

ORANGE COUNTY STORMWATER PROGRAM

RECEIVING WATERS AND MS4 DISCHARGE MONITORING PLAN

OCTOBER 1, 2013 TO SEPTEMBER 30, 2014

Pursuant to Order R9-2009-0002



Submittal to the San Diego Regional Water Quality Control Board
September 3, 2013

**2013-14 Receiving Waters and MS4 Discharge Monitoring Plan
San Diego Region of Orange County**

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1.0 INTRODUCTION

1.1 Purpose and Organization of Monitoring Plan

The purpose of this plan is to meet the requirement of Order No. R9-2009-0002 to submit a description of the Receiving Waters and MS4 Discharge Monitoring Program for the upcoming monitoring year (Oct. 1, 2013 – Sept. 30, 2014).

The following core monitoring program elements are conducted by the Orange County Stormwater Program in the San Diego Region of Orange County:

- Mass Loading Station Monitoring
- Urban Stream Bioassessment Monitoring
- Ambient Coastal Receiving Waters Monitoring
- Coastal Storm Drain Outfall Monitoring
- Wet Weather MS4 Discharge Monitoring
- Dry Weather MS4 Discharge Monitoring

The Orange County Stormwater Program participates in collaborative, large scale regional monitoring efforts such as the Bight Study, administered by the Southern California Coastal Waters Research Project (SCCWRP), that use standardized sampling methods to collect a wide range of data across the entire region

Additionally, when needed, tightly focused and relatively short-term “Special Studies” typically involving exploratory data analysis methods, investigations of new measurement methods, problem characterizations, or one-time measurements of important processes are performed.

1.2 Monitoring Site Locations

All monitoring site locations can be viewed using the following interactive mapping application:

[Orange County Stormwater Program San Diego Region Monitoring Site Locations GIS Cloud Map](#)



1.3 Program History

The County of Orange (the Principal Permittee), the Orange County Flood Control District and incorporated cities (all three collectively referred to as Permittees) first obtained NPDES Stormwater Permits No. CA 8000180 and No. CA 0108740 (subsequently referred to as the First Term MS4 Permits) from the Santa Ana and San Diego Regional Water Quality Control Boards in 1991. In 1996, the First Term Permits were replaced by Permits Nos. CAS618030 and CAS0108740 (subsequently referred to as the Second Term MS4 Permits) and these Permits were renewed by Orders from the respective boards in 2002 (Third Term MS4 Permits) and in 2009 (Fourth Term MS4 Permits). The overall evolution of the Orange County Stormwater Program’s monitoring efforts during this period is illustrated in **Figure 1**.

On December 16, 2009, the California Regional Water Quality Control Board - San Diego Region adopted Order No. R9-2009-0002 "Waste Discharge Requirements for Discharges of Runoff from Municipal Separate Storm Sewer Systems (MS4s) Draining the Watershed of the County of Orange, the Incorporated Cities of Orange County, and the Orange County Flood Control District within the San Diego Region" (Permit). Attachment E of Order No. R9-2009-0002 contains the requirements of the "Receiving Waters and MS4 Discharge Monitoring and Reporting Program." According to Section III.A.1 of Attachment E, the Principal Permittee must submit by September 1 of each year, a detailed description of the monitoring programs that will be implemented during the upcoming year beginning on October 1. The following is a description of the monitoring plan for the year spanning October 1, 2013 to September 30, 2014. The monitoring program elements described in this plan are a continuation of programs that were implemented during the 2012-13 monitoring year.

2.0 FOURTH TERM MS4 PERMIT MONITORING PROGRAM UNDER ORDER R9-2009-0002

According to Order R9-2009-0002 the Fourth Term MS4 Permit monitoring program is intended to meet the following goals:

- Assess the overall health of receiving waters
- Characterize stormwater discharges
- Assess the chemical, physical, and biological impacts to receiving waters resulting from MS4 discharges
- Detect and eliminate Illegal Discharges/Illicit Connections (ID/ICs) to the MS4
- Identify sources of specific pollutants
- Prioritize drains and sub-drainage areas that need management actions
- Provide information to implement required BMP improvements
- Measure and improve the effectiveness of the Permittees' runoff management programs
- Assess compliance with Order No. R9-2009-002

The monitoring program is designed to enable the Permittees to answer the following questions:

1. Are conditions in the receiving waters protective, or likely to be protective, of beneficial uses?
2. What is the extent and magnitude of the current or potential receiving water problems?
3. What is the relative MS4 discharge contribution to the receiving water problem(s)?
4. What are the sources of MS4 discharge that contribute to receiving water problem(s)?
5. Are conditions in receiving waters getting better or worse?

The 2013-14 monitoring plan contains the same elements of the monitoring program implemented during 2012-13. **Table 1** contains a list of the monitoring program elements and their requirements.

Table 2 is the list of aqueous chemistry analytes for Mass Loading Stations (MLS), Urban Stream Bioassessment (USB) sites, Ambient Coastal Receiving Waters (ACRW) sites, Non-stormwater Action Levels (NAL) and Stormwater Action Levels (SAL) MS4 monitoring sites. **Table 3** summarizes the toxicity testing requirements for all program elements.

