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March 21, 2023
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Memorandum

To: *Stuart Goong, Beatrice Mussachia*
County of Orange
OC Watersheds Program

From: *Thomas Lo, Donald Schroeder*
Camp Dresser & McKee Inc.

Date: *May 13, 2010*

Subject: *Source Control Plan and Monitoring Program for Coyote Creek Watershed Metals TMDL within Orange County*

The Orange County NPDES Municipal Stormwater Permit (Order No. R8-2009-0030) requires Permittees with discharges tributary to Coyote Creek to develop and implement a constituent-specific source control plan to include a monitoring program to control the discharge of copper, lead and zinc into Coyote Creek and other tributaries in Orange County that discharge into the San Gabriel River. To support the fulfillment of these Permit requirements, Camp Dresser & McKee, Inc. (CDM) conducted several tasks as a supplement to the North Orange County Integrated Resources Water Management Plan prepared for Orange County in 2008. The tasks conducted include:

- Task 4 – Review Metals Data
- Task 5.1 - Coyote Creek Water Quality Monitoring Plan
- Task 5.2 – Quality Assurance Project Plan
- Task 5.3 to Task 5.5 – Subwatershed Prioritization, Sources and Pathways of Metals and BMP Selection and Evaluation
- Task 5.6 – Monitoring Report Outline

The results of the work conducted under these tasks are presented in the following technical memoranda and organized in the following manner:

- Section 1 – Review Metals Data. Existing metals data for Coyote Creek watershed were evaluated to determine if metals (copper, lead, and zinc) exceedences are occurring in the

Coyote Creek watershed within the Orange County jurisdictional boundary. This section presents a summary of the findings of the data review.

- Section 2 – Subwatershed Prioritization, Sources and Pathways of Metals, and BMP Selection and Evaluation. An assessment was prepared that evaluated the major subwatersheds in the Coyote Creek watershed to identify potential sources and cause of elevated metals concentrations in the receiving waters and potential BMPs that could be modified or initiated in the watersheds to reduce metals loadings to the receiving waters. This section presents the results of that assessment.

- Section 3 – Coyote Creek Water Quality Monitoring Plan. Based on an understanding of the TMDL requirements and the findings of Sections 1 and 2, a monitoring plan was prepared to provide specific recommendations for the next 2-3 years and general guidelines for tracking and refining the plan based on the monitoring results of the first several years.

  A preliminary Quality Assurance Project Plan (QAPP) that supplements the Monitoring Plan has been prepared in conformance to the Surface Water Ambient Monitoring Program (SWAMP) compatible template as established by the State Water Resource Control (SWRCB). This document is submitted under separate cover.

- Section 4 – Monitoring Report Outline. This annotated outline was prepared to provide a suggested framework for reporting of monitoring data and assessment of progress for the source control activities once the Monitoring Plan is implemented.

Section 1

Review Metals Data

CDM

Technical Memorandum

To: *Stuart Goong, Beatrice Mussachia*
County of Orange
OC Watersheds Program

From: *Thomas Lo, Donald Schroeder*
Camp Dresser & McKee Inc.

Date: *May 13, 2010*

Subject: *Coyote Creek Source Control Plan – Review Metals Data*

Introduction

The Orange County NPDES Municipal Stormwater Permit (Order No. R8-2009-0030) requires Permittees with discharges tributary to Coyote Creek to develop and implement a constituent-specific source control plan including a monitoring program to control the discharge of copper, lead and zinc into Coyote Creek and other tributaries in Orange County that discharge into the San Gabriel River. Coyote Creek has wet weather technical total maximum daily loads (TMDLs) for copper, lead, and zinc and a dry weather copper wasteload allocation to help restore and protect the San Gabriel River estuary. A technical TMDL is one that does not include an implementation plan or compliance schedule. The Los Angeles Regional Water Quality Control Board (LARWQCB) staff is developing a TMDL implementation plan for the San Gabriel River and Impaired Tributaries TMDL.

Prior to development of a TMDL Implementation Plan, the County of Orange, as Principal Permittee, has requested CDM prepare a Source Control Plan to include a review of existing metals data for copper, lead, and zinc to determine if metals exceedances are occurring in the Coyote Creek watershed within the Orange County jurisdictional boundary and to prepare a monitoring program for continued monitoring.

The Source Control Plan will aid in identifying potential localized sources of metals in the watershed and determine what source control measures should be undertaken and if necessary what treatment Best Management Practices (BMPs) can be implemented to reduce metal loads in and from the watershed to achieve the TMDL targets for Coyote Creek.

Coyote Creek Metals TMDL

Biennially, each Regional Board prepares a list of impaired waterbodies in the region, referred to as the 303(d) list (a reference to the applicable section). The 303(d) list identifies the impaired waterbody and by which pollutant(s) it is impaired. All waterbodies on the 303(d) list are subject to TMDL development. A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still meet the applicable water quality standard for that pollutant. Depending on the nature of the pollutant, TMDL implementation may require a cap on pollutant contributions from point sources (wasteload allocation), nonpoint sources (load allocation), or both.

The LARWQCB prepared TMDLs to satisfy a consent decree requiring TMDLs for metals in the San Gabriel River watershed by March 2007. The LARWQCB public noticed the TMDLs on May 5, 2006 and adopted them on July 13, 2006. However, because the State could not complete its process for adopting these TMDLs and obtain EPA approval in time to meet the consent decree deadline, EPA agreed to establish them. In March 2007, USEPA Region 9 established TMDLs for Metals and Selenium for the San Gabriel River and its Impaired Tributaries [1].

Since Coyote Creek is a tributary of the San Gabriel River, wet weather technical TMDLs were established with wasteload allocations for copper, lead, and zinc for Coyote Creek (Table 1). A dry weather technical TMDL was established for the San Gabriel River Estuary. The San Gabriel River Estuary numeric target of 3.7 µg/L (total recoverable) is based on water quality objectives established in the California Toxics Rule (CTR) for saltwater (chronic). Since Coyote Creek is an upstream contributor to the San Gabriel River, a dry weather wasteload allocation (0.941 kg/day) was determined for Coyote Creek, corresponding to a concentration-based allocation of 20 µg/L (USEPA 2007). This wasteload allocation accounts for dilution effects of WRP effluent and therefore is protective of the target in the San Gabriel River Estuary.

Table 1
Numeric Target (total recoverable) and Wasteload Allocations for Coyote Creek

Condition	Total Copper		Total Lead		Total Zinc	
Dry Weather	20 µg/L	0.941 kg/day	--	--	--	--
Wet Weather	27 µg/L [(1)]	9.41 kg/day	106 µg/L [(1)]	36.9 kg/day	158 µg/L [(1)]	55.0 kg/day

[1] Copper, Lead, and Zinc numeric targets (µg/L, total) are hardness dependent and were calculated based on a mean hardness of 105 µg/L for $CaCO_3$.

[1] USEPA Region IX, Total Maximum Daily Loads for Metals and Selenium, San Gabriel River and Impaired Tributaries, March 26, 2007

Coyote Creek Watershed

The Coyote Creek watershed drains approximately 165 square miles of densely urbanized residential, commercial, and industrial development, along with some areas of open space and natural lands in the upper watershed. The Coyote Creek watershed includes portions of unincorporated Los Angeles and Orange Counties, in addition to 21 cities in the two Counties and one city in San Bernardino County (see Figure 1). Table 2 characterizes the distribution of jurisdictional area within the Coyote Creek watershed, including areas downstream of the confluence with the San Gabriel River in the Los Alamitos subarea.

The major creeks and channels of the watershed include Lower Coyote Creek, North Fork Coyote Creek, Brea Creek, Fullerton Creek, Carbon Creek, and Moody Creek. The Coyote Creek watershed is drained by Coyote Creek, and four principal tributaries; Carbon Creek, North Fork Coyote Creek, Fullerton Creek, and Brea Creek. Carbon Creek, Fullerton Creek, and Brea Creek drain MS4s in Orange County and the North Fork Coyote Creek drains LA County MS4s.

Coyote Creek is primarily a concrete-lined trapezoidal channel that flows along the Los Angeles County and Orange County jurisdictional border and is tributary to the San Gabriel River in the Lower Coyote Creek watershed. The upper reach of Coyote Creek is located within Orange County and under the jurisdiction of the Santa Ana Regional Water Quality Control Board (SARWQCB). Major tributaries to Coyote Creek are also concrete lined channels which receive runoff from MS4 drainage systems mostly comprised of underground storm drains.

Table 2
Jurisdictional Area in Coyote Creek Watershed

Jurisdiction	Acreage	Percent of Watershed
Orange County	53,873	53.6%
Anaheim	8,780	8.7%
Brea	5,522	5.5%
Buena Park	6,601	6.6%
Cypress	3,076	3.1%
Fullerton	14,347	14.3%
La Habra	4,731	4.7%
La Palma	1,137	1.1%
Los Alamitos	2,386	2.4%
Placentia	2,336	2.3%
Seal Beach	1,859	1.8%
Unincorporated	3,098	3.1%
Los Angeles County	44,519	44.3%
Artesia	576	0.6%
Cerritos	3,670	3.6%
Diamond Bar	4,589	4.6%
Hawaiian Gardens	612	0.6%
La Habra Heights	3,236	3.2%
La Mirada	5,031	5.0%
Lakewood	507	0.5%
Long Beach	1,760	1.7%
Norwalk	3,181	3.2%
Santa Fe Springs	3,648	3.6%
Whittier	7,406	7.4%
Unincorporated	10,304	10.2%
San Bernardino County	2,032	2.0%
Chino Hills	2,032	2.0%

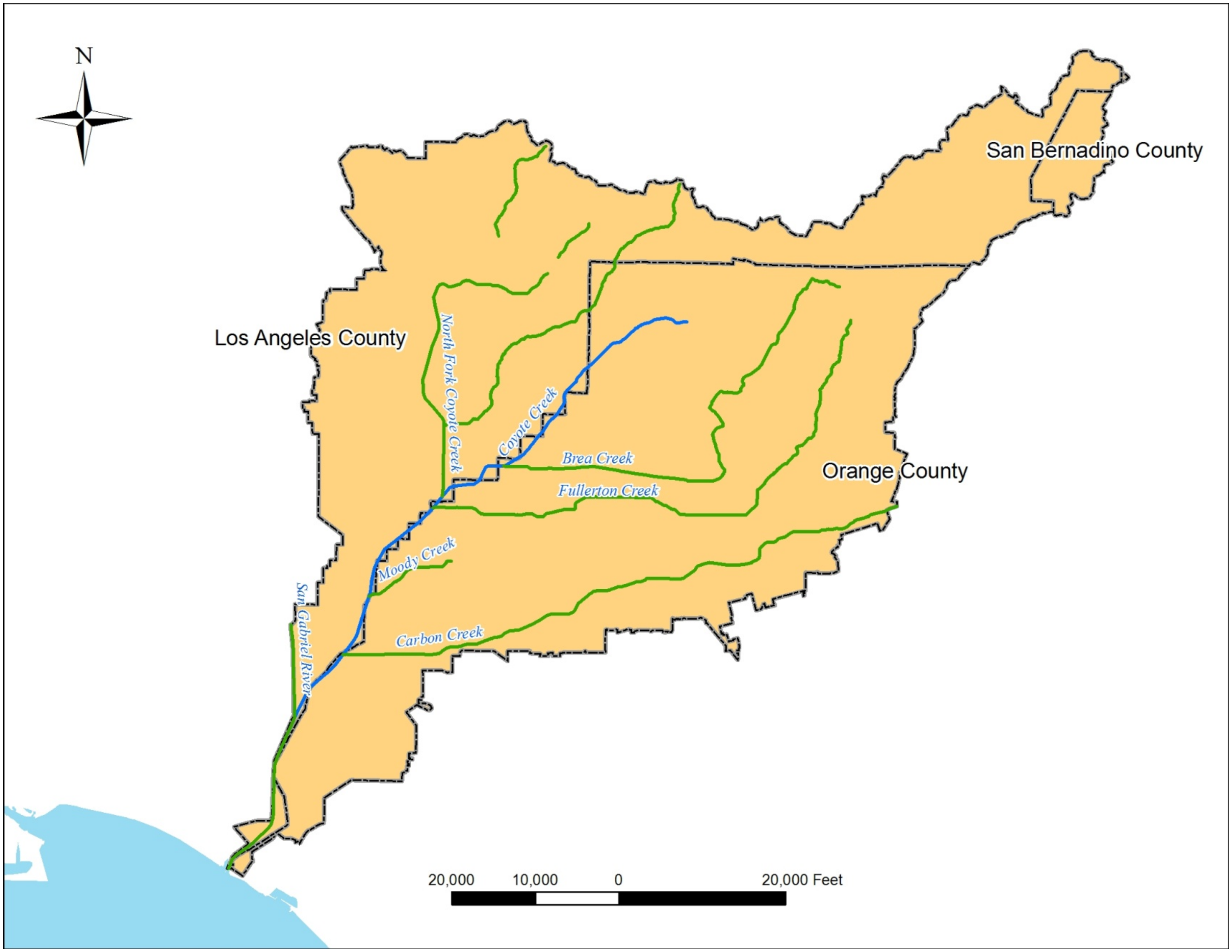

Figure 1
Coyote Creek Watershed and Major Tributaries

Flow Data Review

Dry weather runoff in the Coyote Creek watershed is comprised of low or intermittent volume permitted discharges located throughout the watershed and urban nuisance flows such as from over- irrigation and car washing. In total, runoff in Coyote Creek at Spring Street (which comprises most of the entire watershed) ranges from 15 to 30 cfs depending upon season and status of permitted discharges. This dry weather flowrate is comparable to other southern California watersheds that do not include a major permitted discharge (e.g. effluent from a water reclamation plant (WRP)). Downstream of Spring Street, the Long Beach WRP discharges effluent to Coyote Creek, with a capacity of up to 25 MGD. This review of water quality data does not include an assessment of this discharge and its effect on water quality at the confluence with the San Gabriel River. The TMDL employed a model to estimate the role of seven WRPs in the San Gabriel / Coyote Creek watersheds for dry weather flow and to develop dry weather wasteload allocations for copper from MS4 permittees.

Samples collected by Orange County in the past five years characterize the concentration of metals in dry weather runoff from different parts of the MS4 system. Field measurement of flow at monitored sites provides an approximation of the relative fraction of total dry weather runoff that was sampled compared with the entire Coyote Creek watershed above Spring Street (Table 3).

