1. Introduction

Southern California urban areas have considerable pest pressures, which results in high urban pesticide use. According to the Pesticide Use Report (PUR) over 15,700,000 pounds of pesticides were applied for non-agricultural use in 2017 (CDPR, 2019). Non-agricultural use includes applications for residential, industrial, institutional, structural, or vector control purposes (CDPR, 2014). PUR data do not account for non-professional applications by residents and homeowners, so actual use is higher. Los Angeles, Orange, and San Diego counties, all counties in Southern California, accounted for 22.5% of the total reported non-agricultural use. Specifically, 2,489,130 pounds of pesticides were applied for professional structural pest control or landscape maintenance in Los Angeles, Orange, and San Diego counties in 2017. Urban areas in Southern California are highly developed, with a high percentage of impervious surfaces. Impervious surfaces enhance surface water runoff, which increases the potential for pesticides to enter urban creeks and rivers via storm drains (Gan et al., 2012).

The California Department of Pesticide Regulation’s (CDPR) Surface Water Protection Program (SWPP) has been monitoring pesticides in urban waterways since 2008. Study 320 is a continuation of CDPR’s urban monitoring in Southern California (Study 270) (Budd, 2018). The work described herein complements Study 299, which monitors for pesticides in urban areas of Northern California (Ensminger, 2019). These studies have shown that urban-use pesticides (e.g., pyrethroids, fipronil, imidacloprid, and synthetic auxin herbicides) are commonly detected in urban waterways (Ensminger et al., 2013a). SWPP is particularly interested in cases where pesticide concentrations repeatedly reach or exceed USEPA Aquatic Life Benchmarks, which are a type of toxicity thresholds used to gauge potential risks to sensitive aquatic organisms (Gan et al., 2012; Oki and Haver, 2009; Weston et al., 2014; Weston et al., 2005; Weston et al., 2009). Numerous urban waterways are listed on the 2016 Federal Clean Water Act Section 303(d) list due to the confirmed presence of pyrethroid and organophosphate pesticides (Cal EPA, 2018). High use, high potential for pesticide runoff to enter urban waterways, and historical exceedances of aquatic life benchmarks justify the need to continue monitoring California’s urban waterways.

This study is also designed to evaluate water quality trends that could show changes in pesticide concentrations over time particularly at long-term monitoring sites. CDPR has taken significant mitigation actions to address water quality exceedances for pyrethroids and fipronil in recent years. Surface water
regulations (Chapter 3, Sections 6970 and 6972 in the California Code of Regulations) went in effect in
July 2012 to address pyrethroid concentrations in California surface waters (CDPR, 2013); and in 2018,
new California specific labels were adopted for fipronil-containing products registered for outdoor use.
These mitigation actions were designed to reduce loading of pyrethroids and fipronil to surface waters.
Long-term monitoring could provide data that allow CDPR to assess improvements in water quality, such
as downward trends in pesticide concentrations and/or decreased exceedances of toxicity thresholds.

Previous monitoring efforts have focused on pesticide loading into receiving waters from residential
areas; however, there is little known about the relative contribution of pesticides from other land-uses, such
as commercial and industrial sites. An exploratory site will be added to the current monitoring protocol to
measure pesticide loading from an area draining commercial land use. In addition, the effectiveness of a
low cost mitigation strategy will be evaluated under field conditions at two monitoring locations. Specific
modifications from the Study 320 Fiscal Year (FY) 19 – 20 sampling plan are presented in Section 4.9.

2. Objectives

The goal of this project is to assess pesticide concentrations found in runoff at drainages and receiving
waters within Southern California urbanized areas during rain events and dry season conditions. Specific
objectives include:

1) Determine presence and concentrations of selected priority pesticides in runoff and receiving
   waters of Southern California urban watersheds under dry and storm conditions;
2) Compare measured concentrations of pesticides to aquatic toxicity thresholds;
3) Evaluate pesticide concentration trends through long-term monitoring;
4) Determine the acute toxicity of water samples using laboratory tests conducted with the
   amphipod Hyalella azteca and the midge Chironomus species;
5) Monitor deposition of sediment-bound pyrethroids within selected watersheds;
6) Evaluate commercial land-use as potential source of pesticides to urban waterways; and
7) Evaluate effectiveness of carbon filled socks to reduce pesticides in urban runoff under field
   conditions.

3. Personnel

The study will be conducted by staff from the CDPR’s Environmental Monitoring Branch under the
general direction of Jennifer Teerlink, Environmental Protection Manager I. Key personnel are listed
below:

Project Leader: Aniela Burant, Ph.D.
Field Coordinator: Jason Carter, Ph.D.
Reviewing Scientist: Robert Budd, Ph.D.
Laboratory Liaison: Christopher Collins  
Analytical Chemistry: Center for Analytical Chemistry, Department of Food and Agriculture (CDFA)

Collaborators: University of California - Cooperative Extension Orange County – South Coast Research and Extension Center, Los Angeles Public Works, Los Angeles Sanitation District, City of San Diego, County of San Diego, and Orange County Public Works.

Please direct questions regarding this study to Aniela Burant, Senior Environmental Scientist (Specialist), at (916) 445-2799 or Aniela.Burant@cdpr.ca.gov.

4. Study Plan

4.1 Site Selection

The sites described in this protocol, with the exception of the exploratory site, have been previously sampled by CDPR (Burant, 2019; Budd, 2018). These sites were selected using the watershed prioritization component of the Surface Water Monitoring Prioritization (SWMP) Model. The SWMP model, which is extensively described in Luo, et al. (2017), identifies priority hydrologic-unit codes (HUC) based on reported pesticide use and toxicity data. Using the SWMP Model and its aggregation tool (Luo, et al., 2017), the top ten priority HUC8s are identified for Southern California (Appendix 1). Of these, SWPP currently has monitoring sites within six of the top HUC8s. These watersheds, located throughout heavily urbanized areas of Southern California, provide data to evaluate the spatial distribution of priority pesticides in Southern California surface waters (Budd et al., 2013; Luo et al., 2013). Other factors such as site accessibility, contributing land use, perennial flow, other monitoring agency representation, and budgetary constraints direct site selection in the remaining HUCs.

