Santa Clara Valley
*Urban Runoff*
Pollution Prevention Program

# Watershed Monitoring and Assessment Program

## Integrated Monitoring Report Executive Summary

*Water Years 2014 - 2019*

Submitted in compliance with Provision C.8.h.v of NPDES Permit No. CAS612008, Order No. R2-2015-049

**March 31, 2020**

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# Table E.1. Water Year 2019 Creek Status Monitoring Station Summary Table

In compliance with provision C.8.h.v(1), this table of all Creek Status Monitoring stations sampled by SCVURPPP in Water Year 2019 is provided immediately following the Table of Contents.

| Map ID [1] | Station ID | Watershed | Creek Name | Land Use | Latitude | Longitude | Probabilistic | Targeted | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bioassess, Nutrients, General WQ | Chlorine | Pesticides & Toxicity | Temp [2] | Cont WQ [3] | Pathogen Indicators |
| 60 | 205GUA060 | Guadalupe River | Los Gatos Creek | U | 37.29092 | -121.93516 | X | X | | | | |
| 251 | 205GUA251 | Guadalupe River | Alamitos Creek | U | 37.23306 | -121.87054 | X | X | | | | |
| 4378 | 205R04378 | Guadalupe River | Los Gatos Creek | U | 37.21641 | 121.98787 | X | X | | | | |
| 4395 | 205R04395 | Lower Penitencia Cr | Arroyo de los Coches | U | 37.27497 | -122.74731 | X | X | | | | |
| 4418 | 205R04418 | Coyote Creek | Thompson Creek | U | 37.29241 | -121.76800 | X | X | | | | |
| 4530 | 205R04530 | Coyote Creek | Upper Silver Creek | U | 37.29709 | -121.79408 | X | X | | | | |
| 4537 | 205R04537 | Coyote Creek | Thompson Creek | U | 37.274966 | -121.74731 | X | X | | | | |
| 4591 | 205R04591 | San Tomas Aquino | San Tomas Aquino | U | 37.39046 | -121.96851 | X | X | | | | |
| 4602 | 205R04602 | San Tomas Aquino | Wildcat Creek | U | 37.26485 | -122.01930 | X | X | | | | |
| 4614 | 205R04614 | San Tomas Aquino | San Tomas Aquino | U | 37.27361 | -121.98240 | X | X | | | | |
| 4638 | 205R04638 | Guadalupe River | Guadalupe Creek | U | 37.228257 | -121.90358 | X | X | | | | |
| 4670 | 205R04670 | San Thomas Aquino | Saratoga Creek | U | 37.25077 | -122.05510 | X | X | | | | |
| 455 | 205COY455 | Coyote Creek | Coyote Creek | U | 37.166314 | -121.64775 | X | X | | | | |
| 4274 | 205R04247 | Stevens Creek | Stevens Creek | U | 37.325439 | -122.06068 | X | X | | | | |
| 4271 | 205R04271 | Stevens Creek | Stevens Creek | NU | 37.3051 | -122.15480 | X | X | | | | |
| 4317 | 205R04317 | Coyote Creek | Coyote Creek | U | 37.16628 | -121.63747 | X | X | | | | |
| 4359 | 205R04359 | Adobe Creek | Adobe Creek | U | 37.42889 | -122.10522 | X | X | | | | |
| 4383 | 205R04383 | San Francisquito Cr | San Francisquito Cr | U | 37.45462 | -122.16078 | X | X | | | | |
| 4479 | 205R04479 | San Tomas Aquino | Saratoga Creek | U | 37.35448 | -121.97338 | X | X | | | | |
| 70 | 205STE070 | Stevens Creek | Stevens Creek | U | 37.30275 | -122.07486 | X | X | | | | |
| 033 | 205LGA033 | Guadalupe River | Los Gatos Creek | U | 37.29516 | -121.93337 | | | | | | X |
| 400 | 205LGA400 | Guadalupe River | Los Gatos Creek | U | 37.23869 | -121.97088 | | | | | | X |
| 450 | 205LGA420 | Guadalupe River | Los Gatos Creek | U | 37.22024 | -121.98303 | | | | | | X |
| 330 | 205COY330 | Coyote Creek | Coyote Creek | U | 37.29027 | -121.81831 | | | | | | X |
| 392 | 205COY392 | Coyote Creek | Coyote Creek | U | 37.23504 | -121.76105 | | | | | | X |
| 190 | 205GUA190 | Guadalupe River | Guadalupe Creek | U | 37.24373 | -121.87561 | | | | X | | |
| 202 | 205GUA202 | Guadalupe River | Guadalupe Creek | U | 37.23291 | -121.89795 | | | | X | | |
| 210 | 205GUA210 | Guadalupe River | Guadalupe Creek | U | 37.21746 | -121.91039 | | | | X | | |
| 218 | 205GUA218 | Guadalupe River | Guadalupe Creek | U | 37.2028 | -121.88845 | | | | X | | |

| Map ID [1] | Station ID | Watershed | Creek Name | Land Use | Latitude | Longitude | Probabilistic | Targeted | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bioassess, Nutrients, General WQ | Chlorine | Pesticides & Toxicity | Temp [2] | Cont WQ [3] | Pathogen Indicators |
| 250 | 205GUA250 | Guadalupe River | Alamitos Creek | U | 37.23363 | -121.87058 | | | | X | | |
| 255 | 205GUA255 | Guadalupe River | Alamitos Creek | U | 37.22607 | -121.85842 | | | | X | | |
| 262 | 205GUA262 | Guadalupe River | Alamitos Creek | U | 37.22041 | -121.84516 | | | | X | | |
| 270 | 205GUA270 | Guadalupe River | Alamitos Creek | U | 37.20129 | -121.82891 | | | | X | | |
| 279 | 205GUA279 | Guadalupe River | Alamitos Creek | U | 37.17409 | -121.82409 | | | | X | | |
| 235 | 205COY235 | Coyote Creek | Coyote Creek | U | 37.3536 | -121.87417 | | | | | X | |
| 236 | 205COY236 | Coyote Creek | Coyote Creek | U | 37.35098 | -121.87378 | | | | | X | |
| 239 | 205COY239 | Coyote Creek | Coyote Creek | U | 37.33722 | -121.86953 | | | | | X | |
| 021 | 205STE021 | San Tomas Aquino | Stevens Creek | U | 37.40982 | -122.06905 | | | X | | | |
| 010 | 205STQ010 | San Tomas Aquino | San Tomas Aquino | U | 37.38863 | -121.96853 | | | X | | | |

U = urban, NU = non-urban

[1] Map ID applies to Figure 1.2. of Part B of this Integrated Monitoring Report.

[2] Temperature monitoring was conducted continuously (i.e., hourly) April through September.

[3] Continuous water quality monitoring (temperature, dissolved oxygen, pH, specific conductivity) was conducted during two 2-week periods (spring and late summer).

