MONITORING PROGRAM OBJECTIVES

The major objectives of the monitoring program outlined in the Municipal Stormwater Permit are to:

- Assess compliance with the Municipal Stormwater Permit CAS004001.
- Measure and improve the effectiveness of the Stormwater Quality Management Program (SQMPs).
- Assess the chemical, physical, and biological impacts of receiving waters resulting from urban runoff.
- Characterize stormwater discharges.
- Identify sources of pollutants.
- Assess the overall health and evaluate long-term trends in receiving water quality.

The monitoring program was designed to address these objectives through implementing these several elements:

- Core monitoring, which includes:
- Mass emission monitoring.
    - Water column toxicity monitoring.
    - Tributary monitoring.
    - Shoreline monitoring.
    - Trash monitoring.
- Regional monitoring, including:
    - Estuary sampling.
    - Bioassessment.
- Three special studies, including:
    - The new development impacts study in the Santa Clara Watershed.
    - The peak discharge impact study.

- The Best Management Practice (BMP) effectiveness study.

SUMMARY OF MONITORING RESULTS

CORE MONITORING

Mass Emission Monitoring

The purpose of mass emission monitoring is to:

- Estimate the mass emissions from the Municipal Separate Storm Sewer System (MS4).
- Assess trends in the mass emissions over time.
- Determine if the MS4 is contributing to exceedances of water quality standards by comparing results to applicable standards in the basin plan for the Coastal Watersheds of Los Angeles and Ventura Counties, Ocean Plan, or the California Toxic Rule (CTR), and with emissions from other discharges.

Flows were measured and water quality samples were taken at the following seven mass emission monitoring sites:

- Ballona Creek.
- Malibu Creek.
- Los Angeles River.
- Coyote Creek.
- San Gabriel River.
- Dominguez Channel.
- Santa Clara River.

All mass emission sites, except the Santa Clara River site, are equipped with automated samplers with integral flow meters for collecting flow-composite samples. A minimum of three storm events, including the first storm, and two dry-weather events were sampled at each mass emission site. TSS were collected from five storm events at the Santa Clara River mass emission site; seven storm events at the Ballona Creek, Coyote Creek, and San Gabriel River mass emission sites; and six storm events at Malibu Creek, Los Angeles River, and Dominguez Channel mass emission sites.

Based on results of the mass emission monitoring, three different water quality analyses were conducted.

- A comparison to appropriate water quality standards.
- An analysis of pollutant loadings and trends.
- An evaluation of the correlation between pollutants of concern and TSS.

Summaries of the analyses are as follows:

Comparison Study

A comparison of the monitoring results to the applicable water quality standards in the Basin Plan, the Ocean Plan, or the CTR was conducted. The lowest possible standard of the three documents was used for the comparison study. The California Department of Fish and Game provided fresh water final acute criteria water quality standards for Chlorpyrifos and Diazinon. The Basin Plan is designed to enhance water quality and protect the beneficial uses of all regional waters. The Ocean Plan is applicable to point source discharges to the ocean. The CTR promulgates criteria for priority toxic pollutants in the State of California for inland surface waters and enclosed bays and estuaries. Appendix B details results of the monitoring at the mass emission sites, indicating exceedances.

The following conclusions were drawn from the mass emission comparison study:

Wet Weather

Results at issue were chosen to be those in which at least 75 percent of samples exceeded applicable water quality standards. This is similar to the pollutant investigation threshold of three exceedances of four sampling events in the Tributary Monitoring Program.

- Enterococcus and Fecal Coliform exceedances surpassed the above-mentioned threshold at all mass emission monitoring sites.
- Total Coliform was a consistent exceedance issue at all mass emission sites, except for Malibu Creek.
- Total Aluminum and Total Copper exceedances were an issue in all watersheds.
- Total Lead and Total Zinc exceeded the above-mentioned threshold at Coyote Creek, Los Angeles River, Dominguez Channel, and Ballona Creek.
- Ammonia exceedances were an issue in all watersheds, except the San Gabriel and Los Angeles Rivers.
- Cyanide exceedances surpassed the 75 percent threshold at the Los Angeles River and Dominguez Channel.

- Notable differences between this year's results and the 1994-2005 Integrated Receiving Water Impacts Report list of Constituents of Concern are that no dissolved metals were persistently found to be in exceedance at any site during this monitoring year. The only possible exception being Dominguez Channel where 50 percent of its samples for Dissolved Copper were in exceedance of the applicable water quality standard. Dissolved Copper, Lead and Zinc were identified as Constituents of Concern in the 1994-2005 Integrated Receiving Water Impacts Report.

- Exceedances for Cyanide were found only in the Los Angeles River and Dominguez Channel as opposed to all watersheds as reported in the 1994-2005 Integrated Receiving Water Impacts Report.

- Diazinon was identified as a Constituent of Concern in all mass emission watersheds, but only one exceedance was found (Coyote Creek dry-weather event) during this monitoring year.

- Ammonia was not identified as a Constituent of Concern, but consistent exceedances for Ammonia were found in samples taken at all stations, except the Los Angeles and San Gabriel Rivers.