4.1.1 Los Angeles County

Ballona Creek (BAL), Bouquet Canyon Creek (BOQ), Los Angeles River (LAR), San Gabriel River (SGR), Compton Creek 1 (CC1), and Dominguez Channel (DC) are the watersheds of interest in Los Angeles County (Figure 1). All sites are located within concrete-lined channels. These sites are large watersheds with mixed residential and commercial land-use. BAL is in the Santa Monica Bay HUC8 and drains mostly residential land-uses with single- and multi- family homes. BOQ consists of predominantly affluent single-family homes with a small amount of commercial land-use. Although not in a HUC8 identified by the SWMP Model, BOQ has historically high pesticide detections. CC1, a new site in FY19-20, is included again in FY20-21’s sampling plan. CC1 is in the Los Angeles River HUC8 was chosen for its contributing land use characteristics. CC1 has
a high percentage of residential land-use. LAR1, in the Los Angeles River HUC8, drains residential land-uses, but has a higher percentage of commercial and industrial land-uses than BAL or BOQ. Two exploratory storm drain sites along the LA River (LAR3 and LAR4) were included in last year’s study to determine relative contributions from commercial-dominated land-use sites. These sites drain from downtown Los Angeles. These sites will be included in FY 20-21. DC has the highest percentage of commercial and industrial land-uses of the any of the receiving waters in this study. SGR consists primarily of wastewater effluent during low flows. Both DC and SGR are in the San Gabriel HUC8.

4.1.2 Orange County
Ambient water quality monitoring will be conducted at six sampling locations within Salt Creek (SC, Figure 2), three locations within Wood Creek Canyon (WC, Figure 3), one site in the Anaheim-Barber City Channel, and one site along Bolsa Chica Channel (ABCC and BCC, Figure 4) in Orange County. ABCC was misidentified as Bolsa Chica Channel (BCC) in FY 18-19; these are the same sampling sites. A sampling site along BCC was included in last year’s sampling plan, just upstream of the confluence of BCC and ABCC. An exploratory storm drain site along Peters Canyon Channel, will be added to this year’s sampling plan.

Sampling stations within Salt Creek (SC1, SC2, SC3, SC4, SC5, and SC7) have been monitored consistently since 2009 as part of CDPR’s urban monitoring program. The surrounding drainage areas within the Salt Creek watershed consist of single-family dwellings, multiple-family dwellings, light commercial buildings, parks, schools, and two golf courses. SC1–SC4 are located directly below storm drains that receive runoff from residential neighborhoods. SC5 and SC7 are located at the receiving waters of urban inputs and will allow evaluation of pesticide concentrations in the watershed as well as downstream transport of pesticides. All SC sites are located in the Aliso-San Onofre HUC8.

Monitoring locations within Wood Creek, all located in the Aliso-San Onofre HUC8, have been monitored since 2009 as part of SWPP’s mitigation evaluation monitoring in urban settings. The monitoring sites are situated at the inlet (WC1) and outlet (WC2) of a small (~0.18 acres) constructed wetland designed to reduce pollutants in urban runoff (Budd, et al., 2012). The wetland receives urban runoff from a drainage area consisting entirely of single- and multiple-family residential units. The primary objective of monitoring at these stations is to observe the efficacy of pesticide removal within the wetland system. Efficacy will be evaluated through comparisons in average pesticide concentrations between the inlet and outlet. A second storm drain (WC3), located within the Wood Creek Watershed, will be monitored for pyrethroids only.
Sampling along the Anaheim-Barber City Channel, which is concrete-lined, and the Bolsa Chica Channel, which has a sediment streambed, will continue. Both watersheds are mixed residential, commercial, and industrial area. The watersheds are located within the Seal Beach HUC8, the highest priority HUC8 in Southern California based on estimated urban pesticide use within the delineated HUC.

An exploratory site in Orange County will be added to the sampling plan this year. The inclusion of an exploratory site to determine relative contributions from commercial-dominated land-use sites is currently under consideration for long-term monitoring. A storm drain along Peters Canyon Channel, just upstream of the confluence of Peters Canyon Channel and San Diego Creek, will be included. This site is located in the Newport Bay HUC8 and upstream of a site monitored by the State Water Resources Control Board’s Stream Pollution Trends (SPoT) Monitoring Program. This site, San Diego Creek at Alton Parkway, has historic detections of pyrethroids in sediment (SWAMP, 2017).

Two socks (1 biochar, 1 activated carbon filled) will be placed at the outfalls of two storm drains in Orange County. Effectiveness of this treatment technology will be measured by comparing pre- and post-carbon sock pesticide concentrations. Implementation will occur in the dry-season.

### 4.1.3 San Diego County

Two stations within the San Diego River watershed, as well as one within the Chollas Creek watershed, will be monitored in San Diego County (Figure 5, Table 1, and Appendix 2). San Diego River and Chollas Creek are not channelized or concrete-lined, which may account for historically lower pesticide concentrations (Budd, 2018). Each of these sites are located within high priority HUC8s in Southern California (Appendix 1). Sampling locations within San Diego County are located near the base of their respective watersheds (i.e., the downstream portion of the watersheds).