Table 3
Measured Dry Weather Runoff at Sampled Sites in Orange County

Site ID	Description	Approximate Dry Weather Runoff (cfs)
ANACIT@B01	Carbon Creek at W. La Palma Ave	0.240
BPARA01	Storm Drain outfall to Coyote Creek	0.011
BPDSA01	Fullerton Creek at Dorothy Ln	0.084
BRRC@I-90	Randolph Channel	0.260
CYPB00P01	Storm Drain outfall to Coyote Creek	0.009
CYPB01PS1	Storm Drain outfall to Carbon Creek	0.003
CYPB01PS2	Storm Drain outfall to Carbon Creek	<0.001
FULA03S05	Kimberly Creek Channel	0.037
FULB01@SCO	Carbon Creek at State College Blvd	n/a [1]
LAFPS@A01	Storm Drain outfall to Coyote Creek	<0.001
LHA01P10	Storm Drain outfall to Coyote Creek	0.209
LHA07XXX	Storm Drain outfall to Coyote Creek	0.045
LPB02P04	Storm Drain outfall to Moody Creek	0.595
	Subtotal of Monitored Drainages	1.5
LACFCD S13	Coyote Creek Watershed	23

1) Site is upstream of Carbon Creek at W. La Palma, therefore flow is not accounted

Wet weather flow in the Coyote Creek watershed is typical of most urbanized southern California watersheds. Storm event runoff increases flow rates in Coyote Creek and its major tributaries several orders of magnitude for short durations. During these wet weather conditions, pollutants accumulated on the watershed are mobilized and and conveyed to receiving waterbodies and can increase the concentration of metals for a short period. Flow monitoring locations in the Coyote Creek watershed include the LACFCD station at Spring Street (Station F354-R). This site records daily runoff and has been in operation since the 1930s. LACFCD collects mass emission data for many pollutants during wet weather events at this location on Coyote Creek to characterize loading from the entire watershed. The TMDL used historical data from this flow gauge to identify a threshold for determining a wet weather event in the watershed of 156 cfs at Spring Street (90th percentile of flow data from 1990-2005).

Orange County operates three flow gauges in the Coyote Creek watershed as part of its annual hydrologic reporting program including Fullerton Creek at Richman, Coyote Creek at Valley View, and Carbon Creek at Bloomfield. Wet weather samples are collected at these flow monitoring locations to estimate pollutant mass emissions from different parts of the Coyote Creek watershed.

Metals Data Review

This section describes the methodology used to evaluate the Coyote Creek watershed's water quality and identify potential hot spots where additional monitoring could be valuable. Water quality samples for copper, lead, and zinc were collected throughout the watershed and compared with site specific TMDL targets to determine whether samples exceeded allowable concentrations. Sample sites were then consolidated based on their subwatersheds and water quality statistics were developed to identify subwatersheds of high metals loading. These results were used to help identify monitoring locations.

There are a total of 19 water quality monitoring stations in the Coyote Creek watershed distributed between the Lower Coyote Creek, Coyote Creek/Brea Creek, North Fork Coyote Creek, Fullerton Creek, and Carbon Creek subwatersheds. Monitoring data at these stations have been collected by Orange or Los Angeles Counties. Some monitoring sites are sampled only during dry weather, while others are sampled during both wet and dry weather. A summary of each monitoring location is provided in Table 4, and a map of the monitoring sites and subwatersheds is shown in Figure 2. Dry weather sampling stations include small outfalls from the storm drain system to Coyote Creek or major tributaries of Coyote Creek and several downstream locations with larger upstream drainage areas. Wet-weather monitoring locations are within Coyote Creek or on major tributaries to Coyote Creek.

Table 4
Summary of water quality monitoring sites within Coyote Creek

Site Description	Site ID	Watershed	Source	Sample Types
Carbon Creek at W La Palma Ave	ANACIT@B01	Carbon Creek	Orange County	Dry
Storm Drain outfall to Coyote Creek	BPARA01	Coyote Creek / Brea Creek	Orange County	Dry
Fullerton Creek at Dorothy Ln	BPDSA01	Fullerton Creek	Orange County	Dry
Randolph Channel	BRRC@I-90	Fullerton Creek	Orange County	Dry
Carbon Creek at Orange Ave	CARB01	Lower Coyote Creek	Orange County	Wet/dry
Coyote Creek at Artesia Blvd	CCBA01	Coyote Creek / Brea Creek	Orange County	Wet/dry
Storm Drain outfall to Coyote Creek	CYPB00P01	Lower Coyote Creek	Orange County	Dry
Storm Drain outfall to Carbon Creek	CYPB01PS1	Carbon Creek	Orange County	Dry
Storm Drain outfall to Carbon Creek	CYPB01PS2	Carbon Creek	Orange County	Dry
Fullerton Creek at Coyote Creek	FCVA03	Fullerton Creek	Orange County	Wet/dry
Fullerton Creek at Richman Ave	FULA03	Fullerton Creek	Orange County	Wet/dry
Kimberly Creek Channel	FULA03S05	Fullerton Creek	Orange County	Dry
Carbon Creek at State College Blvd	FULB01@SCO	Carbon Creek	Orange County	Dry
Storm Drain outfall to Coyote Creek	LAFPS@A01	Carbon Creek	Orange County	Dry
Coyote Creek at Spring Street	LAS13	Lower Coyote Creek	Los Angeles	Wet/dry
North Fork Coyote Creek	LATS17	North Fork Coyote Creek	Los Angeles	Wet/dry
Storm Drain outfall to Coyote Creek	LHA01P10	Coyote Creek / Brea Creek	Orange County	Dry
Storm Drain outfall to Coyote Creek	LHA07XXX	Coyote Creek / Brea Creek	Orange County	Dry
Storm Drain outfall to Moody Creek	LPB02P04	Lower Coyote Creek	Orange County	Dry

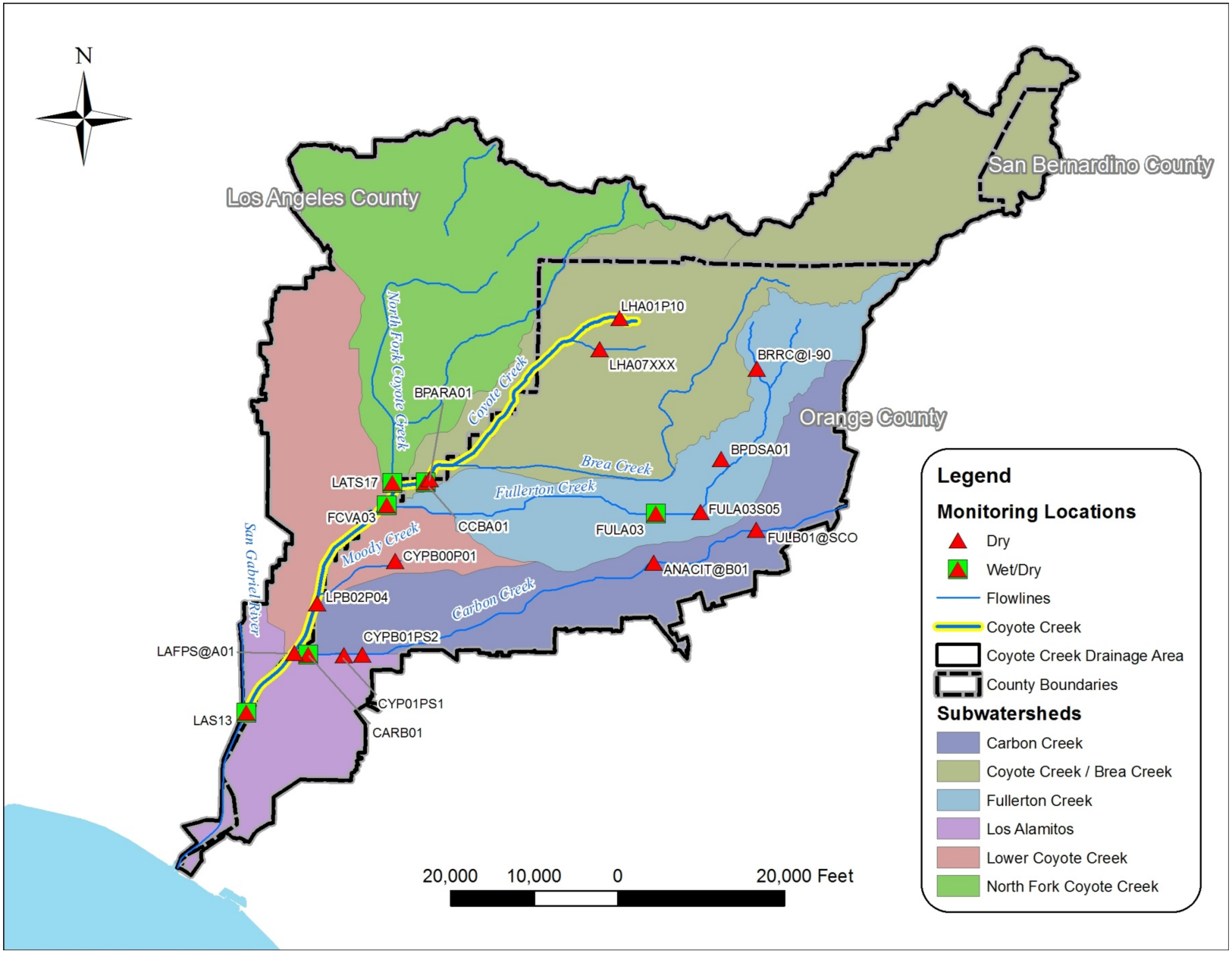

Figure 2
Map of Coyote Creek with Monitoring Locations and Subwatershed Divisions

Methodology for calculating TMDL targets

This section discusses the TMDL targets for Coyote Creek in comparison with historical monitoring data. Hardness dependent numeric targets for total recoverable metals were calculated for each sample to determine the percent of samples with metal concentrations exceeding acute or chronic metal toxicity limits. The methodology for TMDL target calculations is derived from the USEPA's *Region IX Total Maximum Daily Loads for Metals and Selenium for San Gabriel River and Impaired Tributaries* (2007) methodology for calculating TMDL targets.

The metals TMDL for Coyote Creek assigned total recoverable concentration targets for copper during dry weather and for copper, lead and zinc during wet weather. A summary of the TMDLs targets is shown in Table 1. These targets are based on the California Toxics Rule (CTR) criteria and are a function of average hardness concentrations for Coyote Creek. Increasing hardness generally decreases metal toxicity. Hardness of samples collected in recent years varied significantly and was generally higher than the values used to develop the numeric targets in the TMDL. Therefore, a CTR metals analysis was used to develop sample specific TMDL targets for wet weather events to meet acute toxicity requirements. The equation for calculating the criterion maximum concentration (CMC) for a given sample is:

$$CMC = WER \times ACF \times \mathrm{e}^{\mathrm{m_a} \times \ln(\mathrm{hardness}) + \mathrm{b_a}}$$

Where:

CMC = Criterion Maximum Concentration
WER = Water Effects Ratio (assumed to be 1)
ACF = acute conversion factor (to convert from total recoverable to dissolved metals)
m_a = slope factor for acute criteria
b_a = y-intercept for acute criteria

For lead, the acute conversion factor is also based on hardness, and the equation is given by:

$$Lead\ ACF = 1.46203 - [\ln(hardness) \times 0.145712]$$

Coefficients in these equations are specified in the TMDL and are shown in Table 5. Derivation of criterion maximum concentration is based on dissolved metals. CTR defaults for acute conversion factors (ACF) typically overestimate the dissolved fraction of metals in a sample. Thus, in TMDL development, ratios of dissolved to total metals were computed for copper, lead, and zinc, based on historical monitoring data of Coyote Creek (Table 5). To translate from dissolved metals to total recoverable metals, the inverse of the translator is multiplied by the dissolved metal concentration (ex. copper's dissolved to total translator would be 1/0.53 or 1.89).

For dry weather, because the TMDL is based on watershed metals loading determined in the TMDL development process, hardness would not alter the TMDL and therefore the dry weather TMDL target for total recoverable copper is 20 μg/L regardless of hardness within Coyote Creek.

Table 5
Coefficients used in formulas for calculating CTR standards and numeric translator from total recoverable metals to dissolved metals

Metal	Freshwater ACF	m_A	b_A	Freshwater CCF	m_c	b_c	Total to dissolved translator
Copper	0.96	0.9422	-1.7	0.96	0.8545	-1.702	0.53
Lead	0.791 [1]	1.273	-1.46	0.951	1.273	-4.705	0.64
Zinc	0.978	0.8473	0.884	0.946	0.8473	0.884	0.78

1 The Freshwater ACF and CCF for lead are hardness dependent. Conversion factors in this table are based on a hardness value of 100 mg/L as CaCO3.

Results of Monitoring Data and Exceedances

Results of the metals monitoring data are shown in Table 6. For each monitoring location, the 10^{th}, 50^{th}, and 90^{th} percentiles of samples collected at the location portray the range of concentrations at the site. To provide more generalized results, samples within the same subwatershed were aggregated (Table 7). In instances where dry weather monitoring sites were only sampled for dissolved copper and not for total recoverable copper the values were converted to total recoverable metals using the metals translator shown in Table 4. Non-detectable concentrations were assumed to be the minimum detection limit (ex. if the sample detected lead < 0.5 μg/L, the concentration was assumed to be 0.5 μg/L). This conservatively high approach to assigning a value to non-detects had a negligible effect on the results of the study.

Dry weather monitoring data for Kimberly Creek Channel (FULA03S05) showed significantly higher copper concentrations than dry weather samples from other tributaries. This site is downstream of a highly industrial area in Fullerton and could be characterized as a potential hot spot for metals in the Orange County portion of the Coyote Creek watershed. Some sites appeared to have slightly lower dry weather metals concentrations (FULA03-Fullerton Creek at Richman Avenue; CCBA01-Coyote Creek at Artesia Blvd; and CARB01-Carbon Creek at Bloomfield Ave). These monitoring locations are primarily used to collect wet-weather samples. However some post storm samples are typically collected and fall into the dry weather category. These samples, collected immediately following a storm event, have lower concentrations because the storm flush reduced the availability of pollutants for mobilization. Generally, dry weather metals concentrations did not vary substantially between sites, with the exception of site FULA03S05, and were below the wasteload allocation of 20 μg/l.