# EXECUTIVE SUMMARY

This Integrated Monitoring Report (IMR) was prepared by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP or Program), on behalf of its 15 member agencies (13 cities/towns, the County of Santa Clara, and the Santa Clara Valley Water District) SCVURPPP member agencies are subject to the National Pollutant Discharge Elimination System (NPDES) stormwater permit for Bay Area municipalities referred to as the Municipal Regional Permit (MRP). The MRP was first adopted by the San Francisco Regional Water Quality Control Board (SFRWQCB or Regional Water Board) on October 14, 2009 as Order R2-2009-0074 (SFRWQCB 2009; referred to as MRP 1.0). On November 19, 2015, the Regional Water Board updated and reissued the MRP as Order R2-2015-0049 (SFRWQCB 2015; referred to as MRP 2.0).

This IMR fulfills the requirements of provision C.8.h.v of MRP 2.0 for comprehensively interpreting and reporting all monitoring data collected since the previous IMR - Water Years[1] (WYs) 2014 through 2019. The previous IMR included data collected during WYs 2012 and 2013 (SCVURPPP 2014). Data presented in this report were also submitted in electronic SWAMP-comparable formats by SCVURPPP to the Regional Water Board on behalf of SCVURPPP Permittees and pursuant to Provision C.8.h.ii of MRP 2.0.

Provision C.8.a (Compliance Options) of the MRP allows Permittees to address monitoring requirements through a "regional collaborative effort," their countywide stormwater program, and/or individually. On behalf of Co-permittees, SMCWPPP conducts creek water quality monitoring and monitoring projects in in collaboration with the Bay Area Stormwater Management Agency Association (BASMAA) Regional Monitoring Coalition (RMC), and actively participates in the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP), which focuses on assessing Bay water quality and associated impacts.

Monitoring data were collected in accordance with the BASMAA RMC Quality Assurance Project Plan (QAPP; BASMAA 2016a) and the BASMAA RMC Standard Operating Procedures (SOPs; BASMAA 2016b). Where applicable, and in compliance with Provision C.8.b of MRP 2.0, methods described in the QAPP and SOP are comparable with methods specified by the California Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Program Plan (QAPrP).

The IMR consists of five "Parts" (A-E) that address the various sub-provisions of MRP Provision C.8 (Water Quality Monitoring). Monitoring results and recommendations for future monitoring, which are fully described in IMR Parts A-D, are summarized in this Executive Summary. Additionally, a summary of the costs and benefits of monitoring conducted in compliance with provision C.8 is also provided.

- Part A: San Francisco Estuary Receiving Water Monitoring
- Part B: Creek Status and Pesticides & Toxicity Monitoring
- Part C: Stressor/Source Identification Projects
- Part D: Pollutants of Concern Monitoring
- Part E: Monitoring Costs and Benefits Summary

[1] Most hydrologic monitoring occurs for a period defined as a Water Year, which begins on October 1 and ends on September 30 of the named year. For example, Water Year 2019 (WY 2019) began on October 1, 2018 and concluded on September 30, 2019.

## Part A: San Francisco Estuary Receiving Water Monitoring

In accordance with Provision C.8.b of MRP 1.0 and Provision C.8.c of MRP 2.0, Permittees are required to provide financial contributions towards implementing an San Francisco Bay Estuary receiving water monitoring program on an annual basis that, at a minimum, is equivalent to the monitoring conducted via the Regional Monitoring Program for Water Quality in San Francisco Bay (RMP). SCVURPPP Permittees comply with this provision by making financial contributions to the RMP. Additionally, SCVURPPP Permittee and Program staff actively participate in RMP committees, workgroups, and strategy teams, such as the Small Tributaries Loading Strategy (STLS), to help oversee RMP activities and provide input, consistent with MRP Permittee interests.

RMP activities conducted between WY 2014 and WY 2019, included:

- On-going implementation of the long-term **Status and Trends Monitoring Program**, which monitors contaminants in water, sediment, bird eggs, sport fish, and bivalves, and conducts long-term suspended sediment, nutrients, and phytoplankton monitoring.
- Pilot and Special Studies, conducted in support of the:
    - Sources, Pathways and Loadings Work Group (SPLWG);
    - Emerging Contaminants Work Group;
    - Nutrients Management Strategy;
    - Microplastics Strategy;
    - PCBs Work Group;
    - Sediment Work Group; and
    - Selenium Work Group.

## Part B: Creek Status and Pesticides & Toxicity Monitoring

Part B of the IMR comprehensively interprets and reports all Creek Status and Pesticides & Toxicity monitoring data collected since the previous IMR (SCVURPPP 2014). As such, Part B includes data collected during WY 2014 through WY 2019, with bioassessment and chlorine data also inclusive of WYs 2012 and 2013.

The RMC's creek status monitoring strategy includes both a regional ambient/probabilistic monitoring design and a local targeted monitoring design. The probabilistic monitoring design was developed to remove bias from site selection such that ecosystem conditions can be objectively assessed on local (i.e., Santa Clara Basin) and regional (i.e., RMC) scales. The targeted monitoring design focuses on sites selected based on the presence of significant fish and wildlife resources, as well as historical and/or recent indications of water quality concerns. Monitoring results are compared to "triggers" listed in the MRP. Some triggers are equivalent to regulatory Water Quality Objectives (WQOs), while others are thresholds above (or below) which potential impacts to aquatic life or other beneficial uses may occur. Sites where triggers are exceeded (or not met) are considered for future stressor/source identification (SSID) projects.

## B.1 Bioassessment

During WYs 2012 – 2019, SCUVRPPP conducted biological assessments at 160 stream sites. An additional 12 sites were monitored by the Regional Water Board during that timeframe, for a total of 172 sites. Of these sites, 168 were selected using the probabilistic design and 4 were targeted. Bioassessments include the collection of benthic macroinvertebrate and algae samples, physical habitat measurements, water chemistry (i.e., nutrient analyses) and general water quality. The California Stream Condition Index (CSCI), a statewide tool that translates benthic macroinvertebrate data into an overall measure of stream health, was used to assess biological condition.

- Of the 172 (74%) bioassessment sites, 128 (74%; including four targeted sites) received CSCI scores that were below the MRP trigger (0.795), which corresponds to the two lower condition categories *(likely altered* and *very likely altered)*. Of the 128 low--scoring sites, 113 were classified as urban. The proportion of good and very good sites varies by watershed. Figure E.1 illustrates the CSCI condition category scores for the 172 sites.

- Cumulative distribution function (CDF) curves indicate there is a 65% probability that a random stream site in Santa Clara County will have a CSCI score below the MRP trigger (i.e., *likely altered* or *very likely altered* categories). There is a 80% probability that a random *urban* site in Santa Clara County will have a CSCI score below the MRP trigger and there is a 48% probability that a random *non-urban* site will have a CSCI score below the trigger.

Ancillary parameters collected during bioassessments, such as physical habitat, nutrient concentrations, and general water quality measurements, along with watershed grouping based on land use data, were analyzed using Spearman's rank correlation and random forest models to identify stressors that likely to pose the greatest risk to stream health.

- The random forest model for CSCI scores indicates that watershed grouping along with physical habitat, and several landscape and water-quality stressors were the best predictors of condition scores. The high ranking of the watershed variable means that biological conditions stratify spatially, as well as being correlated to specific stressors.

- Results of the Santa Clara stressor assessment were similar to the RMC regional assessment. Both Santa Clara and regional CSCI scores are strongly influenced by physical habitat variables such as imperviousness in the contributing area (BASMAA 2019).