### 4.1.4 Collaborative Monitoring

CDPR has been engaged in a collaborative effort with the State Water Resources Control Board through its SPoT Monitoring Program to increase the data available for trend analysis of current-use pesticides (SWAMP, 2017). The synergistic partnership allows each agency to maximize information gained with limited resources. In coordination with CDPR, the SPoT Program also collects sediments throughout California for pyrethroid and fipronil analyses, which greatly adds to the spatial representation of pesticide monitoring data. Several sites described in this protocol also serve as SPoT monitoring locations for sediments, including BAL, BOQ, LAR1, SGR, and SC5. CDPR collects and analyzes the aqueous samples, while SPoT monitors for pyrethroids and fipronil in sediment. Both sets of data are considered in long-term trend analysis.
4.2 Selection of Pesticides for Monitoring

The SWMP Model was utilized for pesticide selection for ambient monitoring (Budd et al., 2013; Luo et al., 2013). Luo, et al. (2013) describes the SWMP Model in detail, but briefly, the model is based on current pesticide use (PUR, 2016–2018) patterns and aquatic toxicity threshold values. Use data from Los Angeles, Orange, and San Diego counties and aquatic life benchmarks set by the U.S. EPA were considered. The product of the use and toxicity scores yields a final score that represents a relative prioritization of pesticides. In addition, the output generates a monitoring recommendation based on physical-chemical properties such as half-life and solubility. Pesticides that receive a final score of nine or higher are given priority for monitoring. Pesticides with lower scores have either low use in urban environments and/or low associated aquatic toxicity. However, the decision to monitor a pesticide is also influenced by additional factors such as previous monitoring data, budgetary constraints, and analytical capabilities. Thirty-four pesticides received a final score equal to or greater than nine (Appendix 3). These pesticides will be analyzed using five analytical screens: a pyrethroid screen, liquid chromatography (LC) multi-analyte screen, dinitroaniline screen, and phenoxy herbicide screen. Note that the dinitroaniline screen now contains chlorfenapyr, which was previously a one-compound standalone screen. All suites cannot be analyzed at every monitoring location due to budgetary constraints. Priority is given to the pyrethroid and pesticides included in the liquid chromatography (LC) multi-analyte screen. Several sampling locations (SC3, ABCC, BCC, BOQ, SC7, BAL and LAR; depending on the sampling event) will serve as representative watersheds to determine the extent of pesticide concentrations, where all five analytical method screens will be run (Table 2). At these sites, screens that contain pesticides with lower detection frequencies in previous monitoring, such as the dinitroaniline screen, or pesticides that have not previously exceeded benchmarks (e.g., phenoxy herbicides), will be analyzed (Appendix 4).

4.3 Water Sampling

Whole water samples will be collected during two dry-season and two storm sampling events. Dry-season sampling will occur in August 2020 and June 2021. CDPR will attempt to collect storm samples during the first major storm (rain) event of FY 20–21 and during a second major storm in the winter or early spring of 2021 (Table 2).

Dry-season water samples will be collected as grab samples directly into 1-L amber bottles (Bennett, 1997). Where the stream is too shallow to collect water directly into these bottles, a stainless-steel container will be used to initially collect the water samples. Water samples collected during storm events at up to five locations within Salt Creek or Wood Creek watersheds may be collected as time-weighted composite samples utilizing automated sampling equipment set up by UC Cooperative Extension (CDPR, 2011;
Sisnero et al., 2012). Flow-weighted storm runoff will be collected at BAL, CC1, and LAR1 by the Los Angeles County Public Works Department. Storm runoff composite samples collected at SDR1, SDR4 and CHO1 will be collected by the County and City of San Diego, respectively. Samples will be stored and transported on wet ice or refrigerated at 4°C until analyzed. Field duplicates and/or field blanks will be collected during each sampling event for quality assurance.

4.4 Sediment Sampling
Sediment samples will be collected at three locations (Table 2). Enough sediment will be collected to fill ½ pint Mason jars using stainless-steel scoops from the top of the bed layer, biasing for fine sediments where possible (Mamola, 2005). All sediments will be passed through a 2-mm sieve to remove plant debris and then homogenized (Mamola, 2005). Samples will be analyzed for pyrethroids.

4.5 Toxicity Sampling
Water samples will be collected at a subset of sampling sites for toxicity analysis (Table 3). Grab samples will be collected in 1-L amber I-Chem certified 200 bottles (or equivalent) and transported to the Aquatic Health Program at the University of California, Davis. Toxicity testing will measure percent survival of the amphipod *Hyalella azteca* or the midge *Chironomus sp.* in water over 96-hours (Table 3). Several sites described in this protocol also serve as SPoT monitoring locations for sediment toxicity, including BAL, BOQ, LAR1, SGR, SDR1, PCC1, LAR3, LAR4 and SC5 (depending on the sampling event). Data will be shared between monitoring programs.

4.6 Field Measurements
Physical-chemical properties of water column will be determined using a YSI-EXO 1 multi-parameter Sonde according to the methods describe by Doo and He (2008). At each site, water chemistry parameters measured *in situ* will include pH, temperature, salinity, total dissolved solids, and dissolved oxygen. Storm drain flow rates will be measured to characterize the flow regime and to estimate the total loading of target pesticides. Discrete time flow estimations will be determined using either a Global portable velocity flow probe (Goehring, 2008), utilizing a float or fill-bucket method. Continuous flow rates will be obtained at SC2, SC3, and WC2 using an installed Hach Sigma 950 flow meter (Sisneroz et al., 2012; Oki and Haver, 2009).

4.7 Sample Transport
CDPR staff will transport samples following the procedures outlined in CDPR SOP QAQC004.01 (Jones, 1999). A chain-of-custody record will be completed and accompany each sample.
4.8 Organic Carbon and Suspended Sediment Analyses

CDPR staff will analyze water and sediment samples for total organic carbon (TOC) and dissolved organic carbon (DOC) using a TOC-V CSH/CNS analyzer (Shimadzu Corporation, Kyoto, Japan) (Ensminger, 2013b). Water samples will also be analyzed for suspended sediment (Ensminger, 2013c). Lab blanks and calibration standards will be run before every sample set to ensure the quality of the data.