Table 6
Copper, Lead, and Zinc concentrations for dry and wet weather sampling expressed by percentile for monitoring locations in Coyote Creek [µg/L]

Monitoring Site ID	Dry, Total Copper Percentile			Wet, Total Copper Percentile			Wet, Total Lead Percentile			Wet, Total Zinc Percentile		
	10th	50th	90th	10th	50th	90th	10th	50th	90th	10th	50th	90th
ANACIT@B01	5.6	11.9	21.5	-	-	-	-	-	-	-	-	-
BPARA01	7.1	10.0	51.3	-	-	-	-	-	-	-	-	-
BPDSA01	6.3	14.2	36.6	-	-	-	-	-	-	-	-	-
BRRC@I-90	4.0	6.1	22.1	-	-	-	-	-	-	-	-	-
CARB01	5.3	6.4	16.0	8.0	13.0	42.9	0.7	2.3	12.4	11.0	32.0	177.0
CCBA01	4.6	7.5	8.6	5.5	14.0	42.4	1.1	4.7	15.0	8.6	47.0	220.0
CYPB00P01	6.0	8.5	16.4	-	-	-	-	-	-	-	-	-
CYPB01PS1	10.4	18.5	19.9	-	-	-	-	-	-	-	-	-
CYPB01PS2	12.2	15.7	30.9	-	-	-	-	-	-	-	-	-
FCVA03	12.0	12.0	12.0	8.0	22.0	86.7	1.3	7.9	34.0	21.3	94.5	528.0
FULA03	4.8	6.4	9.5	7.8	18.0	84.6	1.2	7.5	30.7	20.2	68.0	446.0
FULA03S05	20.0	47.2	83.4	-	-	-	-	-	-	-	-	-
FULB01@SCO	4.2	11.9	20.9	-	-	-	-	-	-	-	-	-
LAFPS@A01	11.9	17.1	26.6	-	-	-	-	-	-	-	-	-
LAS13	8.9	11.2	25.1	8.0	14.5	56.0	0.0	1.3	24.7	0.0	61.0	237.0
LATS17	17.0	17.0	17.0	16.4	46.5	104.5	0.7	10.9	50.5	27.8	152.0	915.0
LHA01P10	6.7	10.6	14.8	-	-	-	-	-	-	-	-	-
LHA07XXX	8.7	17.2	27.2	-	-	-	-	-	-	-	-	-
LPB02P04	8.1	13.8	22.6	-	-	-	-	-	-	-	-	-

Table 7
Copper, Lead, and Zinc concentrations for dry and wet weather sampling expressed by percentile of Samples Collected in Major Subwatersheds of Coyote Creek [µg/L]

Subwatershed	Dry, Total Copper Percentile			Wet, Total Copper Percentile			Wet, Total Lead Percentile			Wet, Total Zinc Percentile		
	10th	50th	90th	10th	50th	90th	10th	50th	90th	10th	50th	90th
Carbon Creek	5.2	12.0	22.1	8.0	13.0	42.9	0.5	1.3	11.8	11.0	32.0	177.0
Coyote Creek / Brea Creek	6.3	10.8	25.5	5.5	14.0	42.4	0.0	0.0	2.8	8.6	47.0	220.0
Fullerton Creek	4.7	12.1	58.1	7.7	22.0	86.6	1.9	14.7	46.8	19.8	93.0	524.0
Lower Coyote Creek	8.1	15.9	26.2	8.0	14.5	56.0	0.0	2.5	23.0	0.0	61.0	237.0
North Fork Coyote Creek	17.0	17.0	17.0	16.4	46.5	104.5	0.7	10.9	50.5	27.8	152.0	915.0

Metals concentrations during wet weather were greater than during dry weather in most cases, indicating that mobilization of accumulated metals from the watershed during storm events is a key pathway for metals to the receiving water. Review of the wet-weather data showed that North Fork Coyote Creek had copper and zinc median concentrations of over two to three times greater than other tributaries to Coyote Creek. For the entire Coyote Creek watershed, flow weighted composite samples collected by LACFCD at its mass emission site S13 had median concentrations of 14.5 ug/l total copper and 61 ug/l total zinc. The coefficient of variation for the entire set of data at this point shows that there was high variability; 1.6 and 2.2 for total copper and total zinc, respectively. The 90th percentile of samples collected at this location were approximately four times greater than these values, indicating that some storm events had much higher concentrations than others.

To evaluate compliance with the Coyote Creek wet weather metals TMDL, sample-specific numeric targets were calculated using the hardness dependent CTR equations. Dry weather samples were compared with the wasteload allocation of 20 ug/l for total copper. Exceedances between the monitored concentration and the wet weather computed numeric target and dry weather wasteload allocation were accounted for at each sampling location (Table 8), and for each subwatershed (Table 9). Wet weather samples with no recorded hardness were compared with the TMDL numeric targets for Coyote Creek shown in Table 1.

For dry weather, the frequency of exceedances is very high in the Kimberly Creek Channel tributary to Fullerton Creek, with most samples exceeding 20 ug/l total copper. The source of copper in dry weather runoff from this subwatershed should be further evaluated. When looking at other dry weather data collected by Orange County, exceedances of the wasteload allocation occur, but much less frequently than for Kimberly Creek Channel. Several sites showed no exceedences of the dry weather wasteload allocation. These were mostly samples collected following a storm event, where the storm flush could have reduced the mass of metals available for mobilization.

More frequent exceedances of wet weather numeric targets occurred in North Fork Coyote Creek and Fullerton Creek compared to Carbon Creek or the main stem of Coyote Creek. Wet weather samples were collected at two locations along Fullerton Creek over the past five years. Comparing these two datasets suggests that runoff from the portion of the subwatershed downstream of Richman Ave may contribute more metals load from the Fullerton Creek watershed to Coyote Creek. Lastly, there were very few samples where numeric targets for total lead were exceeded. These samples were mostly part of the "first flush" of a storm event, occurring over the first hour of wet weather runoff. Therefore, lead is not considered a significant water quality issue for Coyote Creek.

Table 8
Percent of Samples Exceeding TMDL Numeric Targets for Copper in Dry Weather and Copper, Lead, and Zinc in wet weather

Monitoring Site ID	Dry, Total Copper % of Exceedances (no. of samples)	Wet, Total Copper % of Exceedances (no. of samples)	Wet, Total Lead % of Exceedances (no. of samples)	Wet, Total Zinc % of Exceedances (no. of samples)
ANACIT@B01	16% (19)	-	-	-
BPARA01	40% (5)	-	-	-
BPDSA01	44% (9)	-	-	-
BRRC@I-90	15% (20)	-	-	-
CARB01	20% (5)	23% (22)	0% (22)	18% (22)
CCBA01	0% (6)	19% (27)	0% (27)	15% (27)
CYPB00P01	0% (4)	-	-	-
CYPB01PS1	20% (5)	-	-	-
CYPB01PS2	40% (5)	-	-	-
FULA03	0% (5)	22% (18)	6% (18)	22% (18)
FULA03S05	90% (20)	-	-	-
FULB01@SCO	15% (20)	-	-	-
LAFPS@A01	40% (20)	-	-	-
LAS13	18% (17)	31% (71)	1% (71)	18% (71)
LHA01P10	6% (18)	-	-	-
LHA07XXX	35% (17)	-	-	-
LPB02P04	27% (11)	-	-	-
FCVA03	0% (1)	71% (7)	0% (7)	57% (7)
LATS17	0% (1)	63% (16)	6% (16)	50% (16)

Table 9
Percent of Samples in Each Subwatershed Exceeding TMDL Numeric Targets for Copper in Dry Weather and Copper, Lead, and Zinc in wet weather

Subwatershed	Dry, Total Copper % of Exceedances (no. of samples)	Wet, Total Copper % of Exceedances (no. of samples)	Wet, Total Lead % of Exceedances (no. of samples)	Wet, Total Zinc % of Exceedances (no. of samples)
Carbon Creek	19% (54)	23% (22)	0% (22)	18% (22)
Coyote Creek / Brea Creek	20% (46)	19% (27)	0% (27)	15% (27)
Fullerton Creek	45% (55)	36% (25)	4% (25)	32% (25)
Lower Coyote Creek	27% (52)	31% (71)	1% (71)	18% (71)
North Fork Coyote Creek	0% (1)	63% (16)	6% (16)	50% (16)

Wet weather monitoring in the Coyote Creek watershed validated several regional concepts regarding the mobilization of metals from urban watersheds. Wet weather monitoring conducted by Orange County within the Coyote Creek watershed consisted of time paced samples, which were composited to create one "first flush" sample (the combination of the first hour of samples) and "mid-storm" samples (composites of samples collected after the first hour of the storm).

The average concentrations of "first flush" samples were significantly higher (between 2 and 10 times greater for total copper and total zinc) than storm samples for each of the Orange County wet weather monitoring locations (Table 10). This finding is consistent with other studies in urbanized southern California watersheds[2]. This shows that water quality control practices should consider the timing of metals mobilization from urban watersheds. Isolating and managing the early portion of runoff from a storm event may have significant benefits in the selection of appropriate best management practices (BMPs) to improve water quality in Coyote Creek.

Table 10
Average Copper, Lead, and Zinc Concentrations of "First Flush" and "Storm" Wet Weather Samples Collected by Orange County in the Coyote Creek Watershed

Monitoring Site ID	Average Total Copper [µg/L]	Average Total Lead [µg/L]	Average Total Zinc [µg/L]
CARB01 – Carbon Creek at Bloomfield Ave			
"first flush"	34.0	7.2	154.3
storm	17.8	6.1	72.6
CCBA01 – Coyote Creek at Artesia Blvd			
"first flush"	43.0	14.4	263.5
Storm	13.0	5.1	47.0
FCVA03 – Fullerton Creek upstream of Coyote Creek confluence			
"first flush"	65.8	27.8	422.5
storm	36.7	6.6	80.0
FULA03 – Fullerton Creek at Richman Ave			
"first flush"	93.3	32.2	345.0
Storm	17.9	6.0	75.3
LATS17 – North Fork Coyote Creek upstream of Coyote Creek confluence			
"first flush"	80.0	53.0	3000.0
storm	50.4	49.1	277.9

[2] Stenstrom, M.K. and M. Kayhanian, "First Flush Phenomenon Characterization," A Report to the California Department of Transportation, August, 2005, CTSW-RT-05 -73-02.6, pp 1-68.

Section 2

Subwatershed Prioritization, Sources and Pathways of Metals, and BMP Selection and Evaluation

CDM

Technical Memorandum

To: *Stuart Goong, Beatrice Mussachia*
County of Orange
OC Watersheds Program

From: *Thomas Lo, Donald Schroeder*
Camp Dresser & McKee Inc.

Date: *May 13, 2010*

Subject: *Coyote Creek Source Control Plan - Subwatershed Prioritization, Sources & Pathways of Metals, and BMP Selection & Evaluation*

This technical memorandum evaluates characteristics of the major subwatersheds in the Coyote Creek Watershed and sources that may cause elevated metals concentrations in discharges from the MS4 system. The Coyote Creek watershed was divided into these subwatersheds based on outfalls from major tributaries, as shown in Figure 1. Information on specific sources of metals in the Coyote Creek watershed will facilitate prioritization of the locations and types of potential BMPs to maximize pollutant removal with available resources. Prior to development of an implementation plan to address the total maximum daily load (TMDL) for metals in Coyote Creek, Orange County requested that CDM identify potential sources of metals in the watershed and BMP alternatives to reduce specific sources of metals. The Coyote Creek watershed is a highly urbanized watershed and typical of such a watershed, sources and pathways of metals are diverse and dispersed throughout the watershed. CDM reviewed various sources of data to help identify potential sources of metals discharging to the watershed. Data reviewed included land use information and literature related to metals sources within urban watersheds, and where possible, existing water quality monitoring data. Results of the water quality analysis are presented in Technical Memorandum (Task 4 - Review Metals Data), and focus on copper, lead, and zinc concentrations from various sites throughout the watershed.

The first section of the technical memorandum describes a method for prioritizing the subwatersheds based on a combination of land use and monitoring data; the second section describes potential sources and pathways for the metals; and the final section outlines an approach for BMP selection and prioritization.

Subwatershed Prioritization

Water quality monitoring data were evaluated to assess potential source areas for metals in the Coyote Creek watershed. While existing data provide actual metals concentrations at a

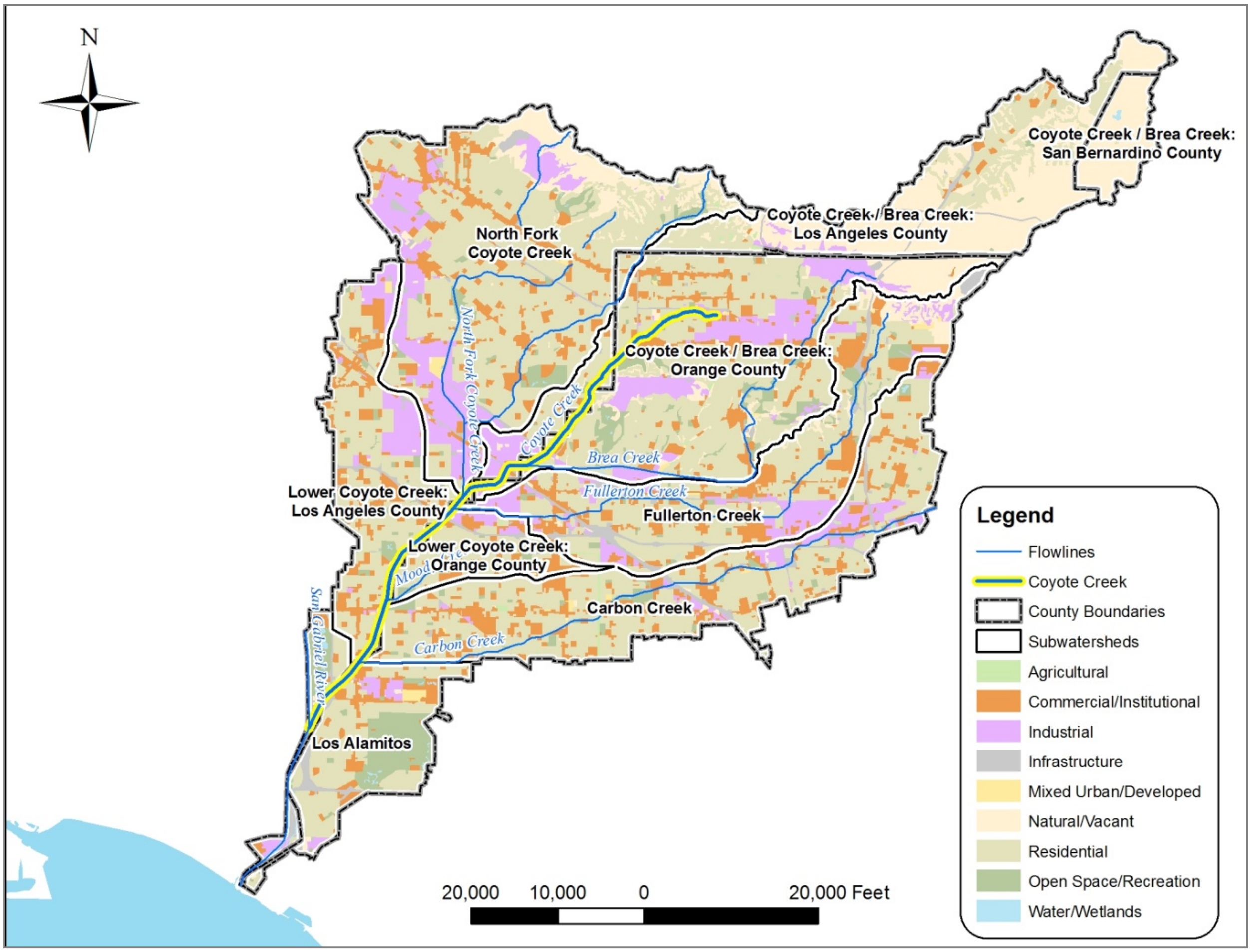

Figure 1
Coyote Creek Subwatershed Delineations and Land Use

given site, the spatial and temporal variation in metals loading is difficult to fully characterize with monitoring alone. Therefore, modeled loads from the land use analysis, which show areas of relatively greater metals loading potential, were also used in developing priorities for subwatersheds.

Review of Monitoring Data

Monitoring data compared with TMDL targets showed certain spatial patterns in exceedances of allowable concentrations. The review concluded that for dry weather, the Fullerton Creek subwatershed showed the greatest percentage of copper exceedances. For wet weather, data showed that lead was not a significant exceedance issue within the watershed. However, for copper and zinc, North Fork Coyote Creek subwatershed (located within Los Angeles County) and Fullerton Creek subwatershed ranked first and second in percentage of exceedances, respectively. Table 1 shows the percent of samples by subwatershed exceeding the TMDL numeric targets.