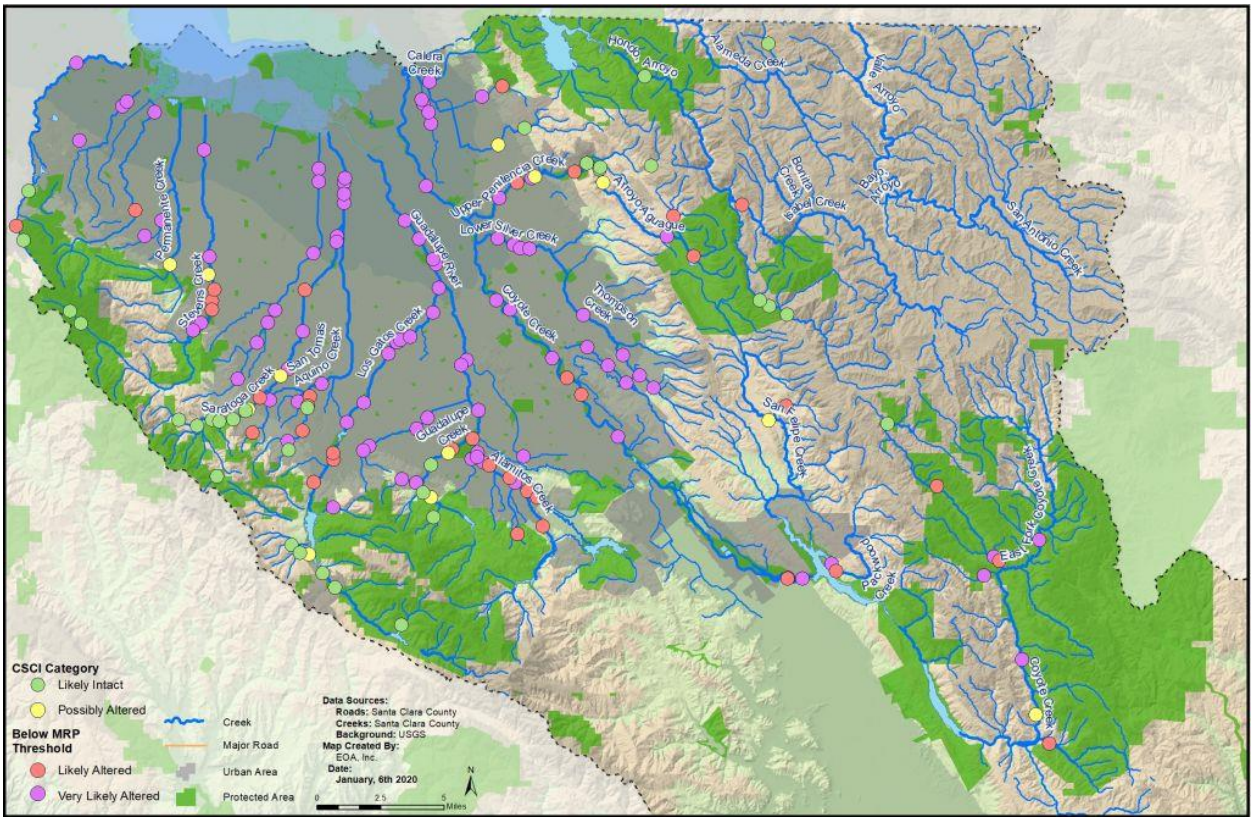


**Figure E.1. CSCI condition categories observed at 172 bioassessments in Santa Clara County, WYs 2012 – 2019.**

## B.2 Continuous Temperature and Water Quality Monitoring

Continuous monitoring of water temperature and general water quality parameters in WY 2014 through WY 2019 was conducted in compliance with Provisions C.8.c of MRP 1.0 and C.8.d.iii – iv of MRP 2.0. Hourly temperature measurements were recorded at a minimum of eight (8) sites each year from April through September. Continuous (15-minute) general water quality measurements (pH, DO, specific conductance, temperature) were recorded at three sites each year during two, two-week periods in the spring (Event 1) and the summer (Event 2). Monitoring sites were selected based on the presence of significant fish and wildlife resources as well as historical and/or recent indications of water quality concerns. The same sites were often monitored for multiple years to gain a better understanding of the range of water quality conditions that may occur over time. In some years, continuous monitoring data were used to support or follow-up on SSID investigations (Figure E.2).

Overall, continuous monitoring results indicate that temperature and specific conductivity typically increase in the downstream direction, which is also characterized by increasing urbanization in Santa Clara County watersheds. The MRP maximum weekly average temperature (MWAT) trigger threshold of 17°C is often exceeded. These temperature exceedances resulted in sites being placed on the list of candidate SSID projects, but may not be of concern in Santa Clara County because the MWAT threshold was developed for streams of the Pacific Northwest, a cooler region with inherently lower water temperatures. Other locations where the MWAT trigger was exceeded are in reaches where cold-water fish migrate, rather than reside or rear.