4.9 Modifications from Study 320 FY 20-21

The current sampling plan is an extension of Study 270 conducted during fiscal years 2009–2019 and Study 320 conducted in FY19-20. Details of the previous year’s sampling protocol are described in the document titled “Ambient Surface Water and Mitigation Monitoring in Urban Areas in Southern California during Fiscal Year 2019-2020” (Budd, 2018). The sampling and analysis schedule is similar to that for FY 19–20, with a few notable modifications (Table 4), including the addition of an exploratory site to determine pesticide loading from commercial land-use and evaluating the effectiveness of two carbon socks to remove pesticides under field conditions.

5. Chemical Analysis

Pesticide analysis will be conducted by the Center for Analytical Chemistry at the California Department of Food and Agriculture, Sacramento, CA (CDFA). CDFA will analyze five analytical suites (Appendix 4). Sediment samples will be analyzed for pyrethroids (Appendix 4). Laboratory QA/QC will follow CDPR guidelines and will consist of laboratory blanks, matrix spikes, matrix spike duplicates, surrogate spikes, and blind spikes (Segawa, 1995). Laboratory blanks and matrix spikes will be included in each extraction set.

6. Data Analysis

Data generated by this project will be entered into a central database that holds all data including field information, field measurements, and laboratory analytical data. We will use various non-parametric statistical methods to analyze the data. The data collected from this project may be used to develop or calibrate urban pesticide runoff models.

Preliminary analysis (Budd et al., 2020) indicated that the sample data are skewed and contain a number of non-detects with multiple reporting limits, which may violate the normality and equal-variance assumptions of the parametric procedures (e.g., ANOVA and t-tests). The application of non-parametric procedures to skewed and censored environmental data is most appropriate for this study (Helsel, 2012). The data will be analyzed by using the R statistical program (R Core Team, 2014), specifically the Non-detects And Data Analysis for environmental data (NADA) package for R (NADA Package for R), and Minitab.
Based on the study objectives, preliminary analysis, and data availability, we propose the following statistical procedures for data analysis (Table 5).

1) Explanatory data analysis will be performed to summarize the characteristics of the sample data. Urban monitoring data have been collected since 2008 for a variety of analytes (Appendix 4) at multiple locations (e.g., Salt Creek, Wood Creek) with different site types (i.e., storm drain outfalls and receiving waters), and between different seasons (i.e., dry and wet seasons) (Tables 1 and 2). Boxplots, histograms, probability plots, and empirical distribution functions will be produced to explore any potential patterns demonstrated by the data.

2) Hypothesis tests will be conducted to compare the concentration between groups of interest. For example, we will test whether there is significant difference in concentration between the dry and wet seasons, or between the different locations. Non-parametric procedures will be used to compute the statistics for hypothesis testing. Data with multiple reporting limits will be censored at the highest limit before proceeding if the test procedure allows only one reporting limit.

3) Trend analysis will be included to demonstrate changes in concentration over time (if any). For the trend analysis, we will use Akritas-Thenil-Sen non-parametric regression, which regresses the censored concentration on time, or the Kaplan-Meier method, which tests the effects of year, month, and location by developing a mixed linear model between the censored concentration and the spatial-temporal factors.

Finally, we will attempt to develop statistical models to assess the factors potentially affecting pesticide concentrations in surface water. We intend to develop a logistic regression model to estimate and predict the likelihood of detection or exceedance of reporting limits or toxicity thresholds. A series of explanatory variables will be examined, including but not limited to: rainfall, field measurements (e.g., flow rate, pH, water TOC, sediment TOC, and TSS), number of households contributing to the storm drain outfall/creek, residential density, percent of impervious areas, season (or month), year, and regulation. Further literature review will be conducted to identify possible explanatory variables in favor of the model.

7. Timeline
Field Sampling: Aug 2020 – Jun 2021
Report to Management: Jan 2022 – Mar 2022
Data Entry into SURF: Mar 2022 – Jun 2022
8. Literature Cited


Doo, S. and L-M. He. 2008. California Department of Pesticide Regulation SOP EQWA010.00: Calibration, field measurement, cleaning, and storage of the YSI 6920 V2-2 multiparameter sonde.

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Ensminger, M. 2013b. Analysis of whole sample suspended sediments in water.


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Luo, Y, M. Ensminger, R. Budd, D. Wang, X. Deng. 2017. Methodology for prioritizing areas of interest for surface water monitoring in urban receiving waters of California.


Segawa, R. 1995. California Department of Pesticide Regulation SOP QAQC001.00: Chemistry Laboratory Quality Control.


### Table 1. Summary of urban pesticide monitoring locations in Southern California.

<table>
<thead>
<tr>
<th>County</th>
<th>Watershed</th>
<th>Stormdrain Outfall</th>
<th>Receiving Water/ Mitigation Outfall</th>
<th>Total Sites</th>
</tr>
</thead>
<tbody>
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<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>Bouquet Creek</td>
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<td>1</td>
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<td>Los Angeles River</td>
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<td>1</td>
<td>3</td>
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<td>San Gabriel River</td>
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<td>1</td>
</tr>
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<td>Los Angeles</td>
<td>Dominguez Channel</td>
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<td>1</td>
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<td>Los Angeles</td>
<td>Compton Creek</td>
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<td>Orange</td>
<td>Anaheim-Barber City Channel</td>
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<td>1</td>
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<td>Orange</td>
<td>Bolsa Chica Channel</td>
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<td>1</td>
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<tr>
<td>Orange</td>
<td>Salt Creek</td>
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<tr>
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<td>Wood Creek</td>
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<td>1</td>
<td>3</td>
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<tr>
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<td>2</td>
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<td>San Diego</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
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<td><strong>12</strong></td>
<td><strong>23</strong></td>
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### Table 2. Ambient surface water and mitigation sampling schedule. Subject to change

<table>
<thead>
<tr>
<th>Site</th>
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<th>Second Storm</th>
<th>June Dry</th>
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<td>LAR4</td>
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<tr>
<td>CHO</td>
<td></td>
<td>LC, PY6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Pesticides includes in screens detailed in Appendix 4. DN=dinitroanline, LC = Liquid chromatography, PX=phenoxy, PY=pyrethroid.