Table 1
Percent of Samples in Each Subwatershed Exceeding TMDL Numeric Targets for Copper in Dry Weather and Copper, Lead, and Zinc in Wet Weather

Subwatershed	Dry, Total Copper % of Exceedances (no. of samples)	Wet, Total Copper % of Exceedances (no. of samples)	Wet, Total Lead % of Exceedances (no. of samples)	Wet, Total Zinc % of Exceedances (no. of samples)
Carbon Creek	19% (54)	23% (22)	0% (22)	18% (22)
Coyote Creek / Brea Creek	20% (46)	19% (27)	0% (27)	15% (27)
Fullerton Creek	45% (55)	36% (25)	4% (25)	32% (25)
Lower Coyote Creek	27% (52)	31% (71)	1% (71)	18% (71)
North Fork Coyote Creek (within Los Angeles County)	0% (1)	63% (16)	6% (16)	50% (16)

Land Use Analysis

Loading of metals to a receiving waterbody is often affected by the distribution of land uses within the upstream drainage area, because relative contributions of sources of metals are often associated with specific land use types. Since watershed-wide land use data are readily available, one simple approach to screening potential source areas within the watershed is spatial analysis of land use distribution in tributaries to the impaired waterbody. Stormwater monitoring programs have characterized pollutant loadings from urban land uses to support Municipal Separate Storm Sewer System (MS4) NPDES permit programs.

During the late 1990s and early 2000s, the LADPW stormwater monitoring program collected flow-weighted composite wet weather samples at eight sampling sites, each specifically selected to be representative of a single land use category. The resulting water quality dataset is very robust relative to other MS4 stormwater programs throughout the United States. This dataset was used to calculate land use based event-mean concentrations (EMCs) using a lognormal statistical distribution. EMCs represent the concentration of a pollutant in stormwater runoff averaged over the duration of a storm event. Table 2 presents the EMCs used to estimate pollutant loadings in runoff from subcatchments within the Coyote Creek watershed. Review of the Orange County mass emission sampling showed that metals concentrations are greatest during the first hour of a storm event, which was referred to as the "first flush."

The volume of runoff from a subcatchment also affects the pollutant loading potential. A simple method to estimate runoff from a subcatchment is to apply a runoff coefficient to a volume of rainfall over the watershed. Table 2 also presents runoff coefficients for general land use groups, determined through model calibration of storm events from 1993-1999 at LADPW mass emission stations, completed during the Southern California Bight study (Ackerman and Schiff, 2003[1]).

To prioritize subwatersheds based only on land use and related information, a mass balance was conducted using land use specific EMCs and runoff coefficients to calculate metals loading from each subwatershed. For this analysis, only total recoverable copper and zinc were calculated for each sub-watershed. While Coyote Creek has a TMDL target for lead, lead is not considered an issue as monitoring data shows that lead concentrations are consistently lower than the target.

The first step involves calculating the area-weighted EMC for total recoverable copper and zinc and the area-weighted runoff coefficient for the subwatershed being analyzed. Equation 1 and equation 2 are used to calculate the area-weighted EMC and runoff coefficient for the subwatershed, respectively.

$$EMC_{weighted,m} = \frac{\sum(EMC_{L,m} \times A_L)}{A} \qquad \text{Equation (1)}$$

$$C_{weighted} = \frac{\sum(C_L \times A_L)}{A} \qquad \text{Equation (2)}$$

Where $EMC_{weighted,m}$ = area-weighted event-mean concentration of metal m for the subwatershed, µg/L
$C_{weighted}$ = area-weighted runoff coefficient, dimensionless
C_L = runoff coefficient for land use L, dimensionless
A = tributary area of the subwatershed, acres
A_L = total area for land use L, acres
$EMC_{L,m}$ = event-mean concentration for land use L and pollutant m

[1] Ackerman, D. and K. Schiff. 2003. Modeling stormwater mass emissions to the southern California Bigh*t. Journal of the American Society of Civil Engineers* 129: 308-323

Table 2
Metals EMCs and runoff coefficients by land use

Land Use Classification	Total Copper [µg/L]		Total Zinc [µg/L]		Runoff Coefficient
	Average	Standard Deviation	Average	Standard Deviation	
Agricultural	100.1	74.8	274.8	147.3	0.10
Caltrans	52.2	37.5	292.9	215.8	0.64
Commercial/Institutional	31.4	25.7	237.1	150.3	0.61
Industrial	34.5	36.7	537.4	487.8	0.64
Infrastructure	34.5	36.7	537.4	487.8	0.64
Mixed Urban	31.4	25.7	237.1	150.3	0.61
Natural/Vacant	10.6	24.4	26.3	69.5	0.06
Open Space/Recreation	10.6	24.4	26.3	69.5	0.06
Residential	18.7	13.4	71.9	62.4	0.39
Water/Wetlands	0.0	0.0	0.0	0.0	0.00

Source: Geosyntec Consultants, 2008.
Note: EMCs and standard deviations are computed from log-transformed data and then converted back to actual concentrations

Metals loading from each subwatershed is estimated as the product of runoff generated within the sub-watershed from a specified 0.5-inch storm event, and weighted EMCs, as shown in Equation 3.

$$Loading_{m,i} = F \times C_{weighted} \times D_i \times A \times EMC_{weighted,m} \qquad \text{Equation (3)}$$

Where $Loading_{m,i}$ = total loading from storm event i for metal m for the subwatershed, kg
F = units conversion factor ($1.027 * 10^{-4}$ L*acres^{-1}*µg^{-1}*in^{-1})
D_i = depth of storm event i, inches

The land use analysis estimated total copper and total zinc loads from a 0.5 inch rainfall event for each of the subwatersheds within Coyote Creek (Table 3). This size rainfall event is likely to occur at least once in a given year; however, the size of the storm is not critical to this analysis. The intent is to use results to evaluate relative differences between subwatersheds in order to prioritize monitoring and watershed management activities. Computed loads were divided by the total acreage of each subwatershed to calculate the average loading per acre for the given storm event. Per acre loading estimates were then used to rank subwatersheds by loading potential, with "1" being the subwatershed with the highest loading of the metal of concern, and "8" being the lowest.

Table 3
Subwatershed Prioritization Based on Estimated Pollutant Loading from a 0.5 inch Storm Event

Subwatershed	Storm Event Load		Unit Area Load		Copper Ranking	Zinc Ranking	Priority Ranking
	Total Copper [kg]	Total Zinc [kg]	Total Copper [g/acre]	Total Zinc [g/acre]			
Coyote Creek / Brea Creek (LA & San Bernardino Counties)	2.5	14.0	0.175	0.961	8	8	Low
Coyote Creek / Brea Creek (Orange County)	7.6	58.0	0.448	3.420	6	6	Medium
North Fork Coyote Creek	10.6	80.4	0.472	3.581	5	4	High
Lower Coyote Creek (LA County)	4.8	36.7	0.583	4.439	1	2	High
Lower Coyote Creek: (Orange County)	1.6	11.0	0.545	3.723	3	3	Medium
Carbon Creek	8.1	51.5	0.541	3.453	4	5	Medium
Fullerton Creek	7.3	57.8	0.570	4.498	2	1	High
Los Alamitos	3.1	19.7	0.422	2.701	7	7	Medium

Recommended Watershed Priorities

Based on the above results, priority designations developed to reflect areas of low, medium, or high potential for metals loading were assigned to each subwatershed (Figure 2). Lower Coyote Creek (in Los Angeles County) and Fullerton Creek subwatersheds have the highest estimated loading per acre, therefore they were assigned as “high” priority. The Coyote Creek / Brea Creek subwatershed within Los Angeles and San Bernardino Counties is less developed than other parts of the Coyote Creek watershed and the land use analysis predicted substantially lower loading potential, therefore this subwatershed was assigned as “low” priority. “Medium” priority was assigned to the remaining subwatersheds, where loading potential was elevated, but less so than in the “high” priority subwatersheds. In general, relative ranks of subwatershed by land use and by existing metals data were similar, with one exception. For North Fork Coyote Creek subwatershed, the relative ranking of loading potential from the land use analysis suggested “medium” priority, while monitoring data showed very high concentrations of metals.

Given that the monitoring data at this site spanned over several storm events over several years, this subwatershed was also given a "high" priority.

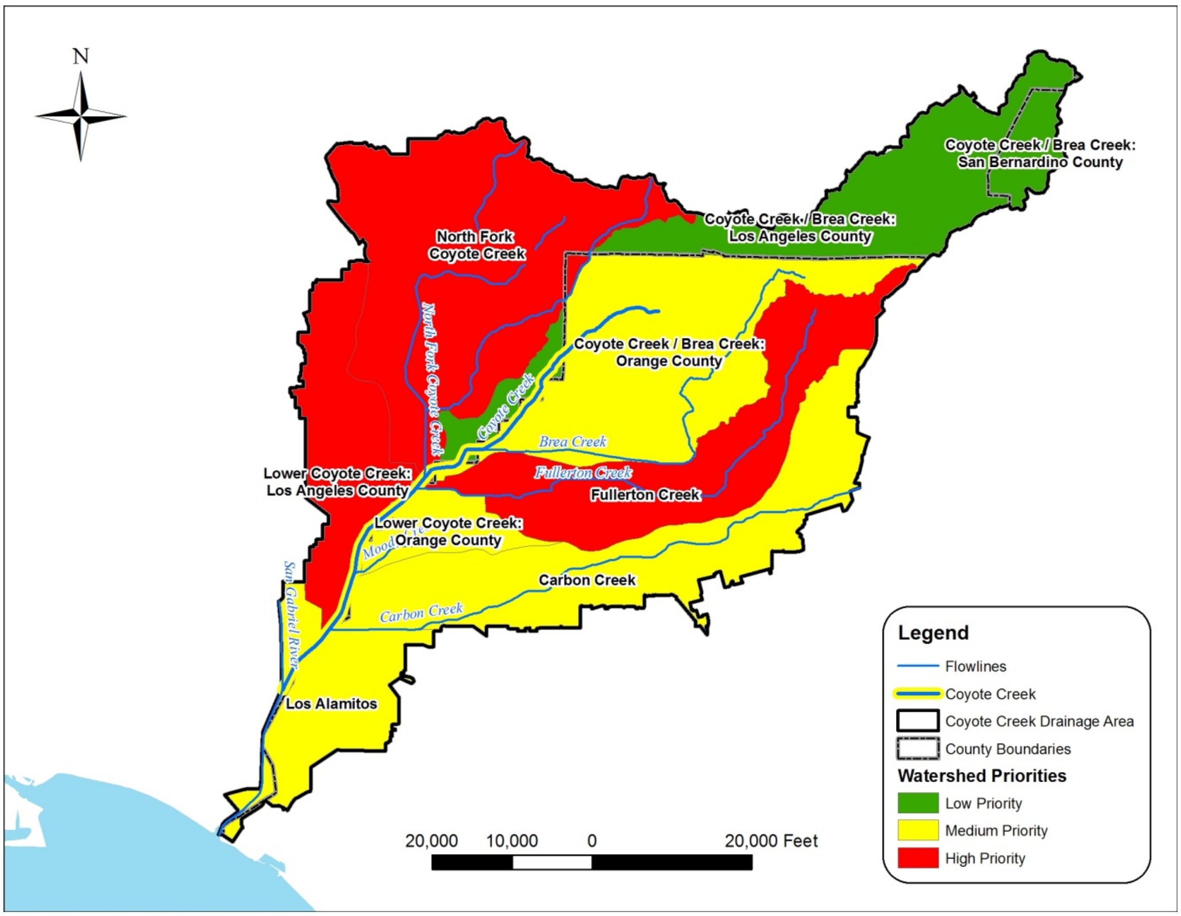

Figure 2
Subwatershed Prioritization for Total Copper and Total Zinc in Coyote Creek

Sources and Pathways of Metals

Apart from reviewing land use data and predicting potential loading of subwatersheds within the Coyote Creek watershed, CDM conducted a literature review of sources and pathways of metals within urban watersheds. Nationwide, watershed management plans identify vehicle brake pads, tire tread, roadway sediment, used motor oil, building materials, and pesticides as significant sources of metals in urbanized watersheds. Table 4 shows the potential sources and pathways for copper, lead, and zinc in urban watersheds.

Vehicle Brake Pads

One of the most significant sources of copper in urban watersheds is copper contained in vehicle brake pads[2]. Several factors affect metals emissions from brake pads such as:

- Traffic volumes and types of vehicles
- Frequency and severity of braking
- Vehicle speed
- Type of brake lining (disc or drum) and replacement of original brake pads (original manufacturer pads have more copper than aftermarket replacement pads)

The Brake Pad Partnership (BPP) is a collaborative effort in California representing water quality regulatory agencies, automobile brake pad manufacturers, environmental groups, and stormwater management agencies. Recent studies conducted through BPP for the San Francisco Bay watershed estimate the copper load from brake pad usage to roadways and/or the atmosphere to be 0.45 milligrams per kilometer (mg/km) of driving (Rosselot, 2006[3]).

This rate of copper wear from brake pads accounts for 15 to 50 percent of copper loads in the subwatershed of the San Francisco Bay, based on results of a mechanistic water quality model using the BPP findings as key input data (Aqua Terra, 2007[4]). Results of these studies show that brake pads with reduced or zero copper content could reduce, or eliminate, buildup of copper within watershed areas from outfitted vehicles.

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[2] Schueler, T.R. Cars are a Leading Source of Metals Loads in California. 2000. In, The Practice of Watershed Protection. Eds, T. Schueler and H. Holland. Center for Watershed Protection. Ellicott City, MD

[3] Rosselot, Kirsten. 2006. Copper Released from Brake Pad Lining Wear in the San Francisco Bay Area. Report prepared for the Brake Pad Partnership

[4] AquaTerra. 2007. Modeling the Contribution of Copper from Brake Pad Wear Debris to the San Francisco Bay

Table 4
Sources and Pathways of Copper, Lead, and Zinc in Urban Watersheds

Source of Metal	Pathways from Watershed to Receiving Waterbody	Copper	Lead	Zinc
Vehicle brakes	• Release to atmosphere; followed by deposition and washoff during rain event; • Release to roadway and washoff during rain event; • Release to vehicle and washoff during rain event or during car washing	x		
Vehicle tires	• Release to roadway and washoff during rain event; • Release to vehicle and washoff during rain event or during car washing			x
Vehicle tire lead weights	• Release to roadway and washoff during rain event		x	
Roofing / Building Materials	• Leaching of roofing and other building materials during rain event; • Rain events washoff of metals accumulated on rooftops from atmospheric deposition		x	x
Pesticides	• Rain events washoff of metals accumulated from non-agricultural use of pesticides • Illicit disposal of pesticides	x		
Vehicle Maintenance / Used Oil	• Illicit disposal of vehicle maintenance materials such as used oil • Leaks from vehicle and washoff during rain event • Release to vehicle and washoff during rain event or during car washing	x	x	x

Vehicle Tires

Debris from tire wear is potentially a significant source of zinc on roadway surfaces. Several studies have estimated the contributions of zinc and other metals, typically found in tire tread, to roadways from driving. The zinc content in tire tread rubber ranges from 0.69 to 1.55 percent by weight, and averages about one percent (Councell *et al.* 2004[5]). Davis *et al.* (2001) analyzed abraded tire powder from four different brands of tires and found it contained 17 µg/g lead and 5 µg/g copper.

[5] Councell, T.B., K. U. Duckenfield, E.R. Landa, and E. Callender. 2004. Tire wear particles as a source of zinc to the environment. *Environmental Science and Technology*,v38

The wear rate for tire tread and associated metals is highly dependent on driving speed and driving styles. Councell *et al.* (2004) conducted a literature review and estimated 0.05 grams of tire tread debris per km traveled is a good estimate of "average" driving conditions. Metals emissions from tire wear to roadways are the product of metal content in tire tread and rate of tread wear. Emission of zinc from tires to roadways is approximately 5 mg/km traveled with a range of possible values from 2.1 mg/km to 14.0 mg/km.