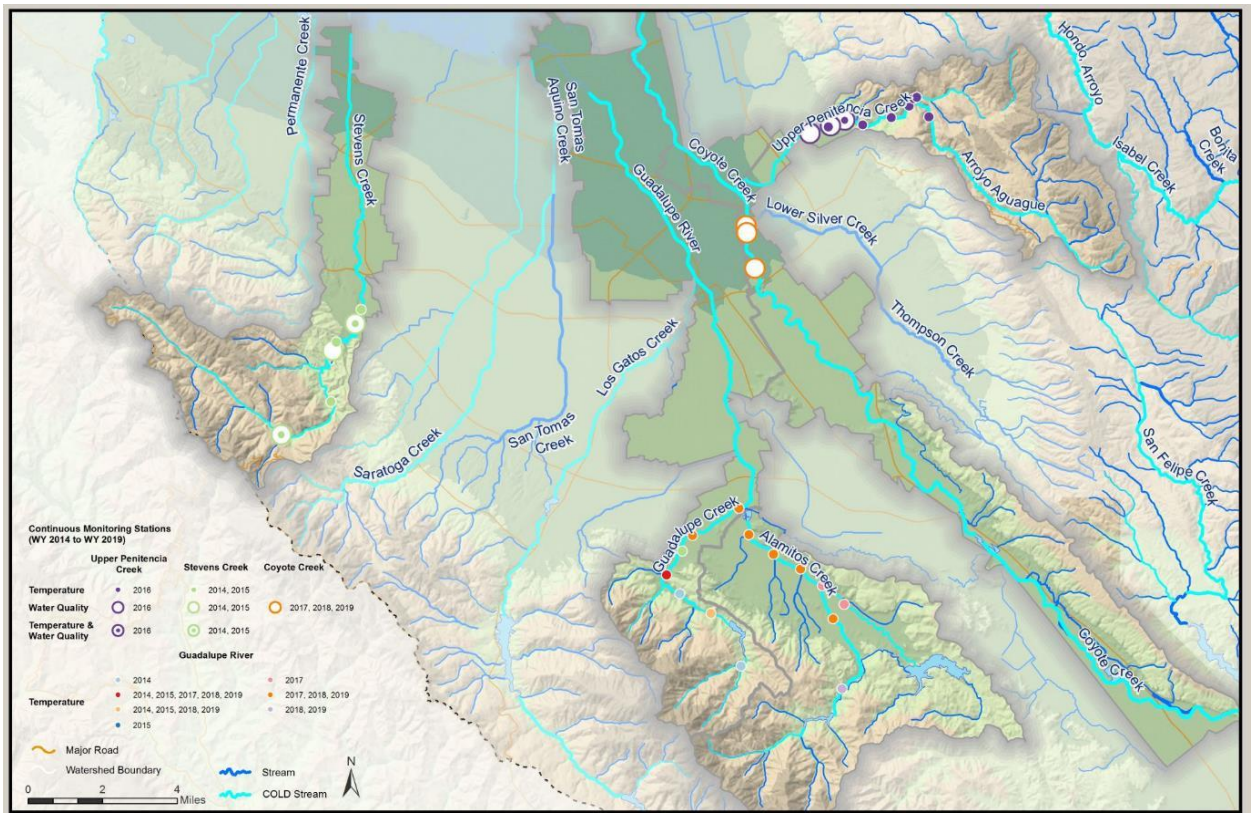


**Figure E.2. Continuous temperature and water quality monitoring stations in Santa Clara Basin, WYs 2014 – 2019.**

## B.3 Pathogen Indicator Monitoring

From WY 2014 through WY 2019, in compliance with Provisions C.8.c of MRP 1.0 and C.8.d.v of MRP 2.0, SCVURPPP collected five grab samples per year for pathogen indicator bacteria analysis. Monitoring was generally conducted at sites that, while generally could not be considered “bathing beaches,” were located within creekside parks or along trails that were considered to exhibit potential for public access to streams. Some stations were sampled in multiple years. The overall goal of pathogen indicator monitoring is to assess whether WQOs are being met and whether creeks are supportive of water contact recreation (REC-1) Beneficial Uses.

Although WQO exceedances were found in two of the six watersheds targeted, there is no evidence for large scale spatial patterns of elevated bacteria concentrations. The results suggest that pathogen indicator densities at the monitoring stations are variable. It is important to recognize that pathogen indicators do not directly represent actual pathogen concentrations and do not distinguish among sources of bacteria. Sources of pathogen indicator bacteria include homeless encampments, wildlife, livestock, pets, leaking septic systems/sanitary sewers, and regrowth of bacteria within biofilms. It is the human sources of bacteria that are associated with REC-1 health risks. As a result, the comparison of pathogen indicator results to pathogen indicator thresholds may not be appropriate and should be interpreted cautiously.

## B.4 Chlorine Monitoring

From WY 2012 through WY 2019, in compliance with Provision C.8.c of MRP 1.0 and Provision C.8.d.ii of MRP 2.0, SCVURPPP collected field measurements of total and free chlorine residual in creeks where bioassessments were conducted. While chlorine residual is generally not a concern in Santa Clara Valley urban creeks, WY 2019 and prior monitoring results suggest there are occasional free chlorine and/or total chlorine residual exceedances in the Santa Clara Basin. Trigger exceedances may be the result of a one-time potable water discharges that are difficult to trace. Furthermore, chlorine in surface waters can dissipate from volatilization and reaction with sediment and organic matter. Over the past eight years of monitoring (WY 2012 – WY 2019), there have been a total of 17 (out of 160) sites with chlorine trigger exceedances (none in WY 2019 after immediate re-sampling).

## B.5 Pesticides and Toxicity Monitoring

Toxicity testing, sediment chemistry monitoring, and water column pesticides monitoring, collectively referred to as pesticides and toxicity monitoring, was conducted during WY 2014 through WY 2019 in compliance with Provisions C.8.c of MRP 1.0 and C.8.g of MRP 2.0. There were slight differences between the two permit terms with regard to the required number of samples, toxicity test organisms, chemical constituents, and MRP triggers.

The results of pesticides and toxicity monitoring conducted from WY 2014 through WY 2019 were analyzed to identify trends at sampling locations in Santa Clara County watersheds. During this period, there were two sediment samples and four water samples with toxicity relative to the laboratory control *and* a Percent Effect exceeding the MRP evaluation criterion. There were an additional 20 test results that had significant toxicity, but with a Percent Effect that did not exceed the MRP trigger thresholds. A majority of these toxicity results were found in water samples and were associated with either *C. dubia* reproduction (10 samples), a chronic toxicity endpoint, or *H. azteca* survival (7 samples), an acute toxicity endpoint. Six of the seven water samples with toxicity to *H. azteca* were collected during wet season sampling events suggesting that stormwater runoff is affecting *H. azteca*. The water samples with toxicity to *C. dubia* were more evenly divided between wet and dry season sampling events.

Between WY 2014 and WY 2019, there was just one sediment sample with a probabe effects concentration (PEC) quotient calculated that was ≥ 1.0 for and analyte other than chromium and nickel (mercury in Alamitos Creek downstream of the former New Almaden Mercury Mining District). Excluding the naturally occurring chromium and nickel, there were eight samples with threshold effects concentration (TEC) quotients ≥ 1.0; the more conservative of the two evaluation criteria. These included legacy insecticide DDT compounds in San Tomas Aquino Creek and Lower Silver Creek; copper in Adobe Creek, San Tomas Aquino Creek, and Stevens Creek, and total PAHs in Stevens Creek. Overall, detection frequencies for bifenthrin and fipronil were on par with results from the DPR Northern California study (Ensminger 2019) and *H. azteca* toxicity responses were similar to SWAMP Stream Pollution Trend (SPoT) monitoring results in Coyote Creek and Guadalupe River (Phillips et al. 2014).

The pesticides and toxicity data collected from WYs 2014 through 2019 provide a reference to inform management decisions regarding water quality improvement in Santa Clara County watersheds and guide the planning of future monitoring in the area.

## B.6 Recommendations

Impacts to urban streams identified through creek status monitoring are likely the result of long-term changes in stream hydrology, channel geomorphology, in-stream habitat complexity, and other modifications associated with the urban development, along with pollutant discharges typically found in urban watersheds. SCVURPPP Co-permittees are actively implementing many stormwater management programs to address these and other stressors and associated sources of water quality conditions observed in local creeks, with the goal of protecting these natural resources. Through the continued implementation of MRP-associated and other watershed management programs (e.g., stream restoration and flow augmentation), SCVURPPP anticipates that stream conditions and water quality in local creeks will continue to improve over time.

Recommendations presented in Part B are directed towards the next iteration of the MRP (i.e., MRP 3.0) that is currently under development and will likely become effective in WY 2022.

- The Program recommends transitioning from the current ambient probabilistic Biological Condition Assessment monitoring design to a targeted design that would focus on specific watersheds or reaches of interest. It is anticipated that a watershed approach would provide stormwater programs more flexibility to evaluate priority areas that stakeholders want to improve, protect, and/or evaluate.

- Continuous monitoring for temperature and general water quality has been an effective tool in supporting SSID studies and evaluating cold water habitat. It can also complement targeted Biological Condition Assessments. The Program recommends continued implementation of this approach in MRP 3.0.