**QC=quality control. Screens will rotate by event.

^Exploratory Sites
### Table 3. Toxicty sampling schedule.

<table>
<thead>
<tr>
<th>Site</th>
<th>Test Species</th>
<th>August Dry</th>
<th>June Dry</th>
<th>First Storm</th>
<th>Second Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAR, BOQ, SC3, SC5, SDR, BAL, SGR, LAR3, PCC1*</td>
<td><em>Hyalella azteca</em></td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>LAR, BOQ, SC3, SC5, SDR, BAL, SGR, LAR3, PCC1*</td>
<td><em>Chironomus sp.</em></td>
<td>7</td>
<td>7</td>
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</tr>
</tbody>
</table>

*Sites will be rotated for each sampling event*

### Table 4. Modifications from sampling plan for fiscal year 2019–2020.

<table>
<thead>
<tr>
<th>Change from FY 19-20</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adding additional toxicity tests</td>
<td>Collaborative monitoring efforts with SPoT program</td>
</tr>
<tr>
<td>Adding PCC1</td>
<td>Adding a drainage location in Peters Canyon Channel in Orange County that receives runoff from commercial land-use to evaluate potential contribution to pesticide loading</td>
</tr>
</tbody>
</table>

### Table 5. Non-parametric procedures frequently used for comparing paired data, two samples and three or more samples.

<table>
<thead>
<tr>
<th>Data</th>
<th>Non-Parametric Procedure</th>
</tr>
</thead>
</table>
| Paired data                    | *Wilcoxon signed-rank test* for uncensored data  
                                 | *Sign test* (modified for ties) for censored data with one reporting limit  
                                 | *Score tests* for censored data with multiple RLs (the PPW test and the Akritas test) |
| Two samples                    | *Wilcoxon rank-sum* (or *Mann-Whitney*) test or *Kolmogorov-Smirnov test* for censored data with one reporting limit  
                                 | *Score tests* for censored data with multiple reporting limits (the *Gehan test* and generalized *Wilcoxon test*) |
| Three or more samples in one-way layout | *Kruskal-Wallis test* (for unordered alternative) or *Jonckheere-Terpstra test* (for ordered alternative) for censored data with one reporting limits  
                                 | *Generalized Wilcoxon score test* for censored data with multiple reporting limits  
                                 | *Multiple comparison* to detect which group is different |
| Three or more samples in two-way layout | *Friedman’s test* (for unordered alternative) or *Page’s test* (for ordered alternative) for censored data with one reporting limits  
                                 | *Multiple comparison* to detect which group is different |
Figure 1. Sampling locations within Los Angeles County, CA.
Figure 2. Sampling locations within Salt Creek Watershed, Orange County, CA.
Figure 3. Sampling locations within Wood Creek Watershed, Orange County, CA.
Figure 4. Sampling location with Anaheim-Barber City Channel, Bolsa-Chica Channel, and Peters Canyon Channel in Orange County, CA.
Figure 5. Sampling locations within San Diego County, CA.
Appendix 1.

Table 1. Top ten HUC8’s identified for urban monitoring in Southern California, ordered by the ranking process.

<table>
<thead>
<tr>
<th>HUC8 Code</th>
<th>HUC8 Name</th>
<th>CDPR Monitoring Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>18070201</td>
<td>Seal Beach (Anaheim Bay)</td>
<td>ABCC, BCC</td>
<td></td>
</tr>
<tr>
<td>18070105</td>
<td>Los Angeles</td>
<td>LAR1, LAR3, LAR4, CC1</td>
<td>SWAMP location, NPDES permit monitoring at several locations along San Diego Creek*</td>
</tr>
<tr>
<td>18070204</td>
<td>Newport Bay</td>
<td>PCC1</td>
<td></td>
</tr>
<tr>
<td>18070104</td>
<td>Santa Monica Bay</td>
<td>BAL</td>
<td></td>
</tr>
<tr>
<td>18070106</td>
<td>San Gabriel</td>
<td>SGR, DC</td>
<td></td>
</tr>
<tr>
<td>18070203</td>
<td>Santa Ana</td>
<td></td>
<td>Southern California Bight Project monitoring site at base of Santa Ana River*</td>
</tr>
<tr>
<td>18070304</td>
<td>San Diego</td>
<td>SDR1, SDR4, CHO1</td>
<td></td>
</tr>
<tr>
<td>18070202</td>
<td>San Jacinto</td>
<td></td>
<td>SWAMP monitoring location along Santa Margarita River*</td>
</tr>
<tr>
<td>18070301</td>
<td>Aliso-San Onofre</td>
<td>SC1, SC2, SC3, SC4, SC5, SC7, WC1, WC2, WC3</td>
<td></td>
</tr>
<tr>
<td>18080303</td>
<td>San Luis Rey-Escondido</td>
<td></td>
<td>SWAMP monitoring location along San Luis River*</td>
</tr>
</tbody>
</table>

*Non-CDPR monitoring locations evaluated using California Environmental Data Exchange Network (CEDEN) available at: http://www.ceden.org/*
### Table 1. Detailed sampling site information