Vehicle Tire Lead Weights

Lead contained in wheel weights used for rotational tire balance is a significant source of lead in the environment. The Center for Environmental Health (CEH) and California Department of Transportation conducted monitoring studies of lead sources in transportation corridors (see CEH testimony that supports Senate Bill 757, which promotes exchanging lead weights with an alternative product, posted at www.ceh.org).

Roofing and Other Building Materials

Metals leached from roofing and other building materials (such as metallic siding) during storm events can be another significant source of metals loading to downstream waters. For example, zinc sources in roof materials include galvanized gutter and downspouts, nails, solder, wood preservative chemicals (zinc naphthalene), and fungi resistant chemicals (zinc sulfate and zinc chloride). Chang *et al.* (2004[6]) evaluated roof runoff water quality from 16 structures with 4 different types of roofing materials. They observed mean zinc concentrations in rooftop runoff that were significantly greater than mean zinc concentrations in rainwater (139 ug/l). Mean zinc concentrations varied by roof material type (wood shingle, 16,300 µg/L; galvanized metals, 11,800 µg/L; aluminum, 3,200 µg/L; and composite shingle, 1,400 µg/L) (Chang *et al.* 2004).

To estimate the mass load from rooftops attributable to roofing material, Van Metre and Mahler (2003[7]) related mass emissions from asphalt shingle and galvanized metal roofs to isolate the mobilization of metals by leaching of roofing materials from atmospheric deposition processes. The study found lead was significantly greater in asphalt shingles than galvanized metal roofs. Conversely, cadmium and zinc were significantly greater in galvanized metal than asphalt shingle roofs. Results showed that leaching of lead from asphalt shingle roofs mobilizes an estimated 67 micrograms per square meter ($\mu g/m^2$) during most storm events. Leaching of cadmium and zinc from galvanized metal roofing mobilizes 1.5 $\mu g/m^2$ and 1,385 $\mu g/m^2$ in most storm events, respectively. Another study estimated that new copper roofs release approximately 1087 mg/m^2 per year (Barron 2001[8]). Davis *et al.*

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[6] Chang, Mingteh, Mathew W. McBroom, and R. Scott Beasley. 2004. Rooftops as a source of nonpoint water pollution. *Journal of Environmental Management.* v73.
[7] Van Metre, P.C. and B.J. Mahler. 2003. The contribution of particles washed from rooftops to contaminant loading to urban streams. *Chemosphere.* v52
[8] Barron, T. S. 2001. Architectural Uses of Copper: An Evaluation of Stormwater Pollution Loads and BMPs. Prepared for the Palo Alto Regional Water Quality Control Plant

(2001[9]) analyzed metals concentrations in runoff from a sample of residential, commercial, and institutional roofs and found loading rates similar to the other studies.

Pesticides

In addition to brake pads, the BPP investigated urban copper from other sources. One study found that copper from pesticides applied to urban land contributed the largest source of copper releases in San Francisco Bay Watersheds. For example, in 2003 alone, approximately 100,000 kg of copper was released from pesticides applied to urban land in the San Francisco Bay watershed. This accounted for 42 percent of the total human sources of copper released in the Bay Area (Rosselot 2007[10]).

Comparable studies have not been conducted in Southern California. It is likely that pesticides could be a significant copper source in the watershed.

Individual Car Washing

Metals associated with brake pad and tire wear accumulate on vehicles in and around the wheels. Consequently, an additional source of dry weather metals loading in urban watersheds comes from residents washing off cars in driveways, parking lots, and other areas where wash water flows directly to storm drains. Past surveys have indicated that 56 to 73 percent of car owners wash their own cars, and over 90 percent of those let water drain to the pavement (CWP 2008[11]). Davis *et al.* (2001) collected runoff from spraying vehicle wheels and found mean concentrations of 1.9 µg/L cadmium, 280 µg/L copper, 11 µg/L lead, and 330 µg/L zinc. These results suggest that a portion of metals loading in receiving water is derived from residential car washing.

Vehicle Maintenance

Homeowners often perform self-maintenance on cars, including oil changes. This can result in the build-up of metals around areas where maintenance activities are performed. Public education and outreach BMP activities could include materials to educate homeowners on minimizing automotive wastes that end up in storm drains. These educational materials would be cross-linked with materials developed to manage used oil disposal and car washing sources.

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[9] Davis, A.P., M. Shokouhian, and S. Ni. 2001. Loading estimates of lead, copper, cadmium, and zinc in urban runoff from specific sources. *Chemosphere*. v44

[10] Rosselot, Kirsten. 2007. Copper and Solids Removed via Street Sweeping. Report prepared for the Brake Pad Partnership

[11] CWP (Center for Watershed Protection). 2008. Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin. Report for U.S. EPA Chesapeake Bay Program grant CB-973222-01

Specifically, used oil is a significant source of metals and other toxic contaminants into receiving waterbodies (Nixon and Saphores 2007[12]). Used oil within urban areas is released to the environment from vehicle leaks and improper disposal. EPA[13] estimates that only 14 percent of used oil in the United States is recycled, noting that the predominant source of illegal discharges of used oil is from do-it-yourselfers (DIYs). Davis *et al.* (2001) evaluated metals in used oil and found mean concentrations of 400 parts per million (ppm) cadmium, 15,400 ppm copper, 5,400 ppm lead, and 1,800,000 ppm zinc. Other studies in urban watersheds have found that a portion of receiving waterbody loads of cadmium, copper, lead, and zinc are derived from improperly disposed used oil, and oil leaks from vehicles (Schueler 2000[14]). Schueler (2000) estimated that 15 percent of used motor oil is illegally dumped in urban storm drains within the Chesapeake Bay watershed.

Sediment

Metals are typically bound to sediment particles and accumulate on impervious surfaces and within storm drain catch basins. Wet weather runoff washes these sediment particles into waterbodies through the storm drainage system. The ability to control sediment prior to a storm event can be an effective approach to reducing metals in runoff.

BMP Selection and Evaluation

Source Evaluation Activities

Selection of BMPs for reduction of metals loading within the Coyote Creek watershed will rely on water quality data generated from the Coyote Creek Water Quality Monitoring Plan (Monitoring Plan), described fully in Task 5.1. The Monitoring Plan identifies proposed sample locations along the major waterbodies (Coyote Creek, Brea Creek, Fullerton Creek, and Carbon Creek) within the Coyote Creek watershed. Monitoring data from these major watersheds will be used to develop recommendations for source evaluation monitoring activities and potential BMPs to be implemented within targeted drainage areas of the MS4.

The initial sampling strategy relied on review of existing water quality samples (Task 4, Review Metals Data) for copper, lead, and zinc throughout the Coyote Creek watershed compared with site specific TMDL targets to determine whether samples exceeded allowable concentrations. Sample sites were then consolidated based on their subwatershed and water quality statistics were developed to identify subwatersheds of high metals concentrations. These results were then used to help identify monitoring locations.

The Monitoring Plan establishes a sampling program designed to gather additional metals data for dry and wet weather to determine the extent of metals exceedances at select locations

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[12] Nixon, Hilary and Jean-Daniel Saphores. 2007. Impacts of motor vehicle operation on water quality in the US – Cleanup costs and policies. Transportation Research Part D, v12

[13] http://www.epa.gov/wastes/conserve/rrr/pubs/89039a.pdf

[14] Schueler, T.R. Cars are a Leading Source of Metals Loads in California. 2000. In, The Practice of Watershed Protection. Eds, T. Schueler and H. Holland. Center for Watershed Protection. Ellicott City, MD

within the Coyote Creek watershed. Initial monitoring should be conducted primarily at the mouth of major tributaries to Coyote Creek, referred to as Priority 1 sample locations in the Monitoring Plan. After the initial year of monitoring is completed, the Monitoring Plan should be re-assessed to determine if sampling should be conducted at locations in the drainage areas upstream of Priority 1 locations. These "Priority 2" monitoring locations would focus on identifying source areas responsible for elevated metals concentrations observed in downstream samples from the preceding year.

It is anticipated that Priority 1 sites monitored will either show non-exceedances, which will reduce or eliminate the need for continued focus on particular subwatersheds, or will show metals exceedances leading to initiation of Priority 2 site sampling within the subwatersheds. With each additional year of monitoring, data will build upon previous years.

Prior to the second year of monitoring, Permittees should consider whether to initiate source control BMPs (e.g., increased street sweeping, targeted catch basin cleaning, increased facility inspection to assess on site BMPs) beyond baseline measures already implemented within the watershed by Permittees.

Kimberly Creek Channel Special Study

As discussed in the Monitoring Plan, initial review of existing data suggested a potential hot spot at the targeted dry weather site FULA03S05, in Kimberly Creek Channel, which is tributary to Fullerton Creek. Numerous dry weather samples (20) collected at FULA03S05, which is located at the downstream end of the drainage from a large industrial area, showed a very high percent (90%) of exceedances for copper. A Special Study is proposed for this location to more fully investigate the source of metals along Kimberly Creek Channel. The special study includes:

- Conducting a field reconnaissance, in and surrounding Kimberly Creek Channel, along a stretch of channel adjacent to an industrial land use area, to observe all sources of dry weather flows entering the channel

- Dry weather samples for metals analyses should be collected from multiple points along Kimberly Creek Channel

With the source reconnaissance and multi-point sampling along Kimberly Creek Channel, copper data will aid in further evaluating the locations of specific sources along Kimberly Creek Channel. Once data are evaluated and if sampling and reconnaissance points to specific areas of concern, then follow-on actions may include the following BMPs:

- Targeted inspection of industrial facilities located within the vicinity of the channel to verify if discharge permits are being implemented appropriately;

- Increased sweeping of the roadways and;

- Targeted catch basin cleaning in the area of concern prior to the wet season

Evaluation of BMP Effectiveness

Trend detection analyses can evaluate the effectiveness of source control BMPs within the Orange County tributary areas to Coyote Creek. These analyses vary in complexity from simple visual observation of time series plots, to complex statistical tests on concentrations of metals before and after BMP implementation. Typically, monitoring data collected over the first few years of the program can be evaluated using the less complex methods, which requires use of best professional judgment (BPJ) in evaluating time series plots.

If this approach is determined to be insufficient, then parametric or non-parametric statistical tests on data should be considered. A key consideration in conducting statistical tests for trend detection is sample size. A small set of grab samples is not likely to be sufficient to statistically confirm an effect if the natural variability is greater than treatment effects. The effect of implementing source control BMPs may not be detectable as a change in a mean value but rather as a change in variability[15].

The Southern California Coastal Water Research Project developed a tool, “Power Analysis to Determine the Number of Samples Needed for Trend Detection[16]”, which was used to develop BMP effectiveness monitoring recommendations for Orange County tributaries to Coyote Creek. This tool approximates the number of samples needed to provide sufficient statistical power to determine the presence of a trend due to source BMP implementation. Key input variables to the tool include:

- Historical data to evaluate the variability of metals concentrations within a given year and between years

- Change in concentration expected from implementing source control BMPs in the upstream drainage area

- Level of statistical power (typically 80 percent minimum for trend detection)

One scenario tested using this tool involved historical total copper concentrations collected during wet weather at the LA County mass emission station (S13) located on Coyote Creek upstream of the confluence with the San Gabriel River. The scenario showed that at least eight years of monitoring data would be needed to provide sufficient statistical power to claim that source control BMPs reduced total copper by 50 percent within the Coyote Creek watershed. The number of samples per year was less sensitive than the number of years of sample collection, which indicates that existing conditions have higher variability between years than

[15] Coffey, S.W., and M.D. Smolen. 1990. The Nonpoint Source Manager's Guide to Water Quality Monitoring - Draft. Developed under EPA Grant Number T-9010662. U.S. Environmental Protection Agency, Water Management Division, Region 7, Kansas City, MO.
[16] http://www.sccwrp.org/Data/DataTools/SamplingDesignPowerAnalysis.aspx

within years. Thus, monitoring of two wet weather events per year would be sufficient to evaluate BMP effectiveness.

Source Control BMPs

Under their baseline NPDES program, Permittees already implement source control BMPs to reduce pollutants entering the MS4 and conveyed to waterbodies. Permittees will continue to implement municipal programs to reduce pollutants such as street sweeping, catch basin cleaning, industrial facility inspections, and illegal discharge/illicit connection investigations.

Source control BMPs focus on preventing and removing stormwater volumes and constituent loads at their source. Source control BMPs range from activities, such as land use planning and infrastructure maintenance, to more site-specific activities, such as targeted inspections or enforcement actions for businesses that are determined to be polluters. Many of these BMPs can be implemented at different levels ranging from individual action to municipal, state, or business initiatives. Benefits of source control BMPs include:

- *Potential cost savings*—Source control BMPs typically do not require large capital expenditures to construct facilities. However, long-term operating costs can be significant for public outreach, inspection, and enforcement programs.

- *Areal treatment coverage*—Many source control BMPs are implemented by Permittees on a city- or county-wide basis. Unlike a treatment BMP facility, the coverage and subsequent benefits of these source control BMPs is not limited to a specific drainage area.

- *Retrofit potential*—Many source control BMPs target existing development and can be implemented under the space constraints prevalent in built-out urban watersheds.

- *Target specific pollutants or sources*—BMPs can target a specific pollutant of concern or the specific source of the pollutant. For example, brake pad replacement initiatives could significantly reduce the mass of total copper created in a watershed.

Source control BMPs that could potentially be implemented in the Coyote Creek watershed to help meet metals TMDL requirements are described in the following sections.

Street Sweeping

Removal of accumulated sediments and associated pollutants from streets is a source control BMP that can be implemented to reduce pollutant loads in runoff entering receiving waterbodies. All Permittees currently implement street sweeping programs to reduce the load of sediments and associated pollutants entering the MS4. However, there may be additional opportunities to enhance this program and increase the effectiveness of sediment removal. Enhancement may be accomplished through activities such as equipment upgrades, targeting hot spots, and changing the frequency of sweeping.

Several alternatives exist for Permittees to enhance their programs by capturing more sediment from roads within the Coyote Creek watershed, including increased frequency of sweeping on non-posted roadways or replacement of aging mechanical broom sweepers (where applicable) with new more efficient types of street sweepers.

For example, the City of Dana Point doubled sediment removal by increasing street sweeping from biweekly to weekly (Dana Point 2005[17]). Several studies comparing mechanical broom sweepers to newer high efficiency alternative equipment have shown increases in sediment removal of 35 percent (Pitt 2002[18]), 15 to 60 percent (Minton 1998[19]), and up to 140 percent (Schwarze Industries 2004[20]).

Catch Basin Cleaning

Catch basin cleaning is an important source control BMP to reduce metals loadings to waterbodies. The Permittees already implement an annual catch basin cleaning program as part of their baseline municipal activities for their NPDES Permit.

Monitoring studies in Portland, Oregon, have shown that catch basins remove 40 to 50 percent of total suspended solids (Herrera 2006[21]). Metals are often bound to fine particulates that become suspended solids during runoff events. Thus, catch basin cleaning can reduce remobilization of pollutants entrained in the sediment. However, increasing cleaning frequency to more than quarterly provides little additional benefit. Herrera (2006) determined that semi-annual cleaning is optimal for the average catch basin.