2.1.1 Mass Loading Station (MLS) Monitoring

2.1.1 Background

The goals of the Mass Loading Station Monitoring Program are to:

- Determine the role, if any, of urban stormwater discharges in the impairment of beneficial uses
- Provide technical information to support effective urban stormwater management program actions to reduce the beneficial use impairment determined to be associated with urban stormwater
- Determine changes in receiving water quality over time

Assessments from the Mass Loading Stations Monitoring Program allow the Permittees to address goals from Attachment E.I.A of the Order which include:

1. Assess the chemical and biological conditions of receiving waters
2. Evaluate the extent and magnitude of the current or potential receiving water problems
3. Evaluate if conditions in receiving waters are getting better or worse

2.1.2 Site Selection

Mass loading monitoring will continue at the same sites monitored during previous years. These sites are:

- Aliso Creek in Aliso/Wood Canyon Wilderness Park (ACJ01)
- Laguna Canyon Channel at Woodland Avenue (LCWI02)
- Trabuco Creek at Del Obispo (TCOL02)
- Prima Deshecha Channel at Calle Grande Vista (PDCM01)
- San Juan Creek at La Novia (SJNL01)
- San Juan Creek at La Novia (SJNL01)

2.1.3 Monitoring Protocols

Each site will be monitored during two stormwater events and two periods of dry-weather flow. Barring the occurrence of a significant, un-forecasted rainfall event, each site will be monitored during the first storm of the season which meets the EPA criteria for representative storm.¹ The second monitoring of each site will be conducted after February 1st. The dry-weather monitoring at each site will occur between May 1st and September 30th with each sampling separated by a minimum of three months. Dry weather monitoring will be coordinated with Urban Stream Bioassessment and Ambient Coastal Receiving Waters monitoring sites to the extent feasible.

Water chemistry and toxicity testing composite samples will be collected with automatic samplers for dry and wet weather conditions in the receiving water. Grab sampling will be used for fecal indicator bacteria, biochemical oxygen demand, and oil and grease, as appropriate. A grab sample of total petroleum hydrocarbons will be collected if sheen is observed. A multi-parameter probe will be used to make in-situ measurements of pH, temperature, specific conductance, and dissolved oxygen. Discharge rate information will be gathered from the closest stream gauge to each water quality monitoring site.

The dry-weather assessments will consist of 24-hour, time-weighted composite samples. The stormwater assessments will consist of a series of time-weighted, composite samples spanning the duration of the stormwater runoff event, up to 96 hours. The first composite sample from each storm will characterize the first flush. This first flush composite sample will be prepared from six discrete samples collected every 12 minutes beginning at the on-set of stormwater flow. The remainder of the stormwater event will be characterized by composite samples comprised of discrete samplings made bi-hourly beginning 3 hours after the on-set of stormwater flow.

The toxicity testing that will be conducted on samples from mass loading sites will be conducted with freshwater and marine or estuarine organisms. **Table 4** summarizes the tests that will be performed.

Order R9-2009-0002 requires toxicity testing of dry weather discharges with marine organisms. Assessing the impacts of dry-weather discharges on the marine environment is coordinated with monitoring conducted as part of the ACRW program. The impacts of dry-weather discharges on the marine environment from Aliso and San Juan Creeks, including Trabuco Creek, are coordinated and monitored as part of the ACRW program. The impacts of dry-weather discharges on the marine environment from Salt Creek are coordinated and monitored as part of the USB program.

Order R9-2009-002 requires toxicity testing unless the dry weather discharge is diverted to a sanitary sewer or if the impact of the dry-weather discharge is evaluated as part of the ACRW program element. Dry-weather discharges from Laguna Canyon Wash and Segunda Deshecha Channel are currently diverted to the sanitary sewer system.

The required acute and chronic marine species toxicity assessments will be made using 48-hr and 7-day survival tests with *Americamysis Bahía*. The Sea Urchin fertilization test will also be utilized since prior stormwater toxicity results from the MLS have shown a significant impact with this test.

2.2 Urban Stream Bioassessment (USB) Monitoring

2.2.1 Background

The goals of the Urban Stream Bioassessment Monitoring Program are to:

- Evaluate the chemical, biological, and physical condition of receiving waters
- Determine the role, if any, of urban stormwater discharges in the impairment of beneficial uses
- Identify specific pollutants, activities, or sources contributing to the impacts
- Provide technical information to support effective urban stormwater management; and, program actions to reduce impact associated with urban stormwater on stream biology and physical habitats.

Aquatic chemistry, toxicity testing, bioassessment, and physical habitat assessments will provide multiple lines of evidence to characterize the conditions of freshwater habitat receiving waters. Assessments from the Urban Stream Bioassessment Monitoring Program will allow the Permittees to address goals from Attachment E.I.A which include:

1. Assess the chemical, physical, and biological conditions of receiving waters

2. Evaluate the extent and magnitude of the current or potential receiving water problems
3. Evaluate if conditions in receiving waters are getting better or worse.

2.2.2 Site Selection

The monitoring locations include seven targeted urban sites and three reference sites within the San Diego Region of Orange County annually selected by the Stormwater Monitoring Coalition (SMC) for their “Regional Monitoring of Southern California’s Coastal Watersheds.”

2.2.3 Monitoring Protocols

Monitoring will be conducted once annually in the late spring after the rainy season to coordinate the targeted site monitoring with the SMC regional program. Collection of benthic macroinvertebrates (BMIs) will be conducted according to Surface Water Ambient Monitoring Program (SWAMP) protocols.² Calculation of the Index of Biotic Integrity (IBI) for each bioassessment will be performed using guidance from “A Qualitative Tool for Assessing the Integrity of Southern Coastal California Streams” by Ode, et al. 2005. Monitoring of stream algae using the EPA’s 1999 Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers³ and SWAMP’s Incorporating Bioassessment using Freshwater Algae into California’s SWAMP⁴ will be incorporated into annual assessments once the algae Index of Biotic Integrity has been developed and approved for NPDES monitoring purposes.

2.2.4 Sediment Toxicity Special Study

Order R9-2009-0002 requires a special study to assess the linkage between sediment chemistry and toxicity with impacts on stream benthic macroinvertebrates. Four targeted sites in urban watersheds and one reference site will be selected to evaluate sediment chemistry and toxicity. Sediment chemistry will include analyses of metals, particulate bound pesticides, pH, total organic carbon, total sulfide, ammonia, and particle size distribution. Acute and chronic toxicity testing of sediments will be performed with *Hyalella Azteca*. Sediment toxicity assessments will be coordinated with MLS monitoring sites to the extent feasible.