Dry Weather

Since the Municipal Stormwater Permit requires only two dry-weather samples at each mass emission monitoring station, at least 75 percent exceedance of events indicates that both samples exceeded the water quality standard.

- Total Copper exceedances were an issue in all watersheds.

- Fecal Coliform exceedances surpassed the above-mentioned threshold at the San Gabriel River and Ballona Creek.

- Enterococcus exceedances were an issue at the San Gabriel River, Dominguez Channel, Ballona Creek, and Santa Clara River.

- Consistent Cyanide exceedances occurred at the Los Angeles River and Coyote Creek.

- Chloride exceedances were an issue at the Santa Clara River mass emission site.

- Sulfate was an issue during dry-weather events at Malibu Creek mass emission station.

- Consistent Ammonia exceedances occurred at the San Gabriel River, Coyote Creek, Los Angeles River, and Dominguez Channel.

- TDS water quality guidelines were consistently surpassed at Coyote Creek and Ballona Creek.

- These results were in general agreement with those on the list of Constituents of Concern identified in the 1994-2005 Integrated Receiving Water Impacts Report. The strongest exceptions were that no dissolved metals (Copper, Lead, and Zinc) or Diazinon exceedances were found.

- Cyanide exceedances crossed the 75 percent exceedances parameter only at the Coyote Creek and the Los Angeles River, whereas it is a listed Constituent of Concern across all watersheds.

- Ammonia, Sulfate, and TDS exceedances were consistent in the watersheds mentioned above, however, those constituents are not listed Constituents of Concern in the 1994-2005 Integrated Receiving Water Impacts Report.

Loading and Trend Analysis

Samples were collected and analyzed for TSS at all mass emission stations equipped with automated samplers for all storm events that resulted in at least 0.25-inch rainfall, as required by the Municipal Stormwater Permit. The TSS concentrations for each storm are shown in Table 4-7 and the total TSS loading for each mass emission station is shown in Table 4-8. An estimate of the total pollutant loads for each mass emission station is shown in Table 4-9, representative of stormwater and urban runoff.

It is possible to see if there is any correlation between storm events and the amount of pollutant loading, by analyzing the pollutant loading at each mass emission station.

Figure 4-4 represents an analysis of trends in stormwater or receiving water quality. Some first flush phenomena are observed, primarily with pollutants associated with particulate matter, and storms with greater runoff volumes typically have larger pollutant loadings. It may be possible to analyze the loading as it relates to total precipitation or precipitation intensity, although an analysis of loading versus time yields little useful information in the short term. Long-term temporal trends cannot be found by analyzing one year's worth of data and an analysis of historical long-term temporal trends can be found in the 1994-2005 Integrated Receiving Water Impacts Report. Additional long-term trend analysis will be conducted for the next Integrated Receiving Water Impacts Report.

Public Works has recently developed an Integrated Water Quality Database. Trend analysis will be conducted with less effort, once previously collected data is entered into the system.

The following conclusions were deduced from the loading analysis:

- The extremely low amount of rain created an unusual combination of modest pollutant loads and high concentrations. This can be explained as a first flush phenomenon. Pollutants accumulate during the dry season and wash off during the first storm event(s) of the year.

- The total runoff volume and pollutant loading at the Los Angeles River Monitoring Station was usually higher than at the other monitoring stations. The Los Angeles River has approximately 2 to 25 times the surface area of the other watersheds. This creates more potential for surface runoff pollution and likely explains, in part, the increased loading of constituents at the Los Angeles River Monitoring Station when compared to the other monitoring stations.

- The storm on December 9, 2006, produced the single largest TSS load of the season at the Los Angeles River with a load 6,650 tons. The Los Angeles River is the largest contributor of TSS out of the seven mass emission stations monitored, although other watersheds sometimes contribute larger loads during particular storm events.

- Five of the seven mass emissions stations exhibited first flush phenomena for TSS. TSS concentrations tended to increase over the season at Coyote Creek, and concentrations in the Santa Clara Watershed varied largely by storm.

- TSS concentrations were usually much higher during wet weather than during dry sampling events. However, the first dry-weather sampling event at the San Gabriel River was higher than any measured wet-weather events at the same location.

- High levels of Aluminum, bacteria, Copper, Lead, Nickel and Zinc were observed at most mass emission stations during most events, and the metals levels tended to decline through the storm season.

- Methylene Blue Active Substances loading, which indicates the presence of surfactants, was generally higher in the more urbanized watersheds. Methylene Blue Active Substances tended to exhibit first flush phenomena in more rural watersheds, but tended to be present at fairly constant levels in the more urbanized watersheds. This suggests continuous sources in the urbanized areas, while the more rural watersheds may have periodic or seasonal sources.

- In general, TDS loads and loads from individual dissolved constituents increased during the storm season, most likely due to the presence of water in the watersheds after the first storm. This water collected dissolved materials and

was then flushed into the MS4 system by additional rainfall. However, other dissolved constituents were observed mainly during the first storm, suggesting that they are present on the surface rather than in the ground.