- Pathogen indicator monitoring is generally not informative due to the prevalence of uncontrollable sources, such as wildlife, and sources outside the scope of stormwater programs such as homelessness. Monitoring efforts for pathogen indicators should instead be used to support bacteria Total Maximum Daily Load (TMDL) action plans in the county.

- Although chlorine monitoring can be an important tool in investigating fish kills, continued chlorine monitoring is not recommended in the next MRP. Exceedances are not prevalent, and sources are generally transient and challenging to trace. Additionally, the most common source, discharges of drinking water, is already addressed by MRP Provisions C.5 (IDDE) and C.15 (Exempted and Conditionally Exempted Discharges) and the NPDES General Permit for Drinking Water Systems (Order WQ 2014-0194-DWQ), and available field equipment does not provide reliable results at the MRP threshold.

- The Program recommends no changes to the current Pesticides and Toxicity monitoring requirements until the statewide coordinated monitoring program, currently under development by the State Water Board, is in place.

## Part C: Stressor/Source Identification (SSID) Projects

In compliance with the MRP, Permittees must initiate a minimum number of SSID projects during the permit term. SSID projects are intended to identify and isolate potential sources and/or stressors associated with observed water quality concerns. These projects are intended lead to action(s) that alleviate stressors and reduce sources of pollutants. During MRP 1.0 (WYs 2012 – 2015), SCVURPPP as part of a regional collaborative, initiated three SSID projects. Two of the MRP 1.0 SSID projects were completed in WY 2013 and results were included in the previous IMR (SCVURPPP 2014). These projects addressed fish kills in Guadalupe River and reduced dissolved oxygen in Coyote Creek. The third project under MRP 1.0, Upper Penitencia Creek low CSCI scores, was completed in 2015 and is described below.

- In WY 2013, SCVURPPP initiated the Upper Penitencia Creek SSID Project by developing a work plan to investigate low creek condition scores[2] and temperature trigger exceedances. The monitoring design followed the CADDIS framework developed by the USEPA (2010). Monitoring parameters were selected to evaluate a range of potential stressors to biological condition at the two locations. One site (the "test site") is potentially affected by discharges from the Robert Gross Percolation Ponds and the second site (the "comparator site") is located upstream of the test site above the pond's outfall. Based on results of the monitoring, the reduced biological integrity observed in Upper Penitencia creek was believed to be associated with episodic streamflow due to percolation of surface flow into the underlying groundwater basin rather than operation of the percolation ponds. Therefore, the sources of stressors identified as causing poor biological condition in the study area cannot be mitigated through stormwater management.

During MRP 2.0 (WYs 2016 – 2019), SCVURPPP initiated two SSID projects and participated in one regional project. These SSID projects are briefly summarized below:

- The Coyote Creek Toxicity SSID Project was triggered by the recommended listing of Coyote Creek for toxicity in sediment in the 2016 Integrated Report (303(d) List/305(b) Report for the San Francisco Bay Region. The Coyote Toxicity SSID monitoring design included an evaluation of sediment chemistry and toxicity testing during the dry season over a two-year period (WY 2018 and WY 2019). The results of this SSID Study and review of toxicity data collected over the past 14 years suggest that sediment toxicity is generally not present in Coyote Creek. Based on these results and analyses, the Coyote Creek Toxicity SSID Project is considered complete.

- The Lower Silver SSID project was triggered by creek status/condition data suggesting that Lower Silver-Thompson Creek watershed has reduced biological integrity and relatively high nutrient concentrations. In WY 2019, SCVURPPP developed a work plan designed to investigate nutrient sources, the relationship between nutrients and biological condition, and the extent of eutrophic conditions. The project was initiated in the summer of 2019 with multiple nutrient monitoring events and will continue through WY 2020.

[2] Creek condition was assessed using the California Stream Condition Index (CSCI) and the Southern California Index of Biological Integrity (SoCal IBI). Both indices translate benthic macroinvertebrate (BMI) data into an overall assessment of stream health.

- The Regional SSID Project - Electrical Utilities as a Potential PCBs Source to Stormwater in the San Francisco Bay Area – was triggered by fish tissue monitoring in the Bay that led to the Bay being designated as impaired on the Clean Water Act (CWA) Section 303(d) list and the adoption of a TMDL for PCBs in 2008. Subsequent PCBs monitoring by the BASMAA RMC partners and the RMP suggests that diffuse sources of PCBs are present throughout the region, with one potential source being releases and spills from electrical utility equipment. The work plan, developed in WY 2018, presents a framework to investigate electrical utility equipment as a source of PCBs to urban stormwater runoff and identify appropriate actions and control measures to reduce the water quality impacts of this source. The RMC partners are currently gathering information from municipally-owned electrical utilities in the MRP area to improve current estimates of PCBs loadings to MS4s and identify opportunities to develop improved spill response and reporting procedures.

Overall, Permittees find that SSID monitoring provides valuable information. Although the SSID studies have found that the primary stressor sources are unrelated to municipal stormwater runoff and/or are inconclusive, they have resulted in a greater understanding of hydrology, water quality, and land use in the targeted watersheds, and the findings inform other aspects of stormwater management. Continuation of SSID monitoring in the next permit should be considered, with the level-of-effort determined in a manner mindful of the overall costs of Provision C.8 monitoring.

## Part D: Pollutants of Concern Monitoring

Part D of the IMR comprehensively reports and interprets all Pollutants of Concern (POC) monitoring data collected since the previous IMR (SCVURPPP 2014). This includes all POC monitoring data collected during WY 2014 through WY 2019. POC monitoring is intended to assess inputs of POCs to the Bay from local tributaries and urban runoff, provide information to support implementation of Total Maximum Daily Load (TMDL) water quality restoration plans and other pollutant control strategies, assess progress toward achieving wasteload allocations (WLAs) for TMDLs, and help resolve uncertainties associated with loading estimates for POCs. Under both MRP 1.0 and MRP 2.0, Permittees are required to monitor a number of POCs including PCBs, mercury, copper, nutrients, and other parameters of interest (e.g., pesticides, toxicity, emerging contaminants, etc.). POC monitoring under MRP 1.0 focused primarily on loads monitoring stations, while POC monitoring under MPR 2.0 focuses primarily on source identification.

POC Monitoring in the Santa Clara Valley is conducted by SCVURPPP and its water quality partners, which include the RMP and the State of California's Surface Water Ambient Monitoring Program (SWAMP) Stream Pollution Trend (SPoT) monitoring program. Figure E.3 illustrates locations of monitoring stations associated with POC monitoring conducted by SCVURPPP and its water quality partners in compliance with MRP provision C.8 in WYs 2014-2019. This figure illustrates the geographic extent of POC monitoring conducted in Santa Clara County since the previous IMR.