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Site ID</th>
<th>Northing</th>
<th>Easting</th>
<th>Site type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt Creek SC1</td>
<td>33.3032.92</td>
<td>-117.4126.53</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>Salt Creek SC2</td>
<td>33.3040.57</td>
<td>-117.4140.67</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>Salt Creek SC3</td>
<td>33.3043.02</td>
<td>-117.4149.55</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>Salt Creek SC4</td>
<td>33.3031.00</td>
<td>-117.4226.34</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>Salt Creek SC5</td>
<td>33.3020.23</td>
<td>-117.4230.87</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Salt Creek SC7</td>
<td>33.2853.97</td>
<td>-117.4326.55</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Ballona Creek BAL</td>
<td>33.5912.92</td>
<td>-118.2455.90</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Bouquet Creek BOQ</td>
<td>34.2542.05</td>
<td>-118.3223.45</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Los Angeles River LAR1</td>
<td>33.8058.09</td>
<td>-118.2054.53</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Los Angeles River LAR3</td>
<td>34.0385676</td>
<td>118.228332</td>
<td>Storm Drain</td>
<td></td>
</tr>
<tr>
<td>Los Angeles River LAR4</td>
<td>34.0385676</td>
<td>118.228332</td>
<td>Storm Drain</td>
<td></td>
</tr>
<tr>
<td>Compton Creek CC1</td>
<td>33.93540</td>
<td>-118.25479</td>
<td>Storm Drain</td>
<td></td>
</tr>
<tr>
<td>San Gabriel River SGR</td>
<td>33.7751.08</td>
<td>-118.0974.18</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Dominguez Channel DC</td>
<td>33.8710.5</td>
<td>-118.2905.69</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Anaheim-Barber City Channel ABCC</td>
<td>33.750297</td>
<td>-118.042183</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Bolsa Chica Channel BCC</td>
<td>33.750261</td>
<td>-118.042493</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Peters Canyon Channel PCC1</td>
<td>33.690339</td>
<td>-117.824827</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>San Diego River SDR4</td>
<td>32.8450.37</td>
<td>-116.9912.06</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>San Diego River SDR1</td>
<td>32.4551.79</td>
<td>-117.1012.24</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Chollas Creek CHO1</td>
<td>32.704850</td>
<td>-117.121143</td>
<td>Receiving water</td>
<td></td>
</tr>
<tr>
<td>Wood Creek WC1</td>
<td>33.3456.56</td>
<td>-117.4443.02</td>
<td>Stormdrain</td>
<td></td>
</tr>
<tr>
<td>Wood Creek WC2</td>
<td>33.5815.83</td>
<td>-117.7457.72</td>
<td>Wetland outfall</td>
<td></td>
</tr>
<tr>
<td>Wood Creek WC3</td>
<td>33.5815.7</td>
<td>-117.7457.27</td>
<td>Stormdrain</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3.
Priority model pesticides (Final Score≥9) based on acute aquatic benchmarks and 2016–2018 urban pesticide usage in Los Angeles, Orange, and San Diego counties, California. All pesticides recommended to monitor based on physical-chemical properties. All pesticides are either within current analytical screens or are undergoing method development.