Correlation Study

An analysis of the correlation between metals, other constituents and TSS levels for two mass emission and one tributary monitoring stations was performed. Not all constituents had a sufficient number of detections to be correlated and the correlation between most constituents and TSS levels was poor. Only those correlations with an R^2 value greater than 0.4 are presented.

Background

The 1994-2005 Integrated Receiving Water Impacts Report presented an analyses of the metals and TSS correlation. This report found that there was poor correlation between TSS and metals in all watersheds besides the Santa Clara River Watershed. It was suggested to remove the TSS correlation requirement from the permit in order to free up resources for increased tributary monitoring. These suggestions were included in the 2006 Report on Waste Discharge. In anticipation of the RWQCBs Concurrence, TSS correlation analysis was only conducted for the Santa Clara River Watershed Ballona Creek Watershed and the Adams Drain Watershed in the 2005-06 Stormwater Monitoring Report.

Public Works continued the reduced TSS correlation efforts recommended in the 2006 Report of Waste Discharge as we did not receive any communication from the RWQCB directing otherwise.

Current Efforts

TSS correlations were prepared for the Santa Clara River, the San Gabriel River, and Upper San Jose Creek, in this report. A trend line was projected on each of the constituent-versus-TSS plots and the coefficient of determination (R^2) was calculated to see if there was any correlation between the concentrations for each constituent and TSS (Figure 4-5). The closer the value of R^2 is to the number one, the stronger the correlation of the two variables.

The following conclusions were deduced from the correlation study analysis:

- The Santa Clara River Watershed, which the 1994-2005 Integrated Receiving Water Impacts Report indicated exhibited the largest number of correlations, had only six constituents what correlated with TSS with an R^2 value greater than 0.4. (Ammonia 0.71, Nitrate (N) 0.68, Nitrate (NO3) 0.67, Total Selenium 0.49, Total Cadmium 0.48, Total Organic Carbon 0.41).

- Three of the correlations were a form of Nitrogen, possibly suggestive of fertilizer runoff from landscaped areas or agriculture.

- The San Gabriel River Watershed had 19 constituents with a R^2 value greater than 0.4. (Alkalinity 0.49, Total Antimony 0.70, Dissolved Antimony 0.70, Total Arsenic 0.58, Total Barium 0.58, Dissolved Barium 0.65, Total Chromium 0.86, Dissolved Chromium 0.61, Total Copper 0.54, Dissolved Copper 0.74, Cyanide 0.80, Hardness as CaCO3 0.52, Ammonia (N) 0.70, Total Nickel 0.47, Nitrate-N 0.65, pH 0.43, Specific Conductance 0.43, Sulfate 0.49, Total Coliform 0.47).

- The highest R^2 value in the San Gabriel River Watershed was 0.86 for Total Chromium. This association of Chromium with particulate matter should be considered when implementing source identification and enforcement activities.

- The Upper San Jose Creek Watershed had 17 constituents with a R^2 value greater than 0.4. (Total Aluminum 0.96, Ammonia 0.50, Total Antimony 0.89, Total Arsenic 0.90, Total Barium 0.94, BOD 0.75, Total Cadmium 0.68, Total Chromium 0.95, Total Chromium VI 0.55, Total Copper 0.80, Dissolved Chromium VI 0.55, Total Iron 0.94, Dissolved Lead 0.80, Dissolved Nickel 0.44, Total Nickel 0.93, Dissolved Phosphorus 0.55, Dissolved Zinc 0.54).

- The highest R^2 value in the Upper San Jose Creek Watershed was 0.96 for Total Aluminum. This association of Aluminum with particulate matter should be considered when implementing source identification and enforcement activities. Also of note, is that the second highest correlation in the Upper San Jose Watershed (tributary to the San Gabriel River Watershed) was for Total Chromium with an R^2 value of 0.95.

- San Gabriel River Watershed and Upper San Jose Creek Watershed had six metals in common that correlated to TSS with a R^2 value greater than 0.4. They were Antimony, Arsenic, Barium, Chromium, Copper, and Nickel.

- The Upper San Jose Creek Watershed exhibits correlations with R^2 values greater than 0.8 for nine metals. They are Aluminum, Antimony, Arsenic, Barium, Chromium, Copper, Iron, Lead, and Nickel.

- The relatively strong correlation between some metals and TSS in the Upper San Jose Creek Watershed and the continued correlation of these metals in the San Gabriel River Watershed should be used to prioritize BMPs and investigative/enforcement actions for those metals.

- Correlation of TSS and constituent concentrations is poor in large watersheds with multiple sources. Correlations are better in smaller watersheds, most likely due to the relatively larger degree of homogeneity in sources.

- TSS correlation should be discontinued in the Mass Emissions Monitoring Program, but may prove to be a useful tool in the Tributary Monitoring Program.

- Use of the newly created Integrated Water Quality Database will allow for more extensive TSS correlation efforts in the future. At this point in time, only the present year's data is available, but efforts are underway to import historical water quality records.