2.3 Ambient Coastal Receiving Water (ACRW) Monitoring

2.3.1 Background

The purpose of the ACRW monitoring is to assess the impact of dry-weather and stormwater discharges from the MS4 on the coastal ecologically sensitive marine receiving waters. The goals of the Ambient Coastal Receiving Water Monitoring Program are to:

- Determine the role, if any, of urban stormwater discharges impacts on marine coastal receiving waters
- Identify specific pollutants, activities, or sources contributing to the impacts
- Provide technical information to support effective urban stormwater management program actions to reduce the sources or causes of pollutants determined to be associated impacts to the marine coastal waters

Aquatic chemistry and toxicity testing is performed to characterize the conditions of marine coastal receiving waters. Assessments from the ACRW Program will allow the Permittees to address goals from Attachment E.I.A of the Order which include:

1. Assessing the chemical and biological conditions of receiving waters
2. Evaluating the extent and magnitude of the current or potential receiving water problems
3. Evaluating if conditions in receiving waters are getting better or worse

2.3.2 Site Selection

The ACRW monitoring program focuses on sensitive marine habitat areas along coastline that receive MS4 discharges. The 2013-14 monitoring plan focuses primarily on receiving water monitoring at MS4 outlets.

2.3.3 Monitoring Protocols

Surfzone monitoring down current of discharges from the outlets provides a more direct assessment of receiving water impacts. Monitoring near the outlets of Aliso Creek, Laguna Canyon Channel, Salt Creek, and San Juan Creek will be conducted concurrently with the MLS or USB monitoring of those channels whenever feasible. **Table 5** summarizes the toxicity tests that will be used in the ACRW program.

A receiving water sample will only be collected if the discharge from the MS4 is hydraulically connected to the surfzone at the time of the site visit. If the connection exists, surfzone monitoring will be conducted 25 yards down current of the stormdrain-surfzone interface.

2.3.4 Dana Point Harbor Regional Harbor Monitoring Program

Monitoring of Dana Point Harbor as part of the ACRW program previously focused on assessing MS4 discharges during dry-weather and storms events and assessing sediment quality using a triad approach. Order R9-2009-0002 provided an allowance to suspend the Dana Point Harbor monitoring contingent upon Orange County's continued participation in the San Diego Regional Water Quality Control Board's Regional Harbor Monitoring Program (RHMP). The Program's monitoring of Dana Point Harbor continues to be implemented as part of the RHMP.

2.3.5 Special Study

Ongoing special study monitoring during the 2013-14 year will continue to focus on assessing sources of pollutants and activities that contribute to impacts on the marine coastal receiving waters in the Dana Point Coastal Streams watershed within the Salt Creek watershed area. A stakeholder technical workgroup formed to address the coastal receiving waters impacts will continue to review data collected from the special study. The workgroup's goal is to provide the technical information needed to support effective urban stormwater management to reduce the sources of pollutant and activities contributing to the coastal receiving waters problems.

2.4 Coastal Storm Drain Outfall Monitoring

2.4.1 Regional Bacteria Monitoring

During 2013-14, the Permittees will continue to participate in a collaborative regional monitoring program with the Orange County Health Care Agency (HCA) and local sanitation districts. The MS4 outlets will continue to be monitored during each weekly site visit.

2.4.1.1 Monitoring Protocols

A sample from the MS4 will only be collected if the discharge from the MS4 is hydraulically connected to the surfzone at the time of the site visit. If the connection exists, surfzone monitoring will be conducted 25 yards upcoast and 25 yards downcoast of the stormdrain-surfzone interface. If no connection exists, a surfzone sample will be collected at the downcoast location. Water temperature and flow rate from the drain will be collected each site visit to extent feasible taking into account site safety concerns from high surf or unsafe conditions due to high tides.

Bacteriological analyses from the regional program are performed by the HCA Public Health Laboratory in order to provide real-time information regarding potential beach postings and a need for follow up sampling to reassess conditions.

2.5 Wet Weather MS4 Discharge Monitoring

2.5.1 Background

Section D of Order No. R9-2009-0002 describes how “Stormwater Action Levels” (SALs) will be used to evaluate the quality of stormwater discharges from the MS4. Attachment E of Order No. R9-2009-0002 contains the requirements of the “Receiving Waters and MS4 Discharge Monitoring and Reporting Program.” Section II.B.1 of Attachment E describes the “Wet Weather MS4 Discharge Monitoring” requirements for major outfalls.

The SALs program will enable the Permittees to address the following goals from Attachment E.I.A of the Order:

1. Characterize stormwater discharges
2. Identify sources of specific pollutants
3. Prioritize drains and sub-drainage areas that need management actions
4. Detect and eliminate illicit discharges and illicit connections to the MS4
5. Provide information to implement required BMP improvements
6. Assess the overall health of the MS4 during wet weather conditions
7. Measure and improve the effectiveness of the Permittees’ runoff management programs;
8. Assess compliance with Order No. R9-2009-0002

Specifically, the SALs Program will allow Permittees to answer the following questions:

1. What is the relative MS4 discharge contribution to the receiving water problem(s) during wet

weather conditions?

2. What are the sources of MS4 discharge that contribute to receiving water problem(s)?
3. Are conditions getting better or worse?

2.5.2 Site Selection

The Permittees currently evaluate the quality of stormwater runoff through the Mass Loading and Ambient Coastal Receiving Waters (ACRW) Programs. Although the wet weather MS4 discharges are indirectly measured in the MLS and ACRW programs, the uncertainty of MS4 specific discharge quality cannot be assessed in the well mixed and episodic conditions observed in receiving waters.