Policies and Ordinances

Water quality benefits can be achieved through development and implementation of new or modified policy ordinances that improve urban runoff management by focusing on:

- Reducing the volume of urban runoff (thereby indirectly improving water quality)
- Removing pollutants from urban runoff through natural processes
- Modifying local ordinances to restrict the use of architectural or ornamental copper

Urban runoff management alternatives include an integrated water resources approach to include infiltration of urban runoff for groundwater recharge, and capture and re-use for

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[17] Dana Point, California. 2005. Street sweeping will make a clean sweep to protect the ocean. http://secure.purposemedia.com/dpstreetcleaning/streetsearch.html
[18] Pitt, R. 2002. Emerging stormwater controls for critical source areas. In: Management of Wet-Weather Flow in the Watershed. Sullivan, D. & Field R. (Eds). Street cleaning (pp. 14-16), CRC Press, Boca Raton, Florida
[19] Minton, G.R., B. Lief, and R. Sutherland. 1998. High efficiency sweeping or clean a street, save a Salmon! *Stormwater Treatment Northwest*. Vol. 4, No. 4. November
[20] Schwarze Industries. 2004. Virginia test documents pickup of high efficiency sweepers. *American Sweeper*. 8(1)
[21] Herrera Environmental Consultants. 2006. Technical Memorandum: Nonstructural Stormwater BMP Assessment. Prepared for the City of Portland Bureau of Environmental Services

irrigation. Examples of areas where policy development can especially benefit water quality include low impact development and green street or green roof building requirements.

Currently, the County of Orange and co-Permittees are developing guidance documents to update the model Water Quality Management Plans (WQMPs) for new development and redevelopment projects to comply with Permit requirements for the incorporation of Low Impact Development (LID) principles. Once these model WQMPs requirements are implemented in new development/redevelopment projects, these policies and ordinances will further reduce runoff and associated pollutants.

Public Education and Outreach

Education and outreach programs focus on educating the public on stormwater runoff and changing behaviors that contribute to pollutant loadings in the watershed. These programs can be tailored to residents and businesses, and involve dissemination of information through means such as brochures, posters, websites, public events, utility bill inserts, and surveys. For reducing metals loading, education and outreach activities can focus specifically on car washing and other types of vehicle maintenance.

Program options to reduce metals from car washing activities include outreach materials to encourage (1) car owners to use commercial car washes, or (2) wash cars on permeable surfaces. For charity car washes, car wash kits could be provided to block runoff from reaching a storm drain, or storm drain inserts could be used to catch water.

Homeowners often perform other do-it-yourself maintenance on cars, including oil changes. This activity can result in the build-up of metals around areas where maintenance activities are performed. Education and outreach BMP activities could include materials to educate homeowners on minimizing automotive wastes that end up in storm drains. These educational materials would be cross-linked with materials developed to manage used oil disposal and car washing sources. Used oil is a significant source of metals in urban watersheds and is predominantly from illegal discharges by individuals changing oil. Programs to encourage proper disposal of used oil include public education and free hazardous waste drop off areas.

Product Replacement

Use of alternative products that replace products that are known sources of metals can significantly reduce metal loads in the Coyote Creek watershed over time. Replacing vehicle brakes pads, vehicle tires, and rooftop/building materials would partially reduce or eliminate the source of different pollutants from the watershed, thereby reducing loading of metals to receiving waterbodies. Areas to target for use of replacement products include:

Vehicle Brake Pads

In California, the Brake Pad Partnership (BPP) has been established to guide efforts to reduce the use of copper in brake pad manufacturing. The BPP is a collaborative effort representing water quality regulatory agencies, automobile brake pad manufacturers, environmental groups, and stormwater management agencies.

The BPP is currently pursuing legislation that reduces the amount of copper used in brake pads over a phased period of time. The currently proposed legislation (SB 346) places a 5 percent by weight limit on the amount of copper used in brakes sold in California by 2021. This percentage would be reduced to just 0.5 percent by 2032. The legislation also requires that the copper is not replaced with materials that could also impair water quality. Continued stakeholder support of this legislation is considered critical to the success of this legislative effort.

Vehicle Tires

Tires with reduced metals content would reduce or eliminate the buildup of metals on roadways in the watershed from outfitted vehicles. However, no efforts exist at this time to develop an alternative product that reduces the metals content of vehicle tires. Accordingly, the only means to reduce this source of metals at this time is to continue to implement programs that reduce the number of vehicle miles traveled on roadways, e.g., through programs that increase the use of alternative means of transportation.

Vehicle Tire Lead Weights

Efforts are moving forward to replace lead wheel weights with an alternative product. A legislative bill (SB 757) is currently working its way through the California legislature that will prohibit the manufacture, sale, or installation in California of wheel weights that contain more than 0.1 percent lead. The bill also contains language to make sure that the lead wheel weights are not replaced with a constituent that is also an environmental concern, e.g., zinc.

Roofing and Other Building Materials

Roofing and other building materials with low levels of cadmium, copper, lead, and zinc would reduce the concentration of these metals in runoff. However, no efforts are underway at this time to produce roofing and other building materials with reduced metal content. An alternative is to implement source control BMPs that facilitate efforts to contain onsite urban runoff. Examples of such BMPs include redirection of roof downspouts and the use of rain barrels or cisterns to collect roof runoff for reuse on lawns or gardens. These BMPs can be implemented in all types of land uses including residential, commercial, and industrial.

Pesticides

Products such as pesticides could be a significant copper source in the watershed. Copper is contained in 19 different active ingredient lists in pesticides registered for sale in the State of California[22]. Reductions of this source of copper loading may be achieved through product

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[22] TDC Environmental. 2004. Copper Sources in Urban Runoff and Shoreline Activities. Report prepared for the Clean River Estuary Partnership.

replacement (if alternative products become available). However, reductions may also be achieved through education and outreach on the proper use and disposal of pesticides.

Treatment Control BMPs

Typical stormwater BMPs are effective at reducing metals by capturing suspended sediment in runoff, which also provides treatment for particulate metals. Table 5 provides a summary of effluent metals concentrations for commonly implemented treatment control BMPs[23]. The summary shows that most stormwater BMPs would reduce total copper and total zinc to below numeric targets in the Coyote Creek TMDL. On the other hand, if dissolved metals cause TMDL allocation exceedances, the range of potential treatment control BMPs is substantially reduced.

As additional monitoring data is collected, and source controls BMPs are implemented, there may be a need in the future to implement treatment control BMPs, if source controls are insufficient to meet TMDL targets. Locations and potential treatment BMP options would be evaluated as needs arise.

Table 5
Average Influent and Effluent Concentration for Different Treatment Control BMP Types based on Performance Data Submitted to the International BMP Database

Constituent	Influent / Effluent	Detention Pond	Wet Pond	Wetland Basin	Bio-filter	Media Filter	Hydrodynamic Devices
Suspended Solids (mg/L)	Influent	73	34	38	52	43	40
	Effluent	31	13	18	24	16	38
Total Copper (µg/L)	Influent	20	9	6	32	15	15
	Effluent	12	6	4	11	10	14
Dissolved Copper (µg/L)	Influent	7	7	-	14	8	14
	Effluent	7	4	-	8	9	14
Total Lead (µg/L)	Influent	25	14	5	20	11	18
	Effluent	16	5	3	7	4	11
Dissolved Lead (µg/L)	Influent	1	3	1	2	1	2
	Effluent	2	2	1	2	1	3
Total Zinc (µg/L)	Influent	112	61	47	177	92	119
	Effluent	60	29	31	40	38	80
Dissolved Zinc (µg/L)	Influent	26	47	-	58	69	36
	Effluent	26	33	-	25	51	42

[23] http://www.bmpdatabase.org/

Section 3

Coyote Creek Water Quality Monitoring Plan

Coyote Creek
Water Quality Monitoring Plan

OC Watersheds Program

May 13, 2010

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Section 1
Introduction

The Orange County NPDES Municipal Stormwater Permit (Order No. R8-2009-0030) requires Permittees with discharges tributary to Coyote Creek to develop and implement a constituent-specific Source Control Plan, including a monitoring program, to control the discharge of copper, lead and zinc into Coyote Creek and other tributaries in Orange County that discharge into the San Gabriel River.

This Coyote Creek Watershed Water Quality Monitoring Plan ("Monitoring Plan") establishes a monitoring program to support the constituent-specific Source Control Plan. The Monitoring Plan establishes sample locations within the watershed, sample collection methods, and frequency of sampling.

Under ongoing County-wide monitoring conducted by OC Watersheds, past sampling has been conducted for a wide variety of parameters to include metals within the Coyote Creek watershed. This plan addresses the Coyote Creek watershed within the jurisdiction of the County of Orange and focuses on efforts to expand and direct future monitoring of metals, specifically copper, lead, and zinc.

1.1 Regulatory Background

Coyote Creek, as a tributary of the San Gabriel River, currently has a wet weather technical TMDL for copper, lead, and zinc established by USEPA Region 9 and the Los Angeles Regional Water Quality Control Board (LARWQCB) in March 2007. The San Gabriel River estuary also has a dry weather technical TMDL for copper. Since Coyote Creek is a tributary to the San Gabriel River estuary, a dry weather wasteload allocation was also established for Coyote Creek.

A technical TMDL is one that does not include an implementation plan or compliance schedule. The LARWQCB staff is in the process of developing a TMDL implementation plan for the San Gabriel River and its Impaired Tributaries. Once the LARWQCB has adopted an Implementation Plan, TMDL requirements may be revised. Until the LARWQCB develops an Implementation Plan, Orange County NPDES Permittees are required to prepare a Source Control Plan designed to ensure compliance with the wasteload allocations.

1.2 Purpose of the Water Quality Monitoring Plan

This Monitoring Plan for the Coyote Creek watershed describes the proposed monitoring program to collect water quality samples for designated dry and wet weather sample locations as part of a source control plan to address the metals TMDLs for Coyote Creek. The requirements for the monitoring program are described in Section 2 of this Monitoring Plan. Section 3 provides the plan for water quality sample collection and handling, and collection of field measurements. Section 4 describes the proposed database management plan.

1.3 Watershed Description

The Coyote Creek watershed drains approximately 165 square miles of densely urbanized residential, commercial, and industrial development, along with some areas of open space and natural lands in the upper watershed. The Coyote Creek watershed includes portions of unincorporated Los Angeles and Orange Counties, in addition to 21 cities in the two Counties and one city in San Bernardino County. The portion of the watershed within the jurisdiction of Orange County is approximately 85 square miles. Figure 1-1 shows the Coyote Creek Watershed and major waterbodies.

The major creeks and channels of the watershed include Coyote Creek, North Fork Coyote Creek, Brea Creek, Fullerton Creek, Carbon Creek, and Moody Creek. The Coyote Creek watershed is drained by Coyote Creek, and three principal tributaries, North Fork Coyote Creek, Fullerton Creek, and Brea Creek.

Coyote Creek is primarily a concrete-lined trapezoidal channel that flows along the Los Angeles County and Orange County jurisdictional border and is tributary to the San Gabriel River in the lower Coyote Creek watershed. The upper reach of Coyote Creek is located within the County of Orange and under the jurisdiction of the Santa Ana Regional Water Quality Control Board (SARWQCB).

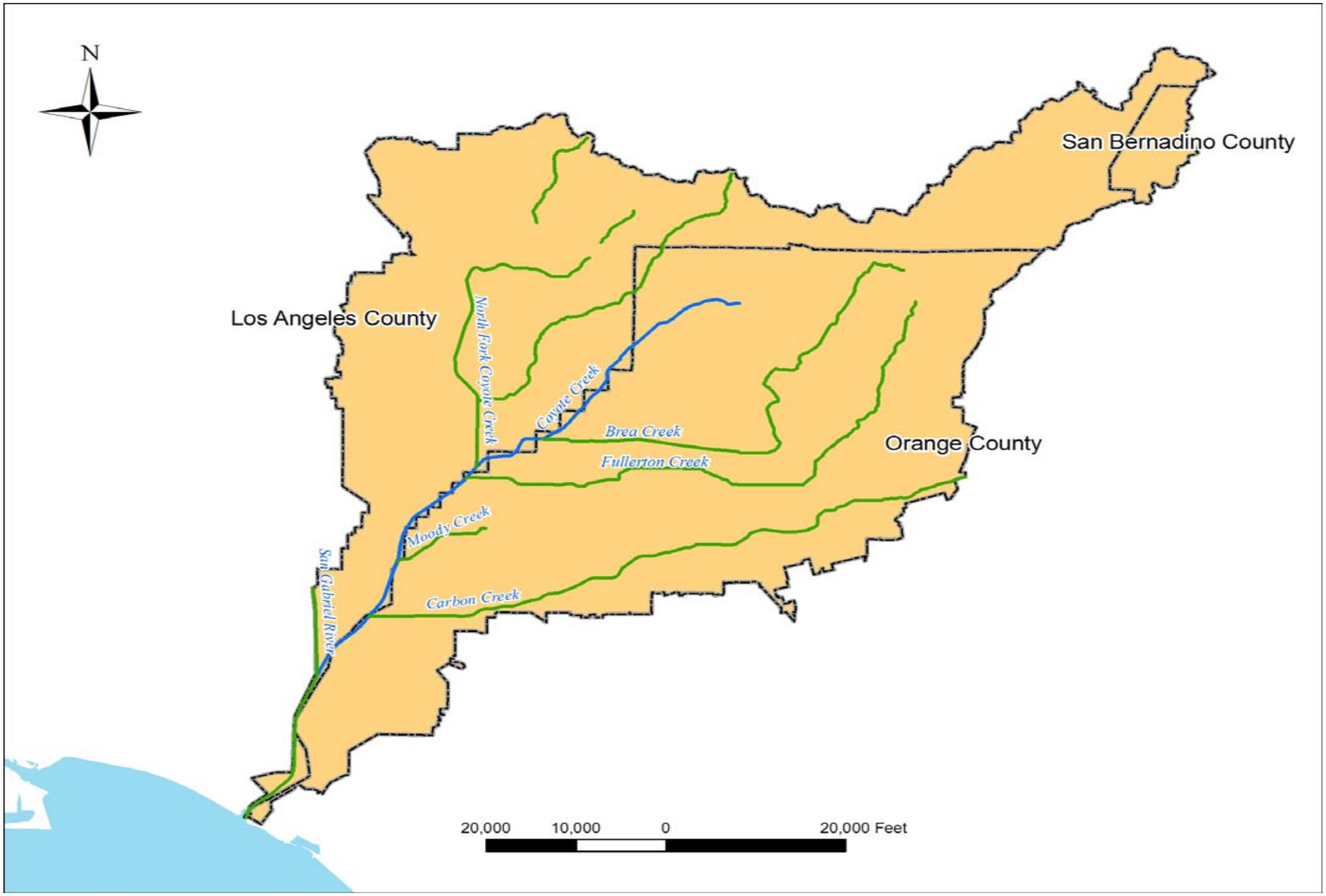

Figure 1-1
Coyote Creek Watershed

Section 2
Coyote Creek Monitoring Program

The following sections describe the sampling locations, frequency of sampling, and types of analyses that will be conducted.

2.1 Monitoring Program Framework

Both additional dry weather and wet weather monitoring are recommended. OC Watersheds has an extensive County-wide sampling program already established. This Monitoring Plan for Coyote Creek is intended as an extension to ongoing monitoring program efforts.

Dry weather grab sampling is recommended at selected dry weather sites on a monthly basis. Instantaneous flow estimates should be made at the same time as grab sampling.