Water Column Toxicity Monitoring

The purpose of water column toxicity monitoring is to evaluate the extent and causes of toxicity in receiving waters and to modify and utilize the SQMP to implement practices that eliminate or reduce sources of toxicity in stormwater.

Water column toxicity monitoring was performed at all mass emission sites in accordance with the Municipal Stormwater Permit. In total, four samples were analyzed for toxicity at each site. An additional event was taken at the San Gabriel and Santa Clara River sites.

Dry-weather samples were collected on October 31, 2006, and April 2, 2007, at the Santa Clara River mass emission site, and on November 1, 2006, and April 2, 2007, at the other six mass emission sites. The results obtained from these samples are found in Table 4-8a.

Wet-weather samples were collected during the first rain event of the season on December 9, 2006, (at all 7 mass emission sites), on February 10, 2007 (at Ballona Creek, San Gabriel River, and Coyote Creek mass emission sites), on February 19, 2007 (at Santa Clara River mass emission site), on February 22, 2007 (at Malibu Creek, Los Angeles River, San Gabriel River, and Santa Clara River mass emission sites), and on April 20, 2007 (at the Dominguez Channel mass emission site). The results obtained from these samples are found in Table 4-8b.

A minimum of one freshwater and one marine species was used for toxicity testing, specifically Ceriodaphnia dubia (water flea) seven-day reproduction/survival and Strongylocentrotus purpuratus (sea urchin) fertilization. Results calculated from the Ceriodaphnia dubia and Strongylocentrotus purpuratus tests included the No Observed Effect Concentration, 50 percent Effective Concentration (EC50), 50 percent Lethal Concentration (LC50), and toxicity unit (TU). No Observed Effect Concentration is the highest concentration of toxicant that would cause no observable adverse effects on the test organisms, which means the values for the observed responses statistically are insignificantly different from the controls. EC50 is the toxicant concentration that would cause an observable adverse effect on a quantal response (such as death, fertilization, germination, or development) in 50 percent of the test population. A quantal response is an all-or-none response. For example, death is a quantal response because a test organism can only be either dead or alive after being exposed to the toxicant concentration in the test sample. When the observable effect is death or immobility, the term Lethal Concentration or LC is used in place of the term Effective Concentration or

EC. Therefore, LC50 is the concentration that produces a 50 percent reduction in survival. TU is defined in the Permit as 100/(LC50 or EC50). A TU value greater than or equal to 1.00 is considered substantially toxic and requires a toxicity identification evaluation (TIE).

The following conclusions were deduced from the water column toxicity testing:

- Ceriodaphnia dubia survival and reproduction were not significantly affected by exposure to the wet-weather samples collected from all sites during this past monitoring season.

- Sea urchin fertilization was significantly affected by exposure to the dry-weather sample collected only from the Ballona Creek mass emission site on April 2, 2007. That sample had TU value equal to 1.004. The TU value triggered a TIE study in accordance with the Permit. The baseline test conducted on the sample did not detect any toxicity, indicating no purpose to continue with further TIE manipulations. The fact that a very slight amount of toxicity was observed in the initial chronic test, indicated that the toxicant was most likely associated with volatile compound(s). The compound(s) apparently dissipated to nontoxic levels between the time of the initial toxicity tests and initiation of the baseline toxicity testing.

- Sea urchin fertilization was significantly affected by exposure to the wet-weather samples collected from all the mass emission stations (Ballona Creek, Malibu Creek, Los Angeles River, Coyote Creek, San Gabriel River, Dominguez Channel, and Santa Clara River) on December 9, 2006. These samples had TU values equal to 1.26, 1.34, 1.42, 1.40, 1.36, 1.36, and 1.36, respectively. In accordance with the Permit, TIEs were attempted on these samples and toxicity was not observed during the baseline toxicity testing, indicating no purpose for furtherance of the TIE analysis. The fact that a slight amount of toxicity was observed in the initial chronic tests, indicated that the toxicant was most likely associated with volatile compound(s). The compound(s) apparently dissipated to nontoxic levels between the time of the initial toxicity tests and initiation of the baseline toxicity testing.

- Sea urchin fertilization was significantly affected by exposure to the wet-weather sample collected from the Dominguez Channel mass emission site on April 20, 2007. That sample had TU value equal to 1.60. The TU value triggered a TIE study in accordance with the Permit. The baseline test conducted on the sample did not detect any toxicity, indicating no purpose to continue with further TIE manipulations. The fact that a very slight amount of toxicity was observed in the initial chronic test, indicated that the toxicant was most likely associated with volatile compound(s). The compound(s) apparently dissipated to nontoxic levels between the time of the initial toxicity tests and initiation of the baseline toxicity testing.

Tributary Monitoring
The purpose of tributary monitoring is to:

- Identify subwatersheds where stormwater discharges are causing or contributing to exceedances of water quality standards.

- To prioritize drainage and subdrainage areas that need management actions.

Sampling for the 2006-07 season was conducted at six tributary monitoring stations in the San Gabriel River Watershed. The tributaries monitored included:

- Big Dalton Wash/Walnut Creek.

