dissolved solids concentrations above Basin Plan objective were observed at Mass Emission station ME-CC during two dry events. It is important to note the Mass Emission station ME-SCR did not exceed these objectives during any wet or dry weather event. Total dissolved solids was included in the Stormwater Monitoring Program's 2002/03 Pollutant of Concern (POC) Prioritization List, but was not ultimately included in the top-ranked POC list contained in the 2002/03 Annual Monitoring Report. The Stormwater Monitoring Program will continue to evaluate total dissolved solids at its monitoring sites as a means of augmenting its database and tracking site-specific and seasonal trends in observed Basin Plan exceedances for this water quality parameter.

Metals

All Mass Emission, Receiving Water and Land Use sites showed concentrations of total aluminum in excess of Basin Plan water quality objectives during one or more wet weather events. This is the fifth year that aluminum has been monitored by the Stormwater Monitoring Program, and the fifth time that a comparison to Basin Plan

objectives has revealed exceedances for total aluminum. It should be noted that aluminum is found as a ubiquitous natural element in sediments throughout Ventura County geology. Mass Emission station ME-CC also recorded concentrations of chromium, copper, lead, mercury, nickel and zinc above water quality objectives, while ME-SCR had cadmium, chromium, copper lead, mercury, nickel, selenium (dry weather only) and zinc (all total fractions) levels above these objectives. Unlike previous years when Mass Emission site ME-VR2 recorded no metals concentration above water quality objectives, this year the site exceeded water quality objectives for cadmium, chromium, copper, lead, mercury, nickel and zinc (all total fractions) during wet weather Event 3, as well as a nickel exceedance during wet weather Event 2. Both Receiving Water sites exhibited exceedances for copper, lead, mercury, nickel and zinc (all total fractions) above water quality standards, in addition to exceedances for dissolved copper at La Vista (W-3) and total chromium and cadmium at Wood Rd. (W-4). Total copper and nickel concentrations measured at the agricultural Land Use site A-1 exceeded their respective Ocean Plan Daily Maximum objectives.

The Basin Plan total aluminum exceedances notwithstanding, it should be noted that most metals exceedances observed during 2007/08 wet weather events were for metals concentrations above Ocean Plan objectives, with the exception of CTR mercury exceedances. Consistent with the most recent POC analysis (see 2002/03 Annual Monitoring Report), the runoff contributions of copper, lead, and zinc will need to be analyzed by the Stormwater Management Program in more detail via trend analyses, source identification, and potential source control measures (see Pollutant of Concern Assessment below).

Nutrients

Water quality objective exceedances were recorded for ammonia at the Mass Emission site ME-SCR and the Receiving Water site La Vista (W-3) during wet weather monitoring. Also, a water quality objective exceedance was recorded for nitrate at the agricultural Land Use site Wood Road (A-1) during Event 2. No water quality objective exceedances for nutrients were observed during dry weather monitoring at the three Mass Emission stations during the 2007/08 monitoring season. Given that these Basin Plan exceedances appear to be an issue most pertinent to fertilizer use by agriculture, the Stormwater Monitoring Program will continue to monitor for nutrients at these sites to augment the database. Consistent with the most recent POC analysis (see 2002/03 Annual Monitoring Report), the runoff contributions of nitrogen compounds will need to be analyzed by the Stormwater Management Program in more detail via trend analyses, source identification, and potential source control measures (see Pollutant of Concern Assessment below).

Organics

Organic compound exceedances observed during 2007/08 wet weather events were limited to the phthalate compound Bis(2-ethylhexyl)phthalate (Event 1 at ME-VR2 and ME-SCR) and various polynuclear aromatic hydrocarbons (PAHs). All monitoring sites evaluated during wet weather events recorded concentrations of polynuclear aromatic hydrocarbons (PAHs) above the Ocean Plan's daily maximum objective for PAH compounds.[6] Additionally, all Mass Emission stations and the Receiving Water site W-4 exhibited one or more PAH compound (see Footnote 6 for list of constituents) concentration in excess of CTR Human Health water quality objectives during storm events. Mass Emission station ME-SCR revealed a pyrene concentration above the Ocean Plan's 6-month median objective during dry weather Event 6. The presence of individual PAH compounds above CTR objectives observed at particular monitoring sites during wet weather conditions are listed as follows:

- Benzo(a)pyrene: ME-CC, ME-SCR
- Benzo(b)fluoranthene: ME-CC, ME-SCR, ME-VR2
- Benzo(k)fluoranthene: ME-CC, ME-SCR
- Chrysene: ME-CC, ME-SCR, W-4
- Indeno(1,2,3-cd)pyrene: ME-CC, ME-SCR

[6] The California Ocean Plan requires that the concentrations of the following individual PAH constituents be summed when comparing discharge concentrations to the Ocean Plan's 0.0088 μg/L PAH objective: Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Fluorene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene.

PAHs are found in the combustion products of wood, coal, and internal combustion engines, and are ubiquitous in the environment. Wildfires that burned in the region in recent years could also have served as a source of PAH compounds that were measured in water quality samples. With reference to both phthalates and PAHs, the CTR Human Health criteria for which these exceedances were observed were based on long-term exposure human health protection. Comparing short-term discharges with the human health criterion is only useful as a screening tool and not for assessing the impact of the stormwater discharge on the waterbody and compliance with water quality standards.