Section D.2 of Order R9-2009-0002 states that the Permittees must develop their monitoring plans to sample a representative percentage of the major outfalls within each hydrologic subarea (HSA). The Permittees created a GIS database containing flood control drainage facilities, Permittee jurisdiction(s), hydrologic area (HA) and HSA designations. Using a random selection process, 1 major outfall was selected from each of the 14 HSAs and the San Mateo Canyon HA. The random selection process was repeated until an appropriate location could be identified based on the following outfall criteria:

- Dimensions meeting EPA sizing criteria for major outfalls
- Discharge to Waters of the United States
- Representative of the HSA
- Discharge quality must be measureable without interference from upstream receiving waters
- Discharge must be capable of being collected by an automatic sampler

Through three years of implementing the program, seven of the twelve SALs sites have exhibited no action level exceedances. These sites have been replaced with a new outfall within the same HSA. **Table 6** is an updated list of SAL monitoring locations. No major outfalls fitting the selection criteria exist in the Upper Trabuco, Gobernadora, or Middle San Juan HSAs.

2.5.3 Monitoring Protocols

Two representative storms⁷ will be monitored at each site during the 2013-14 reporting year. Local weather forecast information will be used to prepare for wet-weather MS4 sampling. Equipment will be staged if a storm is forecasted with a projected intensity of >0.10 inch with a 50% probability of precipitation⁷.

Composite sampling periods for each monitoring event will be 24 hours or the period of stormwater runoff (if stormwater runoff extends beyond 24 hours), whichever is shorter. Major outfall monitoring will be coordinated with mass emissions monitoring in the same watershed whenever possible.

Sampling of the major outfalls will be conducted with automatic samplers programmed to initiate sampling once the water level in the outfall reaches a point representative of stormwater runoff and will collect two samples per hour for a 24-hour period. For storms extending beyond 24 hours, a composite sample will be prepared from the contents of all 24 bottles in the automatic sampler. For storms of less than 24 hours in duration, a composite sample will be prepared from the contents of only bottles containing stormwater runoff. At the end of each automatic sampling period, a grab sample of the

receiving water will be collected for analysis of water hardness where appropriate. The physical properties (pH, specific conductance, temperature, and dissolved oxygen) of the major outfall discharge and its receiving water will also be measured with a multi-parameter probe at the time that the automatic sampler is serviced.

2.5.4 Evaluating Monitoring Data

Section D.1 of the Order states: “Beginning Year 3 after Order adoption date (December 16, 2009), a running average of twenty percent or greater of exceedances of any discharge of storm water from the MS4 to waters of the United States that exceed the Storm Water Action Levels (SALs).....will require each Copermittee to affirmatively augment and implement all necessary storm water controls and measures to reduce the discharge of the associated class of pollutants(s) to the MEP standard. The Copermittees must utilize the exceedance information when adjusting and executing annual work plans, as required by this Order. Copermittees shall take the magnitude, frequency, and number of constituents exceeding the SAL(s), in addition to receiving water quality data and other information, into consideration when reacting to SAL exceedances in an iterative manner.”

2.5.5 Follow-up Investigations of SAL Exceedances

Following an exceedance of the stormwater action levels shown in **Table 7**, Permittees perform a preliminary watershed reconnaissance investigation for potential sources. In concert with that effort, the Permittees conduct a follow-up sampling during the next representative storm to assess if the cause of the exceedance is a transient or persistent source of pollution. In the event that an outfall demonstrates a persistent source of pollutants, a more comprehensive investigation into the causes of SAL exceedances will begin following the confirmation sampling event.

Monitoring sites for the SALs program have been sampled a minimum of twice per storm season during the 2010-11, 2011-12, and 2012-13 monitoring years. With the data compiled, the Permittees are able to begin assessing the magnitude, frequency, and number of constituents exceeding the SALs at each outfall. Approximately 85 samples of stormwater runoff from SAL locations have been collected since 2010-11. **Table 8** is a summary of the statistical analysis of the data.

2.5.6 Contingency for SAL Exceedances

If a source cannot be readily identified and eliminated, or cannot be shown to be non-anthropogenic, an evaluation of the impacts of the SAL exceedances on the receiving waters of the major outfall will be conducted. This evaluation may require additional monitoring of the major outfall and its receiving water. The additional monitoring may include determination of the outfall discharge load during composite sampling periods. If a mass emissions monitoring location is downstream of the major outfall, and the two sites were sampled during the same storm, the respective loads from the two sites will be compared. If a mass emissions monitoring station is not located downstream of the major outfall, supplemental monitoring of the major outfall and the receiving waters will be conducted. This monitoring will include composite sampling of the major outfall and the receiving waters upstream and downstream of the major outfall.

2.6 Non-Stormwater Dry Weather Action Levels

Order R9-2009-002 requires the Permittees to implement a Dry Weather Non-stormwater Discharge Monitoring Program to assess compliance with non-stormwater action levels (NALs) in Section C of the Order. The following subsections describe the NALs monitoring program implemented by the Permittees during the 2011-12 reporting year that will continue during the 2013-14 year.

The NALs program allows the Permittees to address the goals from Attachment E.I.A. of the Order which include:

1. Characterize non-stormwater discharges
2. Identify sources of specific pollutants
3. Prioritize drains and sub-drainage areas that need management actions
4. Detect and eliminate illicit discharges and illicit connections to the MS4
5. Provide information to implement required BMP improvements
6. Assess the overall health of the MS4 during dry weather conditions
7. Assess compliance with Order No. R9-2009-0002

Specifically, the NALs program allows the Permittees to answer the following questions:

1. What is the relative MS4 discharge contribution to the receiving water problem(s) during dry weather conditions?
2. What are the sources of MS4 discharge that contribute to receiving water problem(s)?
3. Are conditions getting better or worse?

2.6.1 Site Selection

According to Order R9-2009-0002, monitoring locations must be major outfalls⁵, constituting a representative percentage of the major outfalls within each hydrologic subarea (HSA), or other outfall points identified by the Permittees as potential high risk sources of polluted effluent. Monitoring of the discharges from the major outfalls will include **Table 2** constituents, chloride, sulfate, and additional markers that are indicative of human bacteria sources. Water hardness of the receiving waters upstream of the major outfalls will be monitored to compute the site-specific NALs for total recoverable metals in discharges to inland surface waters.