- Puente Creek.

- Upper San Jose Creek.

- Maplewood Channel.

- North Fork Coyote Creek.

- Storm Drain 21 (Artesia-Norwalk Drain).

A minimum of four storm events and two dry events were sampled at each tributary monitoring site.

Since the tributary monitoring stations collect samples from subwatersheds within the San Gabriel River Watershed, the results from the San Gabriel River and Coyote Creek Mass Emission stations were also used in the analysis. The Big Dalton Wash/Walnut Creek, Puente Creek, and Upper San Jose Creek stations are upstream of the San Gabriel River Mass Emission Station. The North Fork Coyote Creek and Storm Drain 21 (Artesia-Norwalk Drain) stations are upstream of the Coyote Creek Mass Emission station. The Maplewood Channel station is situated below the San Gabriel mass emission station. Maplewood Channel results were analyzed in comparison with those from the Coyote Creek Mass Emission station as it was hypothesized that results from those two sites would be most alike.

It was not possible to accurately identify any problems based on dry-weather results as only two samples were taken at each tributary monitoring station in compliance with the Municipal Stormwater Permit as modified by the Los Angeles RWQCB. Nevertheless, efforts were expended to analyze data from two dry-weather events.

A comparison was made between tributary water quality results and the water quality objectives outlined in the Ocean Plan, the Basin Plan, and the CTR, in order to identify the subwatersheds where stormwater discharges are causing or contributing to exceedances of water quality standards. The freshwater final acute criteria set by the

California Department of Fish and Game was also used to provide water quality standards for Chlorpyrifos and Diazinon. Appendix B contains details of results of tributary monitoring, indicating exceedances.

The following conclusions were drawn from the wet-weather tributary comparison study:

Results at issue were chosen to be those in which at least 75 percent of samples exceeded applicable water quality standards. The pollutant investigation threshold is three exceedances out of four sampling events in the Tributary Monitoring Program.

- Enterococcus, Fecal Coliform, and Total Coliform were ubiquitous in all of the tributary watersheds, surpassing the above-mentioned 75 percent exceedance threshold.

- Total Aluminum and Total Copper was an issue across all watersheds.

- Total Zinc surpassed the 75 percent threshold in all watersheds, except for Big Dalton/Walnut Creek.

- Total Lead exceedances were an issue at Puente Creek, Maplewood Channel, North Fork Coyote Creek, and SD 21 (Artesia-Norwalk Drain).

- Ammonia exceedances were consistent in Puente Creek, Maplewood Channel, North Fork Coyote, and SD 21 (Artesia-Norwalk Drain).

- These results align with the Constituents of Concern for San Gabriel River and Coyote Creek, identified in the 1994-2005 Integrated Receiving Water Impacts Report. The exceptions are that no consistent exceedances were found for Dissolved Lead, one of the Constituents of Concern.

- Total Zinc and Ammonia were not identified as a Constituents of Concern for San Gabriel River or Coyote Creek in the 1994-2005 Integrated Receiving Water Impacts Report, yet consistent exceedances occurred as mentioned above.

- Total Aluminum was not identified as a Constituent of Concern in Coyote Creek, yet a significant number of exceedances were found in both of its tributaries (North Fork Coyote and SD 21 (Artesia-Norwalk Drain).

- Cyanide exceedances were not found to be an issue in any tributary, contrary to the Constituent of Concern list for both San Gabriel River and Coyote Creek.

Results from this past season's wet-weather monitoring were analyzed and a loading per area metric was used to prioritize pollutant reduction activities, in order to help focus management actions in the San Gabriel River and Coyote Creek Watersheds. Only those Constituents of Concern that had consistent exceedances this past year were considered. The results indicate that the San Gabriel River Watershed would benefit

from focusing management actions for wet weather in the order of Big Dalton/Walnut Creek, Upper San Jose Creek, and Puente Creek, for all of the above-mentioned Constituents of Concern. Also, the Coyote Creek Watershed would benefit from focusing management actions in the order of SD 21 (Artesia-Norwalk Drain), Maplewood Channel, and North Fork Coyote Creek.

The following conclusions were drawn from the dry-weather tributary comparison study:

- Total Copper surpassed the 75 percent exceedance pollutant investigation threshold in all watersheds.

- Ammonia exceeded the 75 percent threshold in all watersheds, except for Maplewood Channel.

- Enterococcus was an issue in Big Dalton/Walnut Creek, Puente Creek, and Upper San Jose Creek.

- Fecal Coliform exceedances surpassed the above-mentioned threshold at Puente Creek, Maplewood Chanel, and SD 21 (Artesia-Norwalk Drain).

- TDS exceedances were consistent at North Fork Coyote Creek and SD 21 (Artesia-Norwalk Drain).

- Cyanide exceedances were an issue at the North Fork Coyote Creek tributary site.

- These results align generally with the Constituents of Concern for San Gabriel River and Coyote Creek mentioned above. The exceptions are that no consistent exceedances were found for Dissolved Lead in the Coyote Creek tributaries, nor for Cyanide in the San Gabriel River tributaries.