Wet weather monitoring by automated samplers is recommended. This additional sampling conducted within the Coyote Creek watershed will be consistent with those practices already established. Existing OC Watersheds Monitoring protocols include use of automated samplers to collect discrete samples on a time-weighted basis over the course of a storm event. These discrete samples are composited and submitted for laboratory analysis according to first flush, storm flow, and low flow conditions, as defined by:

- First Flush - defined as samples collected within the first hour after automated samplers are initiated or triggered by actuator sensors placed just outside the base flow within the flood control channels.

- Storm Flow – defined as samples collected after the First Flush and over an additional approximate 24-hour period (or greater, depending on duration of storm event).

- Low Flow – defined as runoff samples collected after a storm event has concluded with conductivity readings measured to be greater than ½ of the conductivity readings measured from pre-storm base flow.

OC Watersheds uses this water quality concentration data coupled with 5-minute interval flow data to calculate event mean concentrations.

The following minimum data should be collected during each sampling event at each Monitoring Program site. Table 2-1 lists the field collected data and laboratory analyses to be performed.

Table 2-1 Constituents Monitored			
Parameter	**Laboratory**	**Dry Weather**	**Wet Weather**
Temperature	In Field	X	X
pH	In Field	X	X
Dissolved Oxygen	In Field	X	X
Conductivity	In Field	X	X
Turbidity	Laboratory	X	X
Copper [1]	Laboratory	X	X
Lead [1]	Laboratory		X
Zinc [1]	Laboratory		X
Hardness	Laboratory	X	X

[1] Metals to be analyzed for total and dissolved fraction

2.2 Sample Locations

Sampling locations were chosen after review of existing dry and wet weather sample data collected by OC Watersheds within the Coyote Creek watershed from 2006 to 2009. Based on observation and review of existing sample data, new sampling locations are recommended to fill significant gaps in available data.

Additional focused sampling is recommended for waterbodies in which existing metals concentration data showed exceedances of the dry weather concentration-based copper allocation or the wet weather numeric targets established for copper, lead, and zinc for Coyote Creek.

Table 2-2 provides a brief site description for each of the potential Monitoring Program sample locations for both dry weather and wet weather conditions. The proposed locations are shown in Figure 2-1.

While a number of potential site locations were identified and the rationale for selecting these sites is discussed in the following section, the sites were prioritized in order to help focus limited resources on the highest priority sites first. As shown in Table 2-2, two priority levels were identified. The rationale for assigning priorities is as follows:

- **Priority 1** – Sites identified as Priority 1 include: (1) downstream locations in major channels above their confluence with Coyote Creek, and in the main stem of Coyote Creek above the confluence with tributaries; and (2) locations at or downstream of existing dry weather monitoring locations with evidence of more frequent metals exceedances, where additional focused monitoring is clearly suggested. Monitoring of sites for the first case (e.g. downstream end of Brea Creek, Fullerton Creek, and Carbon Creek) will provide new or expanded data for the subwatershed as a whole to help segregate subwatersheds into those that either have persistent presence of metals or do not.

- **Priority 2** – These are sites generally further upstream in subwatersheds located near or downgradient of higher concentrations of industrial/commercial land uses. Priority 2 sites are only initiated for the sampling program after Priority 1 sites have been monitored for a baseline period (see Section 2.4, Monitoring Program Assessment).

Table 2-2 Coyote Creek Monitoring Program Sample Locations				
Priority Level	**Site ID**	**Site Description**	**City**	**New Site**
Dry Weather				
1	BC-1	Brea Creek at Rostrata Ave (confluence w/ Coyote Creek)	Buena Park	Yes
2	BC-2	Brea Creek at Imperial Highway	Brea	Yes
1	CARB01	Carbon Creek at Bloomfield Ave (confluence w/ Coyote Creek)	Cypress	No
2	ANACIT@B01	Carbon Creek at West La Palma Ave	Anaheim	No
1	CCBA01	Coyote Creek at Artesia Blvd	Buena Park	No
1	CC-Beach	Coyote Creek at South Beach Blvd	La Habra	Yes
1	FCVA03	Fullerton Creek at Confluence w/ Coyote Creek	La Palma	No
1	FULA03	Fullerton Creek at Highland (Richman) Avenue	Fullerton	No
Wet Weather				
1	BC-1	Brea Creek at Rostrata Ave (Confluence w/ Coyote Creek)	Buena Park	Yes
2	BC-2	Brea Creek at Imperial Highway	Brea	Yes
1	CARB01	Carbon Creek at Bloomfield Ave (confluence w/ Coyote Creek)	Cypress	No
2	ANACIT@B01	Carbon Creek at West La Palma Ave	Anaheim	No
1	CCBA01	Coyote Creek at Artesia Blvd	Buena Park	No
2	CC-Beach	Coyote Creek at South Beach Blvd	La Habra	Yes
1	FCVA03	Fullerton Creek at Confluence w/ Coyote Creek	La Palma	No
2	FULA03	Fullerton Creek at Highland (Richman) Avenue	Fullerton	No

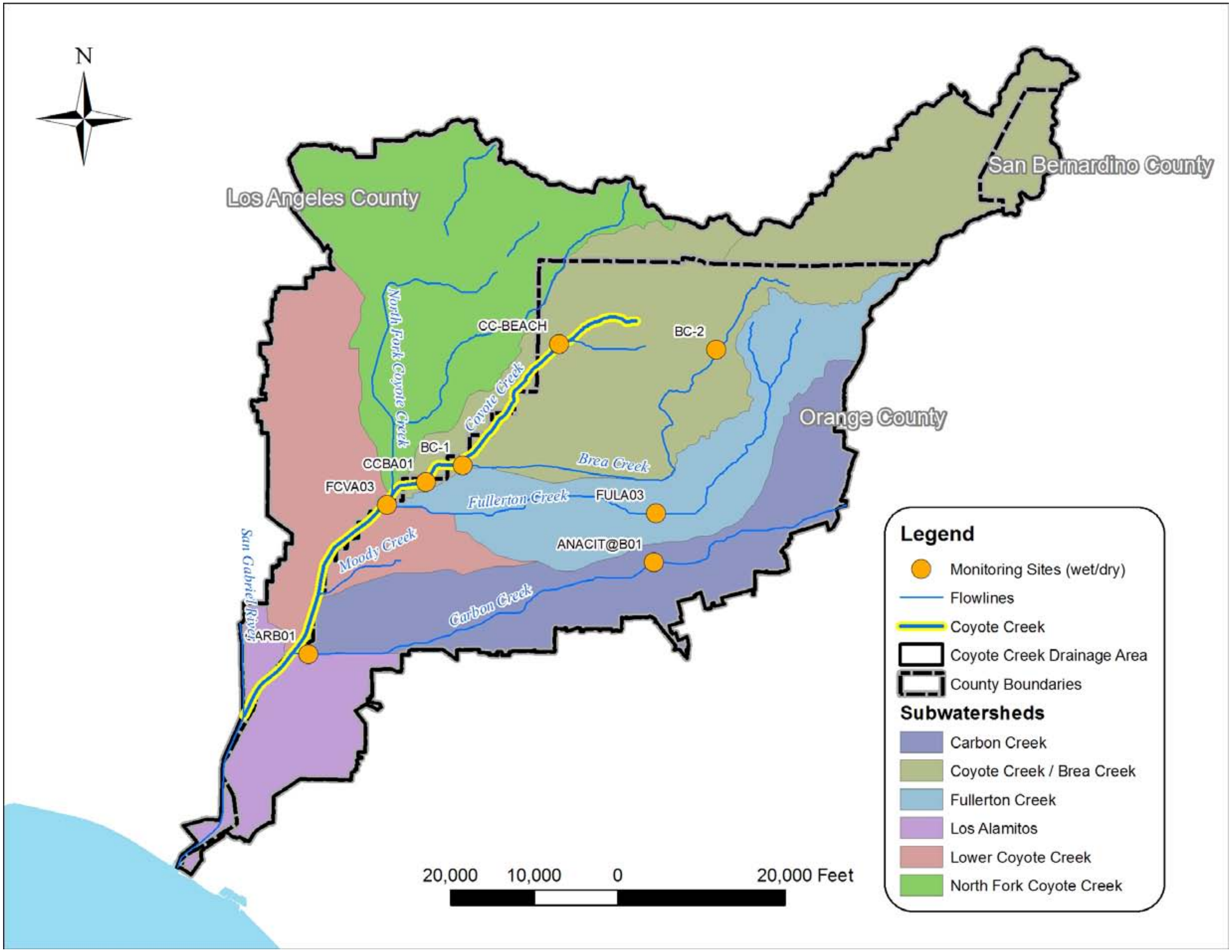

Figure 2-1
Proposed Monitoring Sites for Coyote Creek Watershed

2.2.1 Dry Weather Sample Locations

(exact locations need to be verified by OC Watersheds for accessibility/safety issues)

This section describes the proposed dry weather sample locations listed by waterbody and indicates the assigned priority level.

Brea Creek

No previous dry weather metals sampling was conducted for Brea Creek. Proposed new locations include:

- Brea Creek at Rostrata Avenue (BC-1) – This new sample location is located just upstream of the confluence with Coyote Creek within the City of Buena Park. (Priority 1)

- Brea Creek at Imperial Highway (BC-2) – This new sample location is located in the upper reach of the creek within a commercial land use area in the City of Brea. (Priority 2)

Carbon Creek

- Carbon Creek at Bloomfield Avenue (CARB01) – This sample location is an existing sample location upstream of the confluence with Coyote Creek, in the City of Cypress. Dry weather sampling showed exceedances for 1 out of 5 samples. (Priority 1)

- Carbon Creek at West La Palma Avenue (ANACIT@B01) – This sample location is an existing dry weather site located in the upper reach of Carbon Creek within the City of Anaheim. Dry weather sampling showed copper exceedances for 16% samples collected. Further dry weather sampling is recommended for this site. (Priority 2)

Coyote Creek

- Coyote Creek at Artesia Blvd (CCBA01) – This site is an existing mass emission sample site located in the City of Buena Park. Dry weather data are limited for Coyote Creek in this reach and collection of more baseline data is recommended. (Priority 1)

- Coyote Creek at South Beach Blvd (CC-Beach) – This site will be a new site located in the upper reaches of Coyote Creek within the City of La Habra. Limited data were available in the upper reach within Coyote Creek itself but a flood control channel connected to Coyote Creek (LHA07XXX) indicated copper exceedances in 35% of samples. Additional samples would provide data for the upper reaches of Coyote Creek. (Priority 1)

Fullerton Creek

- Fullerton Creek at confluence with Coyote Creek (FCVA03) – This is an existing sample location established in 2009 for wet weather monitoring. Dry weather sampling is recommended to assess the overall dry weather quality of flow from the subwatershed since existing upstream samples have shown copper exceedances. (Priority 1)

- Fullerton Creek at Highland Avenue (FULA03) – This is the former wet weather sample location on Fullerton Creek, within the City of Fullerton. Dry weather sampling is recommended. This location was selected to determine Fullerton Creek copper concentrations downstream from an existing dry weather "targeted" sampling site, Kimberly Drain near East Elm Avenue (FULA03S05). Dry weather sample data for FULA03S05 showed 90% exceedances for copper. (Priority 1)

Kimberly Drain

- Special Study Location – Numerous dry weather samples (20) were collected at FULA03S05, which is located at the downstream end of the drainage from a large industrial area within the City of Fullerton. Metals data showed a very high percent (90%) of exceedances for copper. A special study is proposed for this location to more fully investigate the source of metals along this drain which connects to Fullerton Creek.

    - A field reconnaissance along Kimberly Drain should be conducted between Fullerton Creek and State College Boulevard to observe for all sources of dry weather flows.

    - Dry weather samples for metals analyses should be collected along multiple points along Kimberly Drain

2.2.2 Wet Weather Sample Locations

(exact locations need to be verified by OC Watersheds for accessibility/safety issues)

This section describes the proposed wet weather sample locations listed by waterbody and indicate the assigned priority levels.

Brea Creek

No previous wet weather metals sampling was conducted for Brea Creek.

- Brea Creek at Rostrata Avenue (BC-1) – This new sample location is located just upstream of the confluence with Coyote Creek within the City of Buena Park. (Priority 1)

- Brea Creek at Imperial Highway (BC-2) – This new sample location is in an upper reach of the creek within a commercial land use area in the City of Brea. (Priority 2)

Carbon Creek

- Carbon Creek at Bloomfield Ave (CARB01) – This former wet weather sample location is located just upstream of the confluence with Coyote Creek and located in the City of Cypress. (Priority 1)

- Carbon Creek at West La Palma Avenue (ANACIT@B01) – This sample location is an existing dry weather site located in the upper reach of Carbon Creek within the City of Anaheim. Wet weather sampling is recommended for this site. (Priority 2)

Coyote Creek

- Coyote Creek at Artesia Blvd (CCBA01) – This sample location is an existing wet weather sampling location in the City of Buena Park. Review of existing data showed copper (19%) and zinc (15%) exceedances which suggest additional sampling may be helpful. (Priority 1)

- Coyote Creek at South Beach Blvd (CC-Beach) – This sample location is a new site located in the upper reach of Coyote Creek within the City of La Habra. No wet weather samples have previously been collected within the upper reach of Coyote Creek. (Priority 2)

Fullerton Creek

- Fullerton Creek at confluence with Coyote Creek (FCVA03) – This is an existing sample location established in 2009 for wet weather monitoring. Since the monitoring dataset is limited, additional sampling is recommended. Copper and zinc showed exceedances of numeric targets. (Priority 1)

- Fullerton Creek at Highland Avenue (FULA03) – This is the former wet weather sample location on Fullerton Creek within the City of Fullerton which showed copper (22%), lead (6%), and zinc (22%) exceedances. This location is selected for additional sampling as a Priority 2 site if sampling at FCVA03 shows consistent exceedances for copper and zinc. (Priority 2)

2.3 Sample Frequency

During the first year, dry weather samples for the metals TMDL should be collected at Priority 1 locations approximately on a <u>monthly</u> basis throughout the entire first year after initiation of sampling. This additional sampling should be coordinated by OC Watersheds in addition to its existing dry weather monitoring program within the Coyote Creek watershed. A varied schedule should be implemented when collecting samples to vary the day of week and time of day grab sampling is conducted. During the wet season, dry weather sampling should be delayed several days (3-5 days or more) to allow for an antecedent dry period prior to dry weather grab sampling.

During the first year, wet weather monitoring for the metals TMDL should take place at Priority 1 sites. Wet weather sampling should occur during the wet season (October 1 – April 30) and should be scheduled in coordination with any existing County-wide monitoring efforts within the Coyote Creek watershed. Pending rainfall, up to <u>three</u> wet weather events should be sampled during the first wet weather season. The decision whether to conduct wet weather sampling should be determined by the Manager for OC Watersheds Environmental Resources and be consistent with mobilization procedures followed for the existing County-wide Monitoring Program.

2.4 Monitoring Program Assessment

The Monitoring Program will be assessed to determine if sample sites warrant continued sampling or if next priority level sites shall be added, or if sample sites should be reprioritized. Assessments will be based on analysis of collected metals data and any additional information gathered through Special Studies. At the end of each successive year of monitoring, a re-assessment of the Monitoring Program will be performed to incorporate new data collected and adapt the program accordingly.

Program assessment should include decision criteria for determining whether to continue, discontinue, or add sampling sites to the sampling program.