PCBs

Total PCB compounds were detected in quantities that exceeded the California Toxics Rule freshwater objectives at ME-CC during Event 2 and at ME-SCR during Events 2 and 3. This was the first time that PCBs were detected in stormwater since the 2000/01 monitoring season. These PCB detections are believed to represent anomalous events and are not believed to be indicative of typical water quality conditions in either watershed.

Pesticides

Pesticide exceedances observed during 2007/08 wet weather events were limited to Chlordane-related compounds[7] and two DDT-related compounds: 4,4'-DDD and 4,4'-DDE. The Ocean Plan's Chlordane objective was exceeded almost every time the Program's water quality samples were analyzed, with the exception of the Mass Emission stations ME-VR2 and ME-SCR, where Chlordane-related compounds were never detected. All monitoring stations, except for the Mass Emission site ME-VR2, showed at least one exceedance of the Ocean Plan's DDT compound[8] objective. The two DDT-related compounds for which CTR Human Health exceedances were recorded at all monitoring sites possessing detectable DDT concentrations were the legacy pesticides 4,4'- DDD and 4,4'-DDE. Dry weather monitoring at Mass Emission station ME-CC also revealed a 4,4'-DDE concentration above the CTR Human Health objective, as well as a BHC-gamma (Lindane) concentration that contributed to an exceedance of the Ocean Plan's HCH[9] 6-month median objective. These legacy pesticides are associated with Ventura County's extensive farming history. These compounds are currently being addressed in the Calleguas Creek watershed through the implementation of the Calleguas Creek Watershed OC Pesticides and PCBs Total Maximum Daily Load (TMDL), adopted by the Los Angeles Regional Water Quality Control Board in July 2005. The Ventura Countywide co-permittees located in the Calleguas Creek watershed were actively involved in the TMDL development and are participating in its implementation. Legacy pesticides, such as DDT and Chlordane compounds, will be further monitored over the course of the TMDL's implementation phase, and if high concentration areas (i.e., "hotspots") of these pesticides are identified, special studies will be implemented to address these hotspots.

Overall Conclusions for 2007/08 Stormwater Monitoring Season

This report summarizes the events of the 2007/08 monitoring season in which the Stormwater Monitoring Program successfully collected and analyzed water quality samples from three wet weather storm events and three dry weather events. The Stormwater Monitoring Program subsequently conducted a thorough QA/QC evaluation of the environmental and QA/QC results generated from its analysis of water quality samples and found the resultant data set to have achieved a 95.7% success rate in meeting Program data quality objectives. Overall, the three wet weather

[7] The California Ocean Plan requires that the concentrations of the following individual Chlordane-related compounds be summed when comparing discharge concentrations to the Ocean Plan's 0.000023 μg/L Chlordane objective: alpha-Chlordane, alpha-Chlordene, alpha-Nonachlor, Chlordane, gamma-Chlordane, gamma-Chlordene, gamma-Nonachlor, and Oxychlordane.

[8] The California Ocean Plan requires that the concentrations of the following individual DDT-related compounds be summed when comparing discharge concentrations to the Ocean Plan's 0.00017 μg/L DDT objective: 2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

[9] The California Ocean Plan requires that the concentrations of the following individual benzene-hexachloride (BHC) pesticides be summed when comparing discharge concentrations to the Ocean Plan's 0.004 μg/L hexachlorocyclohexane (HCH) objective: BHC-alpha, BHC-beta, BHC-delta, and BHC-gamma (Lindane).

and three dry weather events monitored during the current season produced a high quality data set in terms of the low percentage of qualified data, as well as the low reporting levels achieved by all laboratories analyzing the Stormwater Monitoring Program's water quality samples.

Acute toxicity (as demonstrated by a TUa >1.0) was observed only at Receiving Water site W-3 (La Vista) for the sample collected during wet weather Event 2 (December 18, 2007). Although the Program's NPDES permit requires that a TIE be initiated for each sample with a TUa >1.0, the footnote notifying the toxicity laboratory of this requirement was inadvertently omitted from the chain-of-custody, and the TIE for the sample collected at W-3 (La Vista) was therefore not performed.

Chronic toxicity was detected only in the ME-VR2 sample collected during the September 2007 wet event (Event 1). However, because two consecutive wet weather samples did not exhibit toxicity, results from the September 2007 wet event did not trigger TIE initiation.

The September 2007 BMI survey was preceded by a winter in which significant less than average rainfall was recorded in the watershed. As a result, only nine of the 15 BMI sampling locations had sufficient flow for sample collection. Physical habitat conditions at the nine sampling sites ranged from poor to optimal. The best (highest) habitat scores were at locations on the upper main stem of the Ventura River, upper San Antonio Creek and Matilija Creek. The worst (lowest) scores were at locations on the lower Ventura River and Canada Larga Creek. Based on the Southern California Index of Biological Integrity (So CA IBI), the aquatic health of the Ventura Watershed during 2006 ranged from poor to good. The upper site on the North Fork Matilija Creek and the site at upper San Antonio Creek ranked in the good range, while the site on the lower Ventura River ranked in the poor range. The remaining six sites in the watershed ranked in the fair range. The sites that ranked in the poor range were located in areas of the watershed that were impacted by a large transient human population on the Ventura River or located downstream of an erosion control project in the vicinity of grazing and stables.