- Total Lead exceedances did not surpass the 75 percent threshold at any of the sites. Total Lead is a Constituent of Concern for both San Gabriel River and Coyote Creek.

- Dry-weather samples consistently exceeded the water quality objective guidelines for TDS in North Fork Coyote Creek and SD 21 (Artesia-Norwalk Drain). There are no water body specific objectives for TDS in Coyote Creek Watershed. The effluent limit was based upon the guidelines in the Basin Plan, which would be protective of the potential Municipal Drinking Water Standards (MUN) Beneficial Use.

Results from the past year's dry-weather monitoring were analyzed and a loading per area metric was used to prioritize pollutant reduction activities, in order to help focus management actions in the San Gabriel River and Coyote Creek Watersheds. Only those Constituents of Concern that had consistent exceedances this past year were

considered. The results indicate the San Gabriel River Watershed would benefit from focusing management actions for dry weather in the order of Dalton/Walnut Creek, Upper San Jose Creek, and Puente Creek tributaries for all of the above Constituents of Concern. The Coyote Creek Watershed would benefit from focusing management actions for dry weather in the order of Maplewood Channel, SD 21, and North Fork Coyote Creek tributaries for all of the above Constituents of Concern.

Shoreline Monitoring

The City of Los Angeles is required to monitor shoreline stations to evaluate the impacts to coastal receiving waters and impacts to recreational beneficial uses resulting from stormwater/urban runoff. Also, the Municipal Stormwater Permit requires the City of Los Angeles to annually assess shoreline water quality data and submit it to the Principal Permittee for inclusion in the monitoring report. The City of Los Angeles' assessment is still undergoing some changes and quality control checks. It will be forwarded as soon as possible as Appendix D of this monitoring report. Note that the Los Angeles County Flood Control District (Flood Control District) Principal Permittee, does not necessarily agree with all statements and conclusions presented by the City of Los Angeles.

Beginning July 2005, a change in the Santa Monica Bay Beaches Bacteria Total Maximum Daily Load plan impacted the monitoring frequency of the MS4 program. The monitoring frequency for nine stations was reduced to five days per week and the monitoring frequency of the remaining nine stations was reduced to weekly.

Results from this monitoring program included:

- The annual geometric means for all indicator bacteria were higher during wet weather than dry weather.

- The northern Santa Monica Bay stations (Malibu Lagoon to Marina del Rey) generally had higher annual geometric means for all indicator bacteria than southern Santa Monica Bay stations (Ballona Creek to Palos Verdes Peninsula).

- Based upon dry-weather bacterial densities, the Santa Monica Pier station had the lowest percent compliance with bacteria water quality standards and the highest number of exceedances, followed by the Santa Monica Canyon station.

- Also based upon dry-weather bacterial densities, the 40th Street at Manhattan Beach, and Malaga Cove at Palos Verdes Peninsula stations were 100 percent compliant for all standards.

Trash Monitoring

The objectives of trash monitoring are to:

- Assess the quantities of trash in receiving waters after storm events.

- To identify areas impaired for trash.

Visual observations of trash were made and a minimum of one photograph at each mass emission station was taken after four storm events including the first storm event.

The completed Baseline Monitoring Study installed almost 600 catch basin inserts and four Continuous Deflective System units in various land uses, including commercial, high density single family residential, industrial, low density single family residential, and open space/parks, across the Los Angeles River and Ballona Creek Watersheds for monitoring trash discharge rates. The trash collected from each device was separated into two categories: Anthropogenic and Sediment/Vegetation. The trash collected was then weighed and recorded, after separating into these categories. One dry-weather cleaning event was conducted in each watershed during this season completing the contract. Tables 4-12a and 4-12b summarize trash collection results for the cleaning events per land use.

The following conclusions were drawn from the trash monitoring results for Anthropogenic trash in Los Angeles River and Ballona Creek Watersheds:

Los Angeles River Watershed

- The rate of collected trash to tributary area in the Los Angeles River Watershed from one cleaning event for 2006-07 season was 0.49 lbs/acre.

- The industrial land use was the largest trash contributor with a rate of 1.03 lbs/acre. The second highest contributor was the High Density Single Family Residential land use with a rate off 0.86 lbs/acre. It was followed by the Commercial, Open Space/Parks, and Low Density Single Family Residential land uses with rates of 0.72, 0.07, and 0.00 lbs/acre, respectively.

Ballona Creek Watershed

- The rate of collected trash to tributary area in the Ballona Creek Watershed from one cleaning event for the 2006-07 season was 2.23 lbs/acre.

- The commercial land use was the largest contributor with a rate of 7.44 lbs/acre. The second largest trash generated rate was from the Open Space/Parks land use with 2.77 lbs/acre. It was followed by the Industrial land use with 1.72 lbs/acre, and the High Density Single Family Residential land use with 0.78 lbs/acre. Finally, the lowest contributor was the Low Density Single Family Residential land use with 0.57 lbs/acre.

Trash compliance monitoring was not reported for the Los Angeles River Watershed. The Trash Total Maximum Daily Load is not legally in effect in this watershed.