Table 1. Priority Model Pesticides

<table>
<thead>
<tr>
<th>Pesticide Name</th>
<th>Pesticide Class</th>
<th>Use (lbs)</th>
<th>Use Score</th>
<th>Acute Benchmark (ppb)</th>
<th>Toxicity Score</th>
<th>Final Score</th>
<th>Analytical Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifenthrin</td>
<td>Pyrethroid</td>
<td>16669</td>
<td>5</td>
<td>0.07</td>
<td>6</td>
<td>30</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Permethrin</td>
<td>Pyrethroid</td>
<td>15320</td>
<td>5</td>
<td>0.01</td>
<td>6</td>
<td>30</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Lambda-Cyhalothrin</td>
<td>Pyrethroid</td>
<td>4729</td>
<td>4</td>
<td>3.50E-03</td>
<td>7</td>
<td>28</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Neonicotinoid</td>
<td>18788</td>
<td>5</td>
<td>0.38</td>
<td>5</td>
<td>25</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Fipronil</td>
<td>Phenylpyrazole</td>
<td>18005</td>
<td>5</td>
<td>0.11</td>
<td>5</td>
<td>25</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>Pyrethroid</td>
<td>10486</td>
<td>4</td>
<td>0.01</td>
<td>6</td>
<td>24</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Deltamethrin</td>
<td>Pyrethroid</td>
<td>2980</td>
<td>3</td>
<td>0.05</td>
<td>6</td>
<td>18</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Esfenvalerate</td>
<td>Pyrethroid</td>
<td>1379</td>
<td>3</td>
<td>0.02</td>
<td>6</td>
<td>18</td>
<td>Pyrethroid</td>
</tr>
<tr>
<td>Chlorfenapyr</td>
<td>Pyrrole</td>
<td>7791</td>
<td>4</td>
<td>2.91</td>
<td>4</td>
<td>16</td>
<td>Dinitroaniline</td>
</tr>
<tr>
<td>Prodimine</td>
<td>Dinitroaniline</td>
<td>3727</td>
<td>4</td>
<td>6.5</td>
<td>4</td>
<td>16</td>
<td>Dinitroaniline</td>
</tr>
<tr>
<td>Pyriproxyfen</td>
<td>Pyridine</td>
<td>3036</td>
<td>3</td>
<td>0.18</td>
<td>5</td>
<td>15</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Cypermethrin</td>
<td>Pyrethroid</td>
<td>2492</td>
<td>3</td>
<td>0.19</td>
<td>5</td>
<td>15</td>
<td>Pyrethroid</td>
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<tr>
<td>Carbaryl</td>
<td>Carbamate</td>
<td>1008</td>
<td>3</td>
<td>0.85</td>
<td>5</td>
<td>15</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Oryzalin</td>
<td>Dinitroaniline</td>
<td>4704</td>
<td>4</td>
<td>13</td>
<td>3</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Triclopyr, Butoxethyl ester</td>
<td>Pyridine</td>
<td>4397</td>
<td>4</td>
<td>100</td>
<td>3</td>
<td>12</td>
<td>Phenoxy</td>
</tr>
<tr>
<td>Propiconazole</td>
<td>Triazole</td>
<td>3640</td>
<td>4</td>
<td>21</td>
<td>3</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Oxadiazon</td>
<td>Oxadiazole</td>
<td>1878</td>
<td>3</td>
<td>5.2</td>
<td>4</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Pendimethalin</td>
<td>Dinitroaniline</td>
<td>1856</td>
<td>3</td>
<td>5.2</td>
<td>4</td>
<td>12</td>
<td>Dinitroaniline</td>
</tr>
<tr>
<td>Pesticide Name</td>
<td>Pesticide Class</td>
<td>Use (lbs)</td>
<td>Use Score</td>
<td>Acute Benchmark (ppb)</td>
<td>Toxicity Score</td>
<td>Final Score</td>
<td>Analytical Screen</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>------------------------</td>
<td>----------------</td>
<td>-------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Chlorantraniliprole</td>
<td>Anthranilic diamide</td>
<td>793</td>
<td>3</td>
<td>4.9</td>
<td>4</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>DDVP</td>
<td>Organophosphate</td>
<td>722</td>
<td>2</td>
<td>0.03</td>
<td>6</td>
<td>12</td>
<td>In development for the LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Malathion</td>
<td>Organophosphate</td>
<td>407</td>
<td>2</td>
<td>0.05</td>
<td>6</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>Organophosphate</td>
<td>125</td>
<td>2</td>
<td>0.05</td>
<td>6</td>
<td>12</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Sulfometuron-methyl</td>
<td>Urea</td>
<td>432</td>
<td>2</td>
<td>0.45</td>
<td>5</td>
<td>10</td>
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</tr>
<tr>
<td>Dithiopyr</td>
<td>Pyridine</td>
<td>2201</td>
<td>3</td>
<td>20</td>
<td>3</td>
<td>9</td>
<td>In development for the LC Multi-Residue Screen</td>
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<tr>
<td>PCNB</td>
<td>Chlorophenyl</td>
<td>2116</td>
<td>3</td>
<td>50</td>
<td>3</td>
<td>9</td>
<td>N/A</td>
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<tr>
<td>Dichlobenil</td>
<td>Nitrile</td>
<td>1958</td>
<td>3</td>
<td>30</td>
<td>3</td>
<td>9</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Indoxacarb</td>
<td>Oxadiazine</td>
<td>1763</td>
<td>3</td>
<td>84</td>
<td>3</td>
<td>9</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Tebuthiuron</td>
<td>Urea</td>
<td>1571</td>
<td>3</td>
<td>50</td>
<td>3</td>
<td>9</td>
<td>LC Multi-Residue Screen</td>
</tr>
<tr>
<td>Azoxystrobin</td>
<td>Methoxy-acrylate</td>
<td>1186</td>
<td>3</td>
<td>49</td>
<td>3</td>
<td>9</td>
<td>LC Multi-Residue Screen</td>
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<tr>
<td>Thiamethoxam</td>
<td>Neonicotinoid</td>
<td>866</td>
<td>3</td>
<td>17.5</td>
<td>3</td>
<td>9</td>
<td>LC Multi-Residue Screen</td>
</tr>
</tbody>
</table>
Appendix 4.

The following tables show the analytical method reporting levels and method detection limits for pesticides analyzed within screens.

**Table 1. LC Multi-Residue Screen: EMON-SM-05-037**

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Pesticide Class</th>
<th>Method Detection Limit (μg/L)</th>
<th>Reporting Limit (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetamiprid</td>
<td>Neonicotinoid</td>
<td>0.002</td>
<td>0.02</td>
</tr>
<tr>
<td>Azoxystrobin</td>
<td>Methoxy-acrylate</td>
<td>0.0012</td>
<td>0.02</td>
</tr>
<tr>
<td>Bromacil</td>
<td>Uracil</td>
<td>0.000977</td>
<td>0.02</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>Carbamate</td>
<td>0.011</td>
<td>0.02</td>
</tr>
<tr>
<td>Chlorantraniliprole</td>
<td>Anthranilic diamide</td>
<td>0.00182</td>
<td>0.02</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>Organophosphate</td>
<td>0.00123</td>
<td>0.02</td>
</tr>
<tr>
<td>Desulfynyl fipronil</td>
<td>Phenylpyrazole</td>
<td>0.0011</td>
<td>0.01</td>
</tr>
<tr>
<td>Desulfynyl fipronil amide</td>
<td>Phenylpyrazole</td>
<td>0.00244</td>
<td>0.01</td>
</tr>
<tr>
<td>Diuron</td>
<td>Substituted urea</td>
<td>0.00116</td>
<td>0.02</td>
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<tr>
<td>Fipronil</td>
<td>Phenylpyrazole</td>
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<td>0.01</td>
</tr>
<tr>
<td>Fipronil amide</td>
<td>Phenylpyrazole</td>
<td>0.00157</td>
<td>0.01</td>
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<td>Fipronil sulfide</td>
<td>Phenylpyrazole</td>
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<td>0.01</td>
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<td>Fipronil sulfone</td>
<td>Phenylpyrazole</td>
<td>0.000732</td>
<td>0.01</td>
</tr>
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<td>Imidacloprid</td>
<td>Phenylpyrazole</td>
<td>0.00135</td>
<td>0.01</td>
</tr>
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<td>Indoxacarb</td>
<td>Oxadiazine</td>
<td>0.00066</td>
<td>0.02</td>
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<td>Isoxaben</td>
<td>Benzamide</td>
<td>0.0014</td>
<td>0.02</td>
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<td>Malathion</td>
<td>Organophosphate</td>
<td>0.00103</td>
<td>0.02</td>
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<tr>
<td>Oryzalin</td>
<td>Dinitroaniline</td>
<td>0.0035</td>
<td>0.02</td>
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<td>Oxadiazinon</td>
<td>Oxadiazole</td>
<td>0.00071</td>
<td>0.02</td>
</tr>
<tr>
<td>Propiconazole</td>
<td>Triazole</td>
<td>0.00142</td>
<td>0.02</td>
</tr>
<tr>
<td>Pesticide</td>
<td>Pesticide Class</td>
<td>Method Detection Limit (μg/L)</td>
<td>Reporting Limit (μg/L)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Pyraclostrobin</td>
<td>Methoxy-carbamate</td>
<td>0.000535</td>
<td>0.02</td>
</tr>
<tr>
<td>Pyriproxyfen</td>
<td>Pyridine</td>
<td>0.00114</td>
<td>0.015</td>
</tr>
<tr>
<td>Tebuthiuron</td>
<td>Urea</td>
<td>0.003</td>
<td>0.02</td>
</tr>
<tr>
<td>Thiamethoxam</td>
<td>Neonicotinoid</td>
<td>0.001</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**Table 2. Dinitroaniline Screen: EMON-SM-05-006**