The current NALs monitoring program consists of drains that were selected as follows:

- Drawn from the “targeted” sites monitored during the Third Term MS4 Permit Dry Weather Outfall Reconnaissance program
- Randomly selected major outfalls from HSAs that had no targeted sites from the Third Term MS4 Permit Dry Weather Outfall Reconnaissance program

All of these drains had to meet the following criteria:

- The site was added to the Third Term MS4 Permit Dry Weather Outfall Reconnaissance program to characterize the MS4, or because higher potential for an ID/IC was suspected in the respective watershed area

- The drain must have sampleable receiving waters upstream and downstream of the discharge from the outfall in order to assess the impact of the major outfall on the receiving water

The random selection process was repeated until an appropriate location could be identified. **Table 9** is a list of the NALs monitoring sites. Sites that have historically been dry or have had diversions put in place may be in line for replacement with another site within its representative HAS boundary. Continuous evaluation of NALs sites during the 2013-14 monitoring year will occur.

2.6.2 Non-stormwater Action Levels

The NALs were based on narrative and numeric objectives and criteria as outlined in the San Diego Region Basin Plan, the Water Quality Control Plan for Ocean Waters of California (Ocean Plan), and The State Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays and Estuaries (State Implementation Plan or SIP). **Table 10** contains the NALs for general constituents in major outfalls discharging to inland surface waters.

The NALs for total recoverable metals are variable depending on the receiving water matrix. For cadmium, copper, chromium III, lead, nickel and silver in discharges to inland surface waters, the NAL is site specific and is dependent on the receiving water hardness. These NALs were derived from the California Toxics Rule (CTR) criteria for the protection of freshwater aquatic life. **Table 11** lists the NALs for Total Recoverable Metals. **Table 12** lists the NALs for discharges to Dana Point Harbor. **Table 13** list NALs for discharges to the surfzone.

2.6.3 Monitoring Protocols

Monitoring will be conducted using both field and laboratory-based analyses to assess MS4 dry weather discharges. In addition to the required measurements of constituents and physical properties of the discharges from the major outfalls as described in **Tables 2**, the routine monitoring will include assessments of receiving water quality. These assessments will consist of collection of aqueous samples for analyses of NAL constituents (**Table 10-13**) and in-situ measurements of dissolved oxygen, pH, specific conductance, and temperature.

Monitoring at each site consists of a combination of in-situ field measurements, grab samples for laboratory analyses, MS4 discharge measurements, and assessing the impact of MS4 discharges on receiving waters. Field analyses are conducted for turbidity, surfactants, pH, specific conductance, temperature, dissolved oxygen, and water hardness. Grab samples are collected for laboratory analyses as shown in **Table 2**.

Any results indicative of an illicit discharge at the time of a site visit are immediately referred to the respective Permittee for follow-up investigation.

2.6.4 Responses to NAL Exceedances

Section C.2. of Order R9-2009-0002 states that “In response to an exceedance of a NAL, each Copermittee must investigate and identify the source of the exceedance in a timely manner. However, if any Copermittee identifies exceedances of NALs that prevent them from adequately conducting source investigations in a timely manner, then the Copermittees may submit a prioritization plan and

timeline that identifies the timeframe and planned actions to investigate and report their findings on all of the exceedances. “

Monitoring results from measurements conducted in the field (turbidity, dissolved oxygen, MBAS, and pH) exceeding an action level will be provided to the Permittee with jurisdiction immediately. Those results requiring analytical services by contract laboratories (total nitrogen, total phosphorus, total coliform, fecal coliform, *Enterococcus*, hexavalent Cr, total recoverable Cd, Cu, Cr, Pb, Ni, Ag and Zn) will be distributed to the Permittees when all data is available.

Once notified of a NAL exceedance, the respective Permittee will determine the need to initiate a source investigation. **Figure 2** is a flow-chart that provides a general outline of the actions that will be taken in the event of a NAL exceedance. In the event of notification of multiple NAL exceedances (single outfall or multiple outfalls within jurisdiction) the Permittee may elect to establish a prioritization plan for responding to each exceedance.

In order to help Permittees assess the relative levels of impact of dry weather MS4 discharges on receiving waters, assessment of the receiving water will be performed, whenever feasible, in conjunction with the outfall monitoring. For inland surface waters these assessments will be made 25 feet upstream and 25 feet downstream of the stormdrain-receiving waters interface. A sample of the receiving water upstream of the discharge will be analyzed for water hardness. For discharges to the coastal zone the measurements will be made 25 yards upcoast and 25 yards downcoast of the stormdrain.

The results of the receiving water assessments will be used by the Permittees in their annual Program Effectiveness Assessments (PEAs) to document (requirement of Section C.3 of Order R9-2009-0002) any impacts from major discharges containing constituents above the NALs, including the subsequent actions taken to identify and to effectively prohibit the non-stormwater discharge.

The Permittees have developed a model source identification guidance manual titled “San Diego Region Dry Weather Non-stormwater Action Level (NAL) Source Identification Guidance”. The flow charts in the guidance manual are designed to assist the Permittees in reaching one of the following conclusions regarding a NAL exceedance:

- Natural in origin and conveyance
- Illegal discharge/illicit connection
- Exempt category of non-stormwater discharges
- Violation of a separate NPDES/WDR permit
- Unidentified source or activity

2.7 Other Special Studies

2.7.1 Aliso Creek Bacteriological Investigation

The Aliso Creek watershed stakeholders will continue their efforts under the Aliso Creek 13225 Directive Revised Monitoring Program Design.

2.7.2 Stormwater Monitoring Coalition Regional Monitoring of Southern California Coastal Watersheds (see also Regional Monitoring Programs)

The Permittees will continue to participate in the SMC's 5-year regional monitoring effort by conducting bioassessments and physical habitat assessment at sites selected by the SMC (see Section 2.2 of this plan).