Results of trash compliance monitoring for unincorporated Los Angeles County areas and for the cities in the Ballona Creek Watershed are included in Appendix I.

REGIONAL MONITORING

Estuary Sampling

Public Works is participating in the coastal ecology committee of the Bight 2003 project coordinated by the Southern California Coastal Waters Research Project (SCCWRP), in compliance with Section II.F of the Monitoring and Reporting Program of the stormwater monitoring requirements,. The two primary objectives of Bight 2003 are to estimate the extent and magnitude of ecological change in the Southern California Bight and to determine the mass balance of pollutants that currently reside within the Southern California Bight. Regional monitoring components include coastal ecology, shoreline microbiology, and water quality. This project has been conducted in collaboration with various organizations including regulators, wastewater and stormwater permittees, and citizen volunteers under the coordination of SCCWRP.

The goal of the Estuary Sampling program is to supplement the regional monitoring of the Southern California Bight estuarine habitats by sampling estuaries for sediment chemistry, sediment toxicity, and benthic macroinvertebrate diversity to determine the spatial extent of sediment fate from stormwater, and the magnitudes of its effects. The estuaries being sampled in the County of Los Angeles are those of Malibu Creek, Ballona Creek, Los Angeles River, San Gabriel River, and Dominguez Channel.

All reports pertinent to the Bight 2003 Project have been completed by SCCWRP are posted on their website: http://www.sccwrp.org/pubs/techrpt.htm.

Some program findings included:

- Results from the Benthic Macrofauna Program indicated that the sediment dwelling organisms were in good condition in 2003 and are not changing rapidly.

- The Demersal Fishes and Megabenthic Invertebrates Program indicated that those soft-bottom habitat species were healthy in 2003, more so than compared to conditions in the 1970s.

- The Sediment Chemistry Program revealed little change in extent of sediment contamination in the last nine years. Total DDT was the most wide spread sediment contaminant in the Southern California Bight. Trace metals and Total Polycyclic Aromatic Hydrocarbons were most concentrated in marinas and estuaries.

- The Sediment Toxicity Program studied the amount of toxicity to marine organisms living in/on sediment in the Southern California Bight. The results indicated that sediment toxicity was not widespread. The greatest incidences of toxicity were found in marinas and estuaries and attributable to organic contaminants, possibly pesticides.

Bioassessment
Bioassessments aid in evaluating a water body's qualitative integrity by detecting biological responses and trends resulting from exposure to pollution within watersheds. An ultimate goal is to identify probable causes of impairment not detected by chemical and physical water quality analysis. The Monitoring and Reporting Program, Section II.G of the Stormwater Monitoring Permit requires Public Works to perform stream bioassessments in the County in October every year. Sampling sites are spread throughout each of the six major watersheds and are selected to represent the diverse environments of the Los Angeles region. Table 1-1 lists the sampling station locations and Figure 1-1 is a map showing the geographical location of the sampling stations.

The State's Surface Water Ambient Monitoring Program will take information gathered from the biological surveys in the County and combine it with data collected from surrounding counties to refine an Index of Biological Indicators for the Southern California region. The final report from the most recent year of the Bioassessment Monitoring Program (2006) is included in Appendix H of this annual report.

Some program findings included:

- The Cold Creek station had the highest Index of Biotic Integrity score (a quantitative multi-metric scoring system for assessing the quality of benthic macroinvertebrate assemblages), warranting a Good rating. The Arroyo Seco site and one San Gabriel River station also received Good ratings.

- The fourteen other sites had Poor to Very Poor ratings.

- Six of the seventeen stations were located in highly modified, concrete-lined urban water courses, and these sites all had Index of Biotic Integrity ratings of Poor or Very Poor.

- Comparison of Index of Biotic Integrity scores for the four survey years to date did not indicate any substantial trends towards degradation at any of the sites.

SPECIAL STUDIES

Public Works is conducting the following special monitoring programs as required by the 2001 Municipal Stormwater Permit:

New Development Impacts Study in the Santa Clara Watershed
The objective of the New Development Impacts Study in the Santa Clara Watershed is to evaluate the effectiveness of the Standard Urban Stormwater Mitigation Plan (SUSMP) BMPs at reducing pollutants in stormwater runoff.

The Regional Board, in a letter dated March 7, 2003, allowed the County and the City of Santa Clarita to fulfill this permit requirement by simulating the expected improvements from implementation of SUSMP through a mathematical modeling. On

November 13, 2003, we submitted a work plan to the Regional Board. The USEPA's Stormwater Management Model will be used to conduct a deterministic hydrological modeling coupled with a stochastic Monte Carlo approach for modeling stormwater runoff water quality.

A small watershed tributary to the Santa Clara River in the western side of the City of Santa Clarita was selected for monitoring and modeling. The 126-acre drainage area of this pre-SUSMP site includes a mix of residential and commercial land uses, and, therefore, met both the drainage area sizing and land-use criteria for the modeling project.