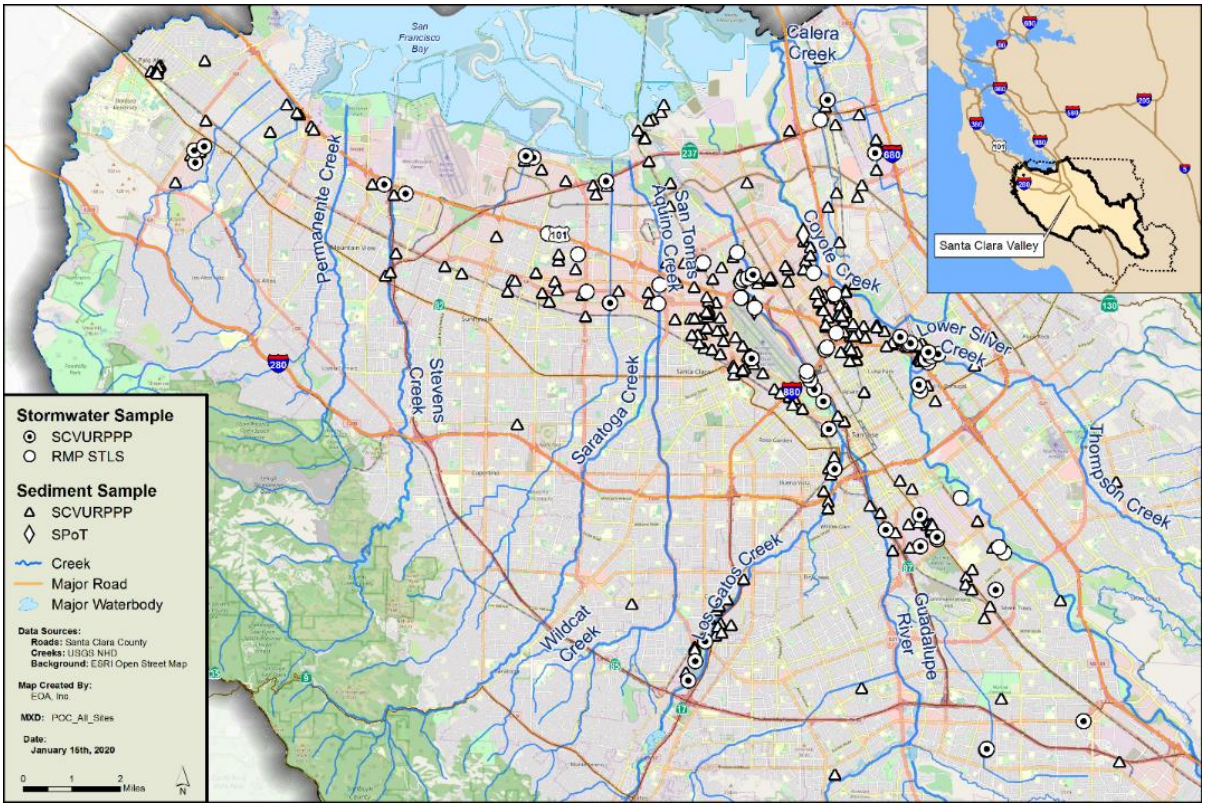


**Figure E.3. POC monitoring stations in the Santa Clara Valley, WYs 2014-2019.**

## D.1 POC Loads Monitoring Stations

Under MRP 1.0, Permittees complied with POC loads monitoring requirements through a collaboration with the BASMA RMC and RMP Small Tributaries Loading Strategy team with the establishment of “bottom-of-the watershed” stormwater monitoring stations across Bay Area Counties. Two POC loads monitoring stations were located in the Santa Clara Valley, including the Guadalupe River station and the Sunnyvale East Channel. Monitoring conducted in WY 2014 included four storms at the Guadalupe River Station, and six storms at the Sunnyvale East Channel Station. Complete results of all monitoring at the POC Loads Monitoring Stations from WY2012 through WY 2014 are presented in Gilbreath et al., (2016). The POC loads monitoring stations were mostly discontinued after WY 2014, with the exception of a single, high-intensity storm event at the Guadalupe River Station in WY 2017. McKee et al. (2018) estimated the mercury loads during this rare event represented more than half of the previously estimated average annual baseline load for the Guadalupe River. SCVURPPP will continue to support mercury monitoring at the Guadalupe River loading stations which is now conducted through the Coordinated Monitoring Program for the Guadalupe River watershed, a collaboration of entities subject to the Guadalupe River Mercury TMDL. The Program is currently working with BASMAA and the RMP STLS to determine if additional POC loading station monitoring is needed in the future to provide additional data for estimating loads to the Bay and to support evaluation and modeling of trends in POC loads to the Bay from urban stormwater runoff.

## D.2 PCBs and Mercury

### *Stormwater Load Estimates*

Provisions C.11.c and C.12.c require that Permittees submit a Reasonable Assurance Analysis (RAA) to demonstrate quantitatively that mercury reductions of at least 10 kg/yr and PCBs reductions of at least 3 kg/yr will be realized by 2040 through implementation of green infrastructure projects. As part of this RAA, the Program estimated the loading for PCBs and mercury in urban stormwater runoff from the Santa Clara Valley to the Bay. These estimates were developed by Paradigm Environmental as Phase I (baseline modeling) for the RAA. The final RAA for the Santa Clara Valley will be submitted in September 2020 with the Program's Fiscal Year 2019/20 Annual Report to the Regional Water Board.

### *POC Monitoring to Identify Sources and Source Areas*

Beginning in WY 2015, SCVURPPP and the RMP STLS began implementing an approach to POC monitoring for PCBs and mercury that focuses on screening monitoring to identify sources and source areas that contribute elevated concentrations of PCBs and/or mercury to the MS4. These areas are designated as Watershed Management Areas (WMAs), where new PCBs and mercury control measures will be implemented to reduce stormwater loads to the Bay. Starting in WY 2015 and continuing through WY 2019, both SCVURPPP and the RMP STLS have conducted screening monitoring in catchments of interest, and targeted source property investigations in catchments with elevated PCBs in street dirt, MS4 sediment, or stormwater samples. A sediment sample or stormwater particle ratio is considered elevated if it has a PCBs concentration over 0.5 mg/kg, moderately elevated from 0.2 to 0.5 mg/kg, and low or urban background below 0.2 mg/kg. PCBs concentrations above 1 mg/kg are considered confirmation of a source.

Figure E.4 presents sediment concentrations and/or particle ratios for all PCBs data collected for source identification by the Program and the RMP STLS between WY 2015 and WY 2019. These data include 332 sediment samples and 70 stormwater samples collected during both screening monitoring and during targeted source property investigations.

Overall, identifying PCBs and mercury source areas and source properties is challenging and often a multi-year process. Since WY 2015, the Program has used the screening monitoring data to identify 21 high and moderate priority WMAs. Eighteen of these priority WMAs have been targeted for source investigations, which have resulted in 11 confirmed source properties. Two of these source properties were referred to the Regional Water Board for follow-up investigation and abatement during this permit term. The remaining 9 confirmed source properties are currently under evaluation by the Program and the associated municipal jurisdictions to determine next steps. Of the 18 WMAs targeted for source property investigations, investigations were completed in 2 WMAs, and are currently ongoing in 16 WMAs. There remain 47 catchments of interest that have not yet been screened for elevated PCBs or mercury concentrations. Given the outcomes of screening monitoring and source investigations to date, the Program recommends maintaining the same yearly minimum PCBs monitoring requirements (8 samples per year) in the next MRP in order to continue to screen catchments, prioritize WMAs and conduct source property investigations as warranted. In contrast, because the baseline loading estimate for mercury indicates that the Santa Clara Valley is already achieving the San Francisco Bay TMDL WLA for mercury in urban stormwater, the Program recommends reducing mercury monitoring requirements in the next MRP.