2.7.3 Sediment Toxicity Study

Order R9-2009-0002 requires a special study to assess the linkage between sediment chemistry and toxicity with impacts on stream benthic macroinvertebrates (see Section 2.2 of this plan)

2.7.4 Trash and Litter Impairment Investigation

The Permittees initiated a special study during the 2010-11 monitoring year, one year ahead of schedule. The Permittees will continue to implement the special study during the 2013-14 year as part of the continued data collection effort towards assessing the impacts of trash on receiving waters

2.7.5 Site Selection

Monitoring locations were chosen to assess trash within receiving waters on a watershed based scale. The current trash and litter monitoring program consists of in stream locations that were randomly selected from the SMC Regional Monitoring Program of Southern California's Coastal Watersheds.

Table 1 – Fourth Term MS4 Permit Monitoring Program Elements

Program Element	Frequency per year per site	No. of Sites	Chemistry	Toxicity Testing	Biology*	Physical Habitat
Mass Loading Stations	4	6	X	X	X	
Urban Stream Bioassessment	1	10	X	X	X	X
Ambient Coastal Receiving Waters	2	11	X	X	X	
Coastal Storm Drain Outfall Monitoring	52	52			X	
Stormwater Action Levels	2	12	X			
Non-stormwater Action Levels	2	25	X		X	
Additional Special Studies						
Aliso Creek Bacteria Investigation		TBD			X	
Trash/Litter Impairment		TBD				X
Sediment Chemistry/Toxicity	1	4	X	X		
*Includes Indicator Bacteria						
TBD - To be determined by project workgroup or as defined in the program specific monitoring plan						

Table 2 – Aqueous Chemistry Monitoring Requirements (for the MLS, USB, ACRW, NALs, and SALs* Programs)

Conventional	Pesticides	Metals (total & dissolved)	Bacteria
TDS	Diazinon	Arsenic	Total Coliform
TSS	Chlorpyrifos	Cadmium*	Fecal Coliform
Turbidity*	Malathion	Chromium	<i>Enterococcus</i>
Hardness	Carbamates**	Copper*	
pH, SC, T, DO	Pyrethroids**	Lead*	
Total P*		Nickel*	
ortho P		Selenium	
Nitrate + Nitrite*		Zinc*	
Ammonia/TKN			
BOD ₅ / COD			
TOC / DOC			
MBAS / O&G			
*Stormwater Action Levels Program required constituents			
**Required only in Prima and Segunda Deshecha watersheds			
Samples of the major outfall discharges and their receiving waters will be analyzed using USEPA or Standard Methods implemented for the Orange County Stormwater Program.			

Table 3 – Toxicity Testing Requirements

Program Component	Dry Weather		Stormwater	
	FW Orgs	Marine Orgs	FW Orgs	Marine Orgs
MLS	2 chronic 2 acute	1 chronic**	2 acute	2 chronic 1 acute
USB	2 chronic* 2 acute*	N/A	N/A	N/A
ACRW	N/A	2 chronic 1 acute	N/A	2 chronic 1 acute
Sed Tox Spec Study	1 chronic 1 acute	N/A	N/A	N/A

* USB at Aliso Creek watershed sites must include Fathead Minnow
 ** DW toxicity at MLS sites may be omitted if flow is diverted or if covered by ACRW program at mouth of channel

Table 4 – Toxicity Testing at Mass Loading Stations

	Freq	Required Tests	Third MS4 Term Permit	Fourth Term MS4 Permit
Dry	2	2 chronic FW 2 acute FW 1 chronic SW*	N/A N/A N/A	CS, SG, FHMS@ CS, HS, FHMS@ MS, SUF
Storm	2	2 chronic SW 1 acute SW 2 acute FW	MS, MG, SUD, SUF MS N/A	MS, SUF MS CS, HS

*Surfzone near outlet Prima Deschecha Channel only
 @ Aliso Creek only
 CS – *Ceriodaphnia* survival; SG – *Selenastrum* growth; FHMS – fathead minnow survival;
 SUD – sea urchin embryo development; SUF – sea urchin fertilization; HS – *Hyaella azteca* survival; MS – mysid survival; MG – mysid growth

Table 5 – Toxicity Testing at ACRW Sites

	Freq	Required	Third Term MS4 Permit	Fourth Term MS4 Permit
Dry	2	2 chronic SW 1 acute SW	MS, MG, SUF, SUD MS	MS, SUF MS
Storm	2	2 chronic SW 1 acute SW	MS, MG, SUF, SUD MS	MS, SUF MS

Table 6 – Stormwater Action Levels (SAL) MS4 Monitoring Locations

Outfall	Drains to	Jurisdiction	HA	HSA
J05P01*	Aliso Creek	LH	Laguna	Aliso
K01TBN1*	Salt Creek	LN	Laguna	Dana Point
I02P14*	Pacific Ocean	AV	Laguna	Laguna Beach
IRVCOVE	Pacific Ocean	LB	Laguna	San Joaquin Hills
No outfall met selection criteria			Mission Viejo	Gobernadora
No outfall met selection criteria			Mission Viejo	Middle San Juan
L02P25*	Trabuco Creek	RSM	Mission Viejo	Middle Trabuco
L01TBN1	San Juan Creek	SJC	Mission Viejo	Ortega
L02P02*	Trabuco Creek	SJC	Mission Viejo	Lower San Juan
L03P09	Oso Creek	MV	Mission Viejo	Oso
L08TBN2*	Bell Canyon Creek	RSM	Mission Viejo	Upper San Juan
No outfall met selection criteria			Mission Viejo	Upper Trabuco
M00P05*	Pacific Ocean	DP	San Clemente	Prima Deshecha
M00TBN1	Segunda Deshecha	SC	San Clemente	Segunda Deshecha
M03P01	Christianitos Creek	SC	San Mateo Canyon	Undefined

* New sampling location for 2013-14 within the representative HSA.