A monitoring station and rain gage were installed at the outlet of the watershed. The station included a flow meter and automatic sampler. The equipment could be monitored remotely through a cell phone connection and hydrologic data was downloaded on a weekly basis.

The final report for this project will be forwarded as soon as quality control checks are completed, anticipated to be Fall 2007.

Some study findings included:

- The monitoring portion of the project focused on a 126-acre tract, approximately 65 percent residential, 35 percent commercial land uses, created before SUSMP controls were mandated.

- Three large storms and three small storms were monitored.

- Exceedances were found for bacteria and some metals.

- Nutrients were below exceedance levels.

- The above monitoring results will be compared to results from a model that includes SUSMP controls.

Peak Discharge Impact Study

The study was conducted to fulfill the requirement to develop numeric criteria for peak flow control by assessing the potential cause and effect relationships between urbanization in watersheds and stream erosion in the County.

An Executive Summary from the study results was included in Appendix B of the 1994-2005 Integrated Receiving Water Impacts Report. The Executive Summary can be found at http://ladpw.org/wmd/NPDES/1994-05_report/contents.html

Best Management Practices Effectiveness Study

The Municipal Stormwater Permit requires studying the effectiveness of various BMPs. Five different types of BMPs have been chosen for this study. These BMPs included:

- Five catch basin inserts connected in series with a hydrodynamic separator downstream of these inserts in the City of South Pasadena.

- An enhanced manhole in one of Public Works maintenance yards in the City of Los Angeles.

- A bioswale located in the City of Los Angeles inside a small public park.

- A treatment train that consisted of a wet vault for oil and sediments separation followed by an infiltration trench inside a metal recycling recycling facility in the City of Los Angeles.

Monitoring started during the 2004-05 season. Current activities included continued monitoring at the bioswale site in the City of Los Angeles and the catch basin insert and hydrodynamic separator device in the City of South Pasadena. Efforts also continued in the design and construction of flow measuring devices, installation of water samplers, and development of monitoring plans for the metals filtration units at the Sun Valley Park Project. Due to technical issues, monitoring of that project has not yet begun. The selected BMPs will be evaluated for effectiveness of removing various pollutants from stormwater runoff.

Recommendations

Monitoring components conducted during the 2006-07 monitoring season included collecting two dry-weather samples at each of the tributary monitoring stations as recommended in the 2002-03 monitoring report. In addition, all required samples were taken, including dry weather and toxicity samples. Below are some recommendations that were identified based on results of monitoring in the 2006-07 monitoring season.

Many of the polychlorinated biphenyls, SOVs, and chlorinated pesticides cannot be compared to the water quality standards because there are no standards listed in the Basin Plan, Ocean Plan, or CTR. However, even if there were water quality standards, all of these constituents were not detected at any of the mass emission or tributary monitoring stations. We recommend discontinuing sampling for these constituents, except during the first storm event of every year. We also request that the Los Angeles RWQCB provide a current compilation of applicable water quality standards in an easily viewable table on their website.

Some constituents sampled at the tributary stations, particularly Total Copper and Total Aluminum showed consistent exceedances of water quality standards during this year of monitoring. The Municipal Stormwater Permit requires the initiation of a focused effort to identify sources of pollutant within that subwatershed when a constituent exceeds a water quality standard in three out of four samples. To identify the possible sources of these pollutants, Public Works compared them with the water quality data collected from the land-use monitoring stations.

The land use of all tributary monitoring stations is predominantly high density single family residential. The land-use monitoring water quality data indicate that Total Copper and Total Aluminum were also typically found from the same land use, high density single family residential. Based upon just one year of monitoring at the San Gabriel River Watershed Tributary Monitoring sites, it is recommended that management actions be focused first upon the Constituents of Concern in the Dalton/Walnut Creek and Storm Drain 21 (Artesia-Norwalk Drain) watersheds for wet weather and Dalton/Walnut Creek and Maplewood Channel for dry weather.

Just one season has been spent gathering data in the San Gabriel River Watershed tributary monitoring sites. Therefore, to verify results, it is recommended that tributary monitoring be continued there for the 2007-08 season.

The role of bacterial populations resident in sediment should be investigated as an alternative to current MS4 sources. The role that tides play in enterococci levels should also be checked. While storm drains are recognized as an important conveyance of bacteria, other sources also exist and should be thoroughly examined.

Efforts on source identification and implementation of BMP strategies should take TSS correlation into consideration. Pollutants with strong correlations may be treated with filtration technologies, and may have relatively localized sources. Conversely, they may also be widespread through aerial deposition, which also provides hints towards source identification.

Compliance with the Municipal Stormwater Permit should be prioritized across all portions of County government. The Flood Control District and Public Works have limits upon their scope of operations, and require the cooperation of other County agencies such as the District Attorney's Office and Sheriff's Department to fully implement effective source control measures. Compliance by other Permitees should also be encouraged through cooperative efforts.

It is recommended that mass emission monitoring, toxicity monitoring, trash monitoring, and tributary monitoring be continued in the future in addition to the regional monitoring and special studies, in order to identify and better understand the source(s) of pollution.

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