The following are recommended decision criteria:

- For dry weather monitoring, Priority 1 locations should be monitored for a minimum 2-year period in order to establish a baseline of copper concentration data.
    - If no exceedances are observed after the 2-year period, Priority 1 sample sites can be removed from the monitoring program.
    - If exceedances are below 20% for samples collected, monitoring at the Priority 1 site can be reduced (e.g., bi-monthly frequency).
    - If exceedances are above 20% for samples collected, then sampling should continue at the Priority 1 site. Sampling at an upstream Priority 2 location is recommended.
- For wet weather monitoring, Priority 1 locations should be sampled for a minimum 3-year period in order to establish a baseline of copper, lead, zinc concentration data.
    - If no exceedances are observed during the 3-year period, Priority 1 sample sites can be removed from the monitoring program.
    - If exceedances are below 20% for samples collected, monitoring at the Priority 1 site may continue with a reduced number of sample events (e.g., 1 wet weather event per season).
    - If exceedances are above 20%, then sampling should continue at the Priority 1 site. Sampling at an upstream Priority 2 location is recommended.

Section 3
Procedures for Field Activities

3.1 Pre-Sampling Procedures

Prior to field sampling, sample teams should complete the following activities as necessary:

- Calibrate YSI multi-parameter (or equivalent) instrument prior to sampling (see the equipment operation manual for specific calibration instructions).
- Prepare ice coolers with ice packs for transporting samples to the OC Watersheds laboratory for preparation.
- Obtain sample containers from laboratory, including water collection bottles and QA/QC samples.
- Pre-label sampling containers with Site Identification Number (Site ID), sample Identification Number (Sample ID), analysis information, and date.
- Pack safety gear, such as waders, protective gloves, and safety vests.
- Pack waterproof pen and field log book.
- Make sure that a vehicle is available and fueled.
- Make sure batteries are charged for autosamplers; pack batteries for field
- Pack sample tubing for wet weather sampling
- Pack chain of custody forms (COCs), field data sheets, camera, and zip lock bags.

3.2 Field Documentation

Field crews should complete a field data sheet for each sampling event. The data sheet should record the following for each sampling event at each sample location, as appropriate:

- Date and time of sample collection
- Monitoring Site and Sample ID numbers
- Unique IDs for any replicate or blank samples collected from the site
- The results of any field measurements (temperature, dissolved oxygen, pH, conductivity)
- Qualitative descriptions of relevant water conditions (e.g. color, flow level, clarity) or weather (e.g. wind, rain) at the time of sample collection

- A description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality

3.3 Sample Collection

Grab water samples are best collected before any other work is done at the site. If other work is done prior to the collection of water samples (for example, flow measurement or other field measurements), it might be difficult to collect representative samples for water chemistry and bacteria analysis from the disturbed waterbody.

Samples shall not be collected if conditions are determined to be unsafe by an on-site assessment by the field team leader.

Follow procedures as set forth in OC Watersheds NPDES County-wide Monitoring Program for grab sampling.

The following lists contain specific steps that should be taken when collecting a water sample (adapted from EPA's Volunteer Stream Monitoring: A Methods Monitoring Manual, EPA 841-B-97-003, 1997 and California's SWAMP Quality Assurance Management Plan, Puckett, 2002):

3.3.1 Label each container with Site ID, Sample ID, analysis information, and date (some of this information may be pre-labeled on the containers).

3.3.2 When wading (if applicable) to the sampling point, try not to disturb bottom sediment.

3.3.3 Place the sample containers in a cooler with cold packs for transport back to OC Watersheds laboratory for processing prior to submittal to the laboratory. Sampling bottles and parameter specific sample containers will be provided by the laboratories.

3.3.4 Field QA Samples (dry weather grabs):

Field Equipment Blanks – One set of field equipment blank samples (equal volume for each constituent) is to be included for each sample event. Sterile deionized water is poured through any equipment used to collect the metals sample at the site where the field equipment blank is being collected.

Field Replicates – Field replicates will be collected at one site for every ten sites visited during one sample event. If less than 10 sites are visited in a day, then 1 field replicate is taken from one site. Field replicates are taken by collecting two sets of samples at the same location within five minutes of each other.

3.4 Sample Handling and Custody

Proper gloves must be worn to prevent contamination of the sample and to protect the sampler from environmental hazards (disposable polyethylene, nitrile, or non-talc latex gloves are recommended). Wear at least one layer of gloves, but two layers help protect against leaks. Safety precautions are needed when collecting samples, especially samples that are suspected to contain hazardous substances.

Properly store and preserve samples as soon as possible. Usually this is done immediately after returning from the collection activities by placing the containers on bagged, crushed or cube ice in an ice chest. The sample temperature should be lowered to at least 4°C within 45 minutes after time of collection. Sample temperature should be maintained at 4°C until delivered to the appropriate laboratory. Care should be taken at all times during sample collection, handling, and transport to prevent exposure of the sample to direct sunlight.

Samples that are to be analyzed should be kept on ice or in a refrigerator prior to delivery to the laboratory.

Every sample shipment should contain a complete Chain of Custody (COC) Form that lists all samples taken and the analyses to be performed on these samples.

Two COCs should be completed every time samples are transported to a laboratory. Include any special instructions to the laboratory. One COC sheet is included with the shipment and the other goes to the sampling coordinator.

3.5 Field Measurements

At each sampling location, record the water temperature, pH, conductivity, and dissolved oxygen concentration. These parameters are measured and recorded using a YSI or equivalent probe. When field measurements are made with a multi-parameter instrument, it is preferable to place the sonde in the body of water to be sampled and allow it to equilibrate in the dissolved oxygen mode while water samples are collected. Field measurements should be made at the centroid of flow, if the stream visually appears to be completely mixed from shore to shore. For routine field measurements, the date, time and depth are reported as a grab. To provide QA/QC of field instruments and sampling personnel, three replicates of each field measurement should be collected at 10 percent of the sites for each sampling event. The site for replication of field measurements will be selected randomly for each day of sampling. Below is a brief discussion of each recorded field measurement (California SWAMP Procedures for Conducting Routine Field Measurements):

3.5.1 Dissolved Oxygen - Calibrate the dissolved oxygen sensor on the multi-probe instrument at the beginning of each day of field measurements. Preferably, dissolved oxygen is measured directly in-stream close to the flow centroid. The dissolved oxygen probe must equilibrate for at least 90 seconds before dissolved oxygen is recorded to the nearest 0.1 mg/L. Since dissolved oxygen takes the longest to stabilize, record this parameter after temperature, conductivity, and pH.

3.5.2 pH - If the pH meter value does not stabilize in several minutes, out-gassing of carbon dioxide or hydrogen sulfide or the settling of charged clay particles may be occurring. If out-gassing is suspected as the cause of meter drift, collect a fresh sample, immerse the pH probe and read pH at one minute. If suspended clay particles are the suspected cause of meter drift, allow the sample to settle for 10 minutes, and then read the pH in the upper layer of sample without agitating the sample. With care, pH measurements should be accurately measured to the nearest 0.1 pH unit.

3.5.3 Conductivity - Preferably, specific conductance is measured directly in-stream close to the flow centroid. Allow the conductivity probe to equilibrate for at least one minute before specific conductance is recorded to three significant figures (if the value exceeds 100 mS/cm). The primary physical problem in using a specific conductance meter is entrapment of air in the conductivity probe chambers. The presence of air in the probe is indicated by unstable specific conductance values fluctuating up to ±100 mS/cm. The entrainment of air can be minimized by slowly, carefully placing the probe into the water; and when the probe is completely submerged, quickly move it through the water to release any air bubbles.

3.5.4 Temperature is measured directly in-stream close to the flow centroid. Measure temperature directly from the stream by immersing a YSI instrument.

3.6 Personnel and Training

Water quality samples for Monitoring Program should be collected by OC Watersheds monitoring staff already trained and proficient in water quality sampling.

Only NPDES contract laboratories will be selected for water quality analyses and they will have the appropriate qualifications for metals analyses.

Primary County personnel that will be involved in the implementation of this Monitoring Plan, including the primary contacts for each entity, are presented in Table 3-1.

Table 3-1
Key Personnel for Monitoring Program

Title	Name (Affiliation)	Tel. No.
Project Director	Chris Crompton, OC Watersheds Program	714-955-0630
Monitoring Programs Supervisor	Theodore von Bitner, OC Watersheds Program	714-955-0680
Principal Investigator	Stuart Goong, OC Watersheds Program	714-955-0656

3.7 Water Quality Analysis

Standard operating procedures for the analysis of water quality samples are provided in the Quality Assurance Protection Plan (QAPP).

Section 4
Data Management

4.1 Documents and Records

All laboratory and field data should follow the guidelines and formats established by OC Watersheds Program.

All samples delivered to contract laboratories for analysis should include completed Field Chain of Custody forms.

All contracted laboratories should generate records for sample receipt and storage, analyses, and reporting.

Copies of original Field Data Sheets and Chain of Custody forms for sites should be maintained. Examples of Field Data Sheets and Chain of Custody forms are on file with the Principal Investigator.

All chemical monitoring records generated by these monitoring programs should be stored at OC Watershed Program offices.

4.2 Database Management

A project database should be maintained by OC Watersheds. All laboratory and field measurement data collected for inclusion in the database should follow the guidelines and formats established by OC Watersheds Program.

The laboratories should provide data in electronic formats to OC Watersheds.

Prior to upload, a QA/QC review of data should be conducted by OC Watersheds to check new data for completeness, validity of analytical methods, validity of sample locations, and validity of sample dates.

The QA/QC should involve assessing new data prior to uploading to ensure it follows specified rules, including issues such as alpha-numeric formatting, units of measurement, missing information, and others. The sample location information should be checked to ensure that sites are correctly referenced and that identifiers and descriptions match corresponding records from the existing database. Data not passing this QA/QC review should be returned to the originating laboratory or generator for clarification and or correction. When all data within a batch set have passed QA/QC requirements, the data will be uploaded to the database. A unique batch number, date loaded, originating laboratory, and the person who loaded the data should be recorded in the database, so that data can be identified and removed in the future if necessary.

Section 5
References

APHA, 1998. Standard Methods for the Examination of Water and Wastewater. 20th Edition. American Public Health Association, Washington DC.

Puckett, M. 2002. Quality Assurance Management Plan for the State of California's Surface Water Ambient Monitoring Program ("SWAMP"). California Department of Fish and Game, Monterey, CA. Prepared for the State Water Resources Control Board, Sacramento, CA. 145 pages plus Appendices.

Section 4

Monitoring Report Outline

CDM

Technical Memorandum

To: *Stuart Goong, Beatrice Mussachia*
County of Orange
OC Watersheds Program

From: *Thomas Lo, Donald Schroeder*
Camp Dresser & McKee Inc.

Date: *May 13, 2010*

Subject: *Coyote Creek Source Control Plan - Monitoring Report Outline*

This technical memorandum provides a proposed outline for future reporting of results and assessment of the Coyote Creek Water Quality Monitoring Program.

Coyote Creek Monitoring Report Outline

Section 1 Introduction

1.1 Regulatory Background

1.2 Coyote Creek Metals TMDL

1.2.1 TMDL background

1.2.2 Orange County Watersheds and Permittee Responsibilities

1.3 Purpose and Objectives

Section 2 Sampling Methodology

2.1 Dry and Wet Weather Sampling

-Describe purpose, sampling locations, sampling details and methodology

2.2 Special Studies

-Describe sampling locations, sampling details, source evaluation investigation activities

Section 3 Data Results and Analysis

3.1 Summary of Monitoring for Dry/Wet Weather Events and Special Studies

-Describe sample collection for dry/wet weather (number of samples collected, dates of sampling)

3.2 Data Results Summary

-Show range of data for each site - 10th, 50th, 90th percentiles for dry/wet weather/special study (similar to Table 6, Task 4 –Data Review TM)

3.3 Compliance Analysis (see Table 8, Task 4 Review Data Tech memo)

-Evaluate for dry weather/special study copper exceedances

-Evaluate for wet weather copper, lead, and zinc exceedances (adjust for hardness)

3.4 Interpretation of Monitoring Results

- Evaluate spatial variability in water quality for dry and wet weather samples

- Evaluate wet weather sample data from different points in monitored event hydrographs to characterize mobilization of metals loads during storms

- Evaluate monitoring data and other observations from special studies

Section 4 Assessment of Monitoring Program

4.1 Assessment of Current Year Monitoring

-Based on interpretation of monitoring results

-Describe what Priority level of sampling sites will continue or discontinue

4.2 Monitoring Activities for Upcoming Year

-Samples sites for dry/wet weather planned, number of samples to be collected

-Describe any Special Studies proposed

4.3 BMP Implementation

-After initial year monitoring is completed, recommend BMPs to be implemented

-What are the BMPs (e.g., enhanced sweeping (frequency, timing, etc.)

Section 5 BMP Effectiveness (applicable once BMPs are actually implemented)

5.1 Effectiveness of BMPs

- Trend analysis to address question of whether metals concentrations are decreasing over time as BMPs are implemented in the watershed

  - Show data as time series plots

  - Use statistical tests as size of data set increases to represent post BMP implementation conditions (see Task 5.4 Technical Memo)

5.2 BMP Recommendations

-Propose modification to BMPs (e.g., enhanced sweeping – adjust schedule/timing, target new streets, etc.)

-Propose new BMPs

Appendices

Appendix A – Water Quality Data Summary

DECLARATION OF SERVICE BY EMAIL

I, the undersigned, declare as follows:

I am a resident of the County of Sacramento and I am over the age of 18 years, and not a party to the within action. My place of employment is 980 Ninth Street, Suite 300, Sacramento, California 95814.

On March 22, 2023, I served the:

- **Claimants' Late Comments filed March 21, 2023**

  California Regional Water Quality Control Board, Santa Ana Region, Order No. R8-2009-0030, Sections IX, X, XI, XII, XIII, and, XVIII, Adopted May 22, 2009, 09-TC-03
  Santa Ana Regional Water Quality Control Board, Resolution No. R8-2009-0030, adopted May 22, 2009
  County of Orange, Orange County Flood Control District; and the Cities of Anaheim, Brea, Buena Park, Costa Mesa, Cypress, Fountain Valley, Fullerton, Huntington Beach, Irvine, Lake Forest, Newport Beach, Placentia, Seal Beach, and Villa Park, Claimants

By making it available on the Commission's website and providing notice of how to locate it to the email addresses provided on the attached mailing list.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this declaration was executed on March 22, 2023 at Sacramento, California.

Jill Magee

Jill L. Magee
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COMMISSION ON STATE MANDATES

Mailing List

Last Updated: 3/9/23

Claim Number: 09-TC-03

Matter: California Regional Water Quality Control Board, Santa Ana Region, Order No. R8-2009-0030, Sections IX, X, XI, XII, XIII, and, XVIII, Adopted May 22, 2009

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City of Cypress
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City of Seal Beach
City of Villa Park
County of Orange
Orange County Flood Control District

TO ALL PARTIES, INTERESTED PARTIES, AND INTERESTED PERSONS:

Each commission mailing list is continuously updated as requests are received to include or remove any party or person on the mailing list. A current mailing list is provided with commission correspondence, and a copy of the current mailing list is available upon request at any time. Except as provided otherwise by commission rule, when a party or interested party files any written material with the commission concerning a claim, it shall simultaneously serve a copy of the written material on the parties and interested parties to the claim identified on the mailing list provided by the commission. (Cal. Code Regs., tit. 2, § 1181.3.)

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