Table 7 - Stormwater Action Levels

Constituent	Units	SAL
Turbidity	NTU	126
Nitrate+Nitrite as N	mg/L	2.6
P Total	mg/L	1.46
Cd Total	ug/L	3.0
Cu Total	ug/L	127
Pb Total	ug/L	250
Ni Total	ug/L	54
Zn Total	ug/L	976

Table 8 - SAL Stormwater Sampling Statistics from 2010 - 2013 Storm Seasons

Constituent	Units	N	Min	Max	Median	90 th percentile	%>SAL
Turbidity	NTU	84	4.0	190	24	79	3.6%
Nitrate+Nitrite as N	mg/L	82	0.3	3.0	0.9	2.0	3.0%
P Total	mg/L	82	0.18	3.27	0.48	0.79	1.2%
Cd Total	ug/L	82	<0.5	3.3	0.5	1.7	2.4%
Cu Total	ug/L	83	13	160	35	88	3.6%
Pb Total	ug/L	83	<0.5	11	2.0	5.2	0.0%
Ni Total	ug/L	83	1.3	28	4.2	13	0.0%
Zn Total	ug/L	83	16	320	56	118	0.0%

N= number of samples

Table 9 – Non-stormwater Action Level Monitoring Sites

Site Code	Type	Receiving Water	HSA	HA
AVJ01P27	T	Aliso Creek	Aliso	Laguna
AVJ01P28	T	Aliso Creek	Aliso	Laguna
COL02P55	R	Trabuco Creek	Middle Trabuco	Mission Viejo
COL07P16		Canada Gobernadora	Gobernadora	Mission Viejo
DPL01S02	T	San Juan Creek	Lower San Juan	Mission Viejo
LBI02@CANAR		Laguna Canyon Wash	Laguna Beach	Laguna
LBIRVCOVE		Pacific Ocean	San Joaquin Hills	Laguna
LFJ01P01	T	Aliso Creek	Aliso	Laguna
LFJ01P05	T	Aliso Creek	Aliso	Laguna
LHJ05P01	T	Aliso Creek	Aliso	Laguna
LHLO4P02		La Paz Creek	Oso	Mission Viejo
LNJ03P13	T	Sulphur Cr	Aliso	Laguna
LNK01P07	R	Salt Creek	Dana Point	Laguna
LWJ01ASVM	T	Aliso Creek	Aliso	Laguna
MVJ01P03	T	Aliso Creek	Aliso	Laguna
MVL02P14		Trabuco Creek	Middle Trabuco	Mission Viejo
MVL03P09	T	Oso Creek	Oso	Mission Viejo
RSML11P01	T	Tijeras Creek	Upper San Juan	Mission Viejo
SCBS@M02	T	Segunda Deschecha Channel	Segunda Deshecha	San Clemente
SCM01@CGV		Prima Deshecha Channel	Prima Deshecha	San Clemente
SCM03P01	T	Christianitos Creek	Undefined	San Mateo
SJCL01@CC	T	San Juan Creek	Lower San Juan	Mission Viejo
SJCL01S01	T	San Juan Creek	Lower San Juan	Mission Viejo
SJCL01S09		San Juan Creek	Ortega	Mission Viejo
SJCL01TBN1	T	San Juan Creek	Lower San Juan	Mission Viejo

R – Random Site, T – Targeted from Third Term MS4 Permit Dry Weather Reconnaissance Program

Table 10 – NALs for Discharges to Inland Surface Waters

Parameter	Units	AMAL	MDAL	Inst. Max	Basis
Fecal Coliform	MPN(CFU)/100 ml	200 ^A , 400 ^B			BPO
<i>Enterococci</i>	MPN(CFU)/100 ml	33		104 ^C	BPO/OP
Turbidity	NTU		20		BPO
pH	Units	Within limit of 6.5 to 8.5 at all times			BPO
Dissolved Oxygen	mg/L	≥5.0 in WARM waters; ≥6.0 in COLD waters			BPO
Total Nitrogen	mg/L		1.0		BPO
Total Phosphorus	mg/L		0.1		BPO
MBAS	mg/L		0.5		BPO

A – Based on a minimum of not less than 5 samples in a 30-day period

B – No more than 10% of the total samples may exceed 400/100 ml during any 30-day period
 C – This value has been set to Ocean Plan criteria for Designated Beach Areas
 BPO – Basin Plan Objective
 OP – Ocean Plan
 MDAL – Maximum Daily Action Level
 AMAL – Average Monthly Action Level

Table 11 – NALs for Total Recoverable Metals

Parameter	Units	FW CTR		SW SIP/CTR	
		MDAL	AMAL	MDAL	AMAL
Cadmium	ug/L	*	*	15.3	7.6
Copper	ug/L	*	*	5.8	2.9
Chromium III	ug/L	*	*	-	-
Chromium VI	ug/L	16	8.1	82.5	41.1
Lead	ug/L	*	*	14	7.0
Nickel	ug/L	*	*	13.6	6.8
Silver	ug/L	*	*	2.2	1.1
Zinc	ug/L	*	*	95	47.3

*Based on receiving water hardness; see formulas in Section 3.6.2

Table 12 – NALs for Discharges to Enclosed Bays

Parameter	Units	AMAL	MDAL	Inst Max	Basis
Total Coliform	MPN(CFU)/100 ml	1000	-	10,000	BPO
Fecal Coliform	MPN(CFU)/100 ml	200 ^A ,400 ^B	-		BPO
Enterococcus	MPN(CFU)/100 ml	35	-	104 ^C	BPO
Turbidity	NTU	75	-	225	OP
Total Metals	ug/L	See SW SIP/CTR above			SIP
pH	Units	Within 6.0 to 9.0 at all times			OP

A – Based on a minimum of not less than 5 samples in a 30-day period
 B – No more than 10% of the total samples may exceed 400/100 ml during any 30-day period
 C – Designated Beach Areas
 BPO – Basin Plan Objective
 OP – California Ocean Plan 2005
 SIP – Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays and Estuaries of California
 MDAL – Maximum Daily Action Level
 AMAL – Average Monthly Action Level