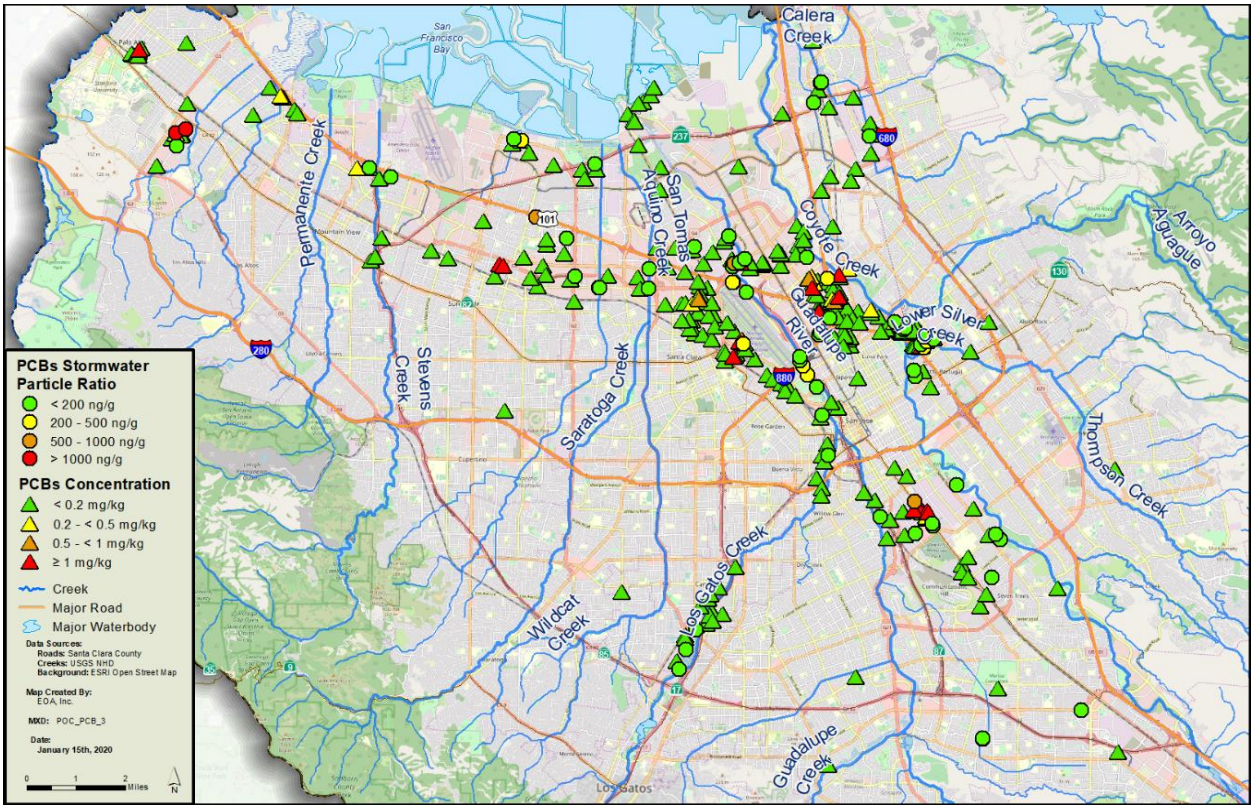


**Figure E.4. Locations and relative concentrations of PCBs measured in sediment and stormwater in the Santa Clara Valley by SCVURPPP and the RMP STLS, WYs 2015 – 2019.**

### *Other PCBs and Mercury Studies*

The Program also completed other POC Monitoring studies per MRP 2.0 requirements through participation in the following BASMAA Regional Projects:

- PCBs in Infrastructure Caulk. This project collected 20 composite samples (region-wide) of the caulks and sealants used in storm drains or roadway infrastructure in public ROWs and analyzed them for PCBs. The results found PCBs concentrations of concern to stormwater (i.e., > 50 ppm) in only one type of sample: black, pliable joint fillers from concrete bridges or roadway overpasses. All other samples were well below the 50-ppm threshold that has been established to identify caulking in building materials that require special handling during building demolition because of PCBs. The Program recommends that any further activities related to PCBs in roadway and storm drain infrastructure caulk focus on caulks and sealants found on concrete bridges and roadway overpasses.
- BMP Effectiveness Studies. This project evaluated the effectiveness of 2 types of BMPs, including (1) biochar-enhanced bioretention soil media, and (2) maintenance practices for large trash full capture devices (i.e., Hydrodynamic Separator Units, or HDS units). The results suggest that (1) biochar may increase PCBs removal in bioretention facilities, and (2) regular maintenance of HDS units increases the PCBs and mercury load reductions from stormwater catchments where these units are located. These results are currently being considered in the update to the Interim Accounting Methodology (BASMAA 2017) that is being conducted as part of a separate BASMAA regional project.

## D.3 Copper

From WY 2016 through WY 2019, in compliance with MRP 2.0 provision C.8.f, SCVURPPP collected at least two samples per year for copper analysis to address Management Question No. 4 (Loads and Status) and Management Question No. 5 (Trends). A review of the WY 2016 through WY 2019 copper dataset suggests that relatively low levels of copper are being conveyed to receiving waters from urban areas during stormwater runoff events. These data provide a relatively cost-effective check on copper discharges to tributaries to the Bay. However, copper data collected under MRP 2.0 have generally been of limited value to the Program. Copper data collected in San Francisco Bay through the RMP Status and Trends Program are more useful in tracking the effectiveness of the copper control measures required by provision C.13 of MRP 2.0 and, more importantly, the success of the Brake Pad Partnership and Senate Bill (SB) 346 which addresses the largest source of copper by requiring brake pad manufacturers to reduce the use of copper in brake pads sold in California. The Program recommends maintaining the same overall copper monitoring requirements (i.e., 20 total samples) in the next MRP, but an elimination of the yearly minimums could result in a more effective monitoring design.

## D.4 Nutrients

Nutrients were included in the MRP 2.0 POC monitoring requirements to support Regional Water Board efforts to develop nutrient numeric endpoints (NNE) for the San Francisco Bay Estuary. In WY 2016 through WY 2019, in compliance with provision C.8.f of MRP 2.0, the Program collected at least two samples per year for nutrient analysis. This monitoring addressed Management Question No. 4 (Loads and Status). A review of the WY 2016 through WY 2019 nutrient dataset suggests that nutrient concentrations are highest during storm events and generally higher at stations lower in the watershed. Nutrient data collected in compliance with provision C.8.f have been used to support Stressor/Source Identification studies investigating causes of low biological condition identified in creeks through provision C.8.c/d Creek Status Monitoring. An ongoing SSID study is being conducted in Lower Silver Creek where some of the highest nutrient concentrations have been measured. However, although nutrient samples provide a useful tool in some types of SSID projects, the Program recommends that the requirement for nutrient monitoring be removed from the POC Monitoring provision under the next MRP. The original need for nutrient sampling in tributaries to the Bay to support Regional Water Board efforts to develop NNEs for the San Francisco Bay Estuary no longer exists. This effort has now been captured and superseded by the State Water Board Biostimulatory Substances and Biological Integrity Project, which is proposing to adopt a statewide water quality objective for biostimulatory substances (such as nitrogen and phosphorus) along with a program of implementation as an amendment to the Water Quality Control Plan for Inland Surface Water, Enclosed Bays and Estuaries of California (ISWEBE Plan).