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Pesticide Class</th>
<th>Method Detection Limit (μg/L)</th>
<th>Reporting Limit (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxyfluorfen</td>
<td>Dinitroaniline</td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>Pendimethalin</td>
<td>Dinitroaniline</td>
<td>0.012</td>
<td>0.05</td>
</tr>
<tr>
<td>Prodimine</td>
<td>Dinitroaniline</td>
<td>0.012</td>
<td>0.05</td>
</tr>
<tr>
<td>Trifluralin</td>
<td>Dinitroaniline</td>
<td>0.014</td>
<td>0.05</td>
</tr>
<tr>
<td>Chlorfenapyr</td>
<td>Pyrrole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3. Phenoxy Screen: EMON-SM-05-012**

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Pesticide Class</th>
<th>Method Detection Limit (μg/L)</th>
<th>Reporting Limit (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>Phenoxy</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Dicamba</td>
<td>Benzoic acid</td>
<td>0.017</td>
<td>0.05</td>
</tr>
<tr>
<td>MCPA</td>
<td>Phenoxy</td>
<td>0.022</td>
<td>0.05</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Pyridine</td>
<td>0.02</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**Table 4. Pyrethroid Screen: EMON-SM-05-022**

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Pesticide Class</th>
<th>Method Detection Limit (μg/L)</th>
<th>Reporting Limit (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifenthrin</td>
<td>Pyrethroid</td>
<td>0.00091</td>
<td>0.001</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>Pyrethroid</td>
<td>0.00146</td>
<td>0.002</td>
</tr>
<tr>
<td>Cypermethrin</td>
<td>Pyrethroid</td>
<td>0.00154</td>
<td>0.005</td>
</tr>
<tr>
<td>Deltamethrin/Tralomethrin</td>
<td>Pyrethroid</td>
<td>0.00177</td>
<td>0.005</td>
</tr>
<tr>
<td>Fenvalerate/Esfenvalerate</td>
<td>Pyrethroid</td>
<td>0.00166</td>
<td>0.005</td>
</tr>
<tr>
<td>Pesticide</td>
<td>Pesticide Class</td>
<td>Method Detection Limit (µg/L)</td>
<td>Reporting Limit (µg/L)</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------</td>
<td>------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Lambda-cyhalothrin</td>
<td>Pyrethroid</td>
<td>0.00174</td>
<td>0.002</td>
</tr>
<tr>
<td>Permethrin cis</td>
<td>Pyrethroid</td>
<td>0.00105</td>
<td>0.002</td>
</tr>
<tr>
<td>Permethrin trans</td>
<td>Pyrethroid</td>
<td>0.00105</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Table 5. Sediment Pyrethroid Screen: EMON-SM-52-9

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Pesticide Class</th>
<th>Method Detection Limit (µg/kg)</th>
<th>Reporting Limit (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifenthrin</td>
<td>Pyrethroid</td>
<td>0.108</td>
<td>1</td>
</tr>
<tr>
<td>Cyfluthrin</td>
<td>Pyrethroid</td>
<td>0.183</td>
<td>1</td>
</tr>
<tr>
<td>Cypermethrin</td>
<td>Pyrethroid</td>
<td>0.107</td>
<td>1</td>
</tr>
<tr>
<td>Deltamethrin/Tralomethrin</td>
<td>Pyrethroid</td>
<td>0.0661</td>
<td>1</td>
</tr>
<tr>
<td>Fenvalerate/Esfenvalerate</td>
<td>Pyrethroid</td>
<td>0.0661</td>
<td>1</td>
</tr>
<tr>
<td>Lambda-cyhalothrin</td>
<td>Pyrethroid</td>
<td>0.115</td>
<td>1</td>
</tr>
<tr>
<td>Permethrin cis</td>
<td>Pyrethroid</td>
<td>0.116</td>
<td>1</td>
</tr>
<tr>
<td>Permethrin trans</td>
<td>Pyrethroid</td>
<td>0.135</td>
<td>1</td>
</tr>
</tbody>
</table>

*Full analytical methods are available at: Analytical Method Page on CDPR Website*