Table 13 – NALs for Discharges to the Surfzone

Parameter	Units	AMAL	MDAL	Inst Max	Basis
Total Coliform	MPN(CFU)/100 ml	1000	-	10,000 1000 ^A	OP
Fecal Coliform	MPN(CFU)/100 ml	200 ^B	-	400	OP
<i>Enterococcus</i>	MPN(CFU)/100 ml	35	-	104 ^C	OP
A – Total coliform density shall not exceed 1000/100 ml when the fecal/total ratio exceeds 0.1					
B – During any 30-day period					
C – Designated Beach Areas					
OP – California Ocean Plan 2005					

REFERENCES

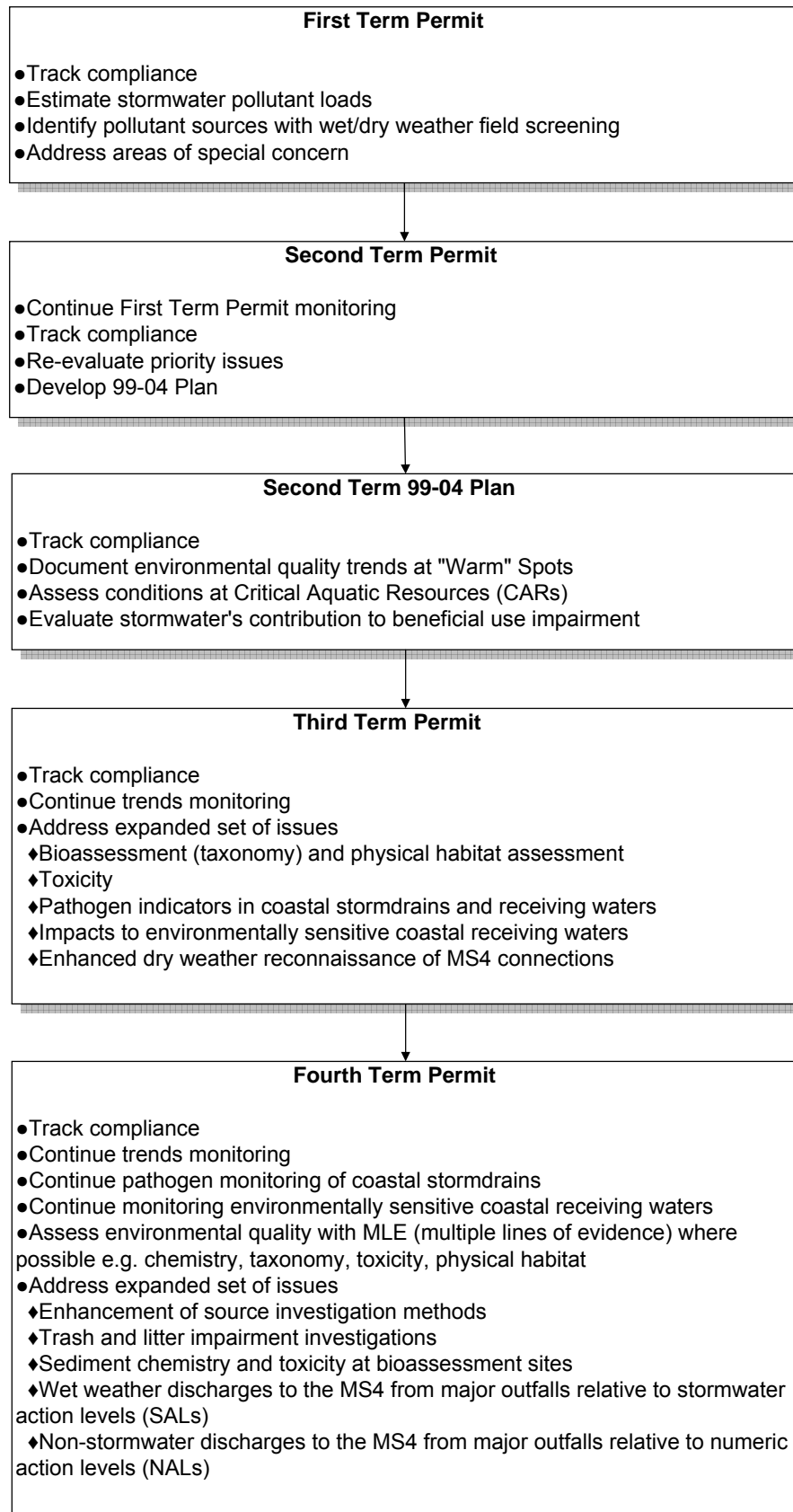
- 1) 40 CFR 122.21(g)(7) *Storm water discharges*. For storm water discharges, all samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inch and at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where feasible, the variance in the duration of the event and the total rainfall of the event should not exceed 50 percent from the average or median rainfall event in that area.
- 2) Ode, P.R.. 2007. Standard operating procedures for collecting macroinvertebrate samples and associated physical and chemical data for ambient bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001.
- 3) ¹ EPA, 1999. *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers*. EPA-841-B-99-002.
- 4) Fetscher, E. A., and K. McLaughlin. 2008. Incorporating bioassessment using freshwater algae into California's Surface Water Ambient Monitoring Program (SWAMP). Southern California Coastal Water Research Project. Costa Mesa, CA
- 5) ¹From 40 CFR Part 122.26 Part (b)(5) and (b)(6)

Major municipal separate storm sewer outfall (or "major outfall") means a municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres); or for municipal separate storm sewers that receive storm water from lands zoned for industrial activity (based on comprehensive zoning plans or the equivalent), an outfall that discharges from a single pipe with an inside diameter of 12 inches or more or from its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or more).

- 6) *Major outfall* means a major municipal separate storm sewer outfall.

- 7) *Storm water discharges.* For storm water discharges, all samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inch and at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. 40 CFR 122.21(g)(7)

Figure 1
Evolution of NPDES Municipal Stormwater Permit Monitoring Program



"Warm" Spots refers to sites with pollutant levels that were elevated relative to long-term County averages
 CARs refers to critical aquatic resources, sites with greater beneficial use potential

Figure 2