## D.5 Emerging Contaminants

Provision C.8.f of MRP 2.0 identifies three emerging contaminants that at a minimum must be addressed through POC monitoring: Perflourooctane Sulfonate Substances (PFOS), Perfluoroalkyl and Polyfluoroalkyl Sulfonate Substances (PFAS), and Alternative Flame Retardants (AFRs). POC monitoring for these emerging contaminants is being addressed through SCVURPPP's participation in the RMP. The RMP has investigated Contaminants of Emerging Concern since 2001 and established the RMP Emerging Contaminants Work Group (ECWG) in 2006. The purpose of the ECWG is to identify CECs that might impact beneficial

uses in the Bay and to develop cost-effective strategies to identify, monitor, and minimize impacts. In 2018, the RMP's ECWG initiated a multi-year special study to analyze stormwater samples collected from urban watersheds for a large suite of CECs intended to target urban runoff constituents rather than those found in wastewater (e.g., pharmaceuticals). Pilot sampling began in 2019. Under the next MRP, SCVURPPP recommends continuing support of RMP special studies that address data gaps and the scientific understanding of fate and transport of stormwater-related CECs in the Bay. In particular, the Program is supportive of continued coordination through the STLS to identify the appropriate watersheds and sampling sites for monitoring CECs through RMP special studies. The Program is also supportive of further developing conceptual and empirical models to better evaluate the distribution and sources of CECs of interest within a stormwater and watershed context.

### D.6 SPoT Program

The SWAMP SPoT program currently collects annual dry season sediments for POCs (subject to funding constraints) at two long-term monitoring sites in Santa Clara County (Coyote Creek and Guadalupe River). The goal is to monitor trends in sediment toxicity and sediment contaminant concentrations in selected large rivers throughout California, and relate contaminant concentrations and toxicity to watershed land uses. The SPoT Monitoring Program data support the investigation of long-term trends in water quality (Management Question #5 – Trends). The most recent technical report prepared by SPoT program staff was published in 2016 and describes seven-year trends from the initiation of the program in 2008 through 2014 (Phillips et al. 2016). An update to the report is anticipated in the near future. During the next MRP, the Program recommends continuing to work with the SPoT Program to conduct long-term trends monitoring.

## Part E: Monitoring Costs and Benefits Summary

MRP 2.0 Provision C.8.h.v(4) requires that Permittees include a budget summary for each monitoring requirement in the IMR. Costs expended by SCVURPPP member agencies, through contributions to the Program, from WY 2014 through WY 2019 to comply with MRP provision C.8 requirements are associated with the following:

- Monitoring program coordination and management,
- Program/project planning,
- Sample and data collection,
- Laboratory analyses,
- Quality assurance/quality control (QA/QC),
- Data evaluation and analysis,
- Data interpretation and reporting, and
- Information management.

Additionally, direct financial contributions to the RMP by SCVURPPP on behalf of Permittees and NPDES permit fee surcharges that were paid by Co-permittees during that time fame and used by the State and/or Regional Water Board to fund its State's Surface Water Ambient Monitoring Program (SWAMP) are costs expended by SCVURPPP Permittees.

Resources spent by SCVURPPP Permittees complying with water quality monitoring requirements between WY 2014 and WY 2019 were considerable (~$6.8 M over 6 years). Average annual monitoring costs during this timeframe were roughly $1.1M/year.

Monitoring activities that are funded by SCVURPPP Permittees, consistent with Provision C.8, generate information designed to answer core management questions outlined in the MRP. The Program conducted a qualitative cost-benefit evaluation of these activities based on the ability of the Program to answer these questions using the data collected between WY 2014 and WY 2019. The results of the evaluation are presented in Table E.2

**Table E.2. Qualitative cost-benefit evaluation of water quality monitoring conducted under MRP 2.0 provision C.8.**

| MRP 2.0 Subprovision | | Relative Costs of Implementing ($ - $$$$)[3] | Relative Benefit Towards Answering Core Management Questions (★ - ★★★★ ) | Evaluation Summary |
|---|---|---|---|---|
| C.8.c | San Francisco Bay Estuary Receiving Water Monitoring (RMP) | $$$$ | ★★★ | Contributions to the RMP provided useful information on the status and trends of water quality in the Bay and provided supplemental information to help SCVURPPP identify PCBs and mercury source areas for management actions. Attempts to focus RMP-led monitoring on high priority issues remains an on-going challenge due to competing interests and information needs. Overall, the RMP provides useful information to track water quality conditions in the Bay and help inform broad-scale management and policy directions based on science, but at a relatively high cost. |
| C.8.d | Creek Status Monitoring | $$$$ | ★★★ | Creek status monitoring continued to provide useful information on the status of water quality in urban creeks that receive stormwater discharges, and the biological condition of those creeks. Many parameters were monitored, however, the utility of the data that the MRP requires to be collected is variable between parameters. Some parameters have provided valuable, baseline data or helped identify concerns that should be addressed. Other parameters were less useful and did not directly assist stormwater managers in validating, refining, or adjusting current practices. The high relative costs and the variability in the usefulness of data collected via this provision suggest that refinements are needed to improve the cost-effectiveness of Creek Status Monitoring during MRP 3.0. |
| C.8.e | Stressor/Source Identification (SSID) Projects | $$ | ★★★ | SSID studies have provided useful information that is needed to help better define potential water quality concerns and identify sources of pollutants or environmental stress occurring in Santa Clara Valley streams. SSID projects have been challenging due to the lack of methods available to differentiate the causes stress and sources of pollutants/stress due to the complex and overlapping watershed/runoff processes observed in streams. The relatively moderate costs and moderate/high benefits of data collected via this provision suggest that SSID projects are cost-effective endeavors, but that refinements are needed to the methods and expectations for these studies to improve the utility of the data collected via provision C.8.e during MRP 3.0. |

[3] Qualitative categories for costs are based on the relative percentage of costs associated with each monitoring component. Costs for data management/QA and reporting were not included in the evaluation because their costs are functions of the other monitoring requirements/components. Qualitative categories are as follows:$ = 1-5%, $$ = 5-10%; $$$ = 10-15%; $$$$ = >15%.

| MRP 2.0 Subprovision | | Relative Costs of Implementing ($ - $$$$)[3] | Relative Benefit Towards Answering Core Management Questions (★ - ★★★★ ) | Evaluation Summary |
|---|---|---|---|---|
| C.8.f | Pollutants of Concern (POC) Monitoring | $$$$ | ★★★ | Monitoring conducted under provision C.8.f provided valuable data on potential sources of POCs in Watershed Management Areas (WMAs) and helped prioritize land areas for further source property evaluations. Additionally, the data collected under this provision helped further understand the geographical distribution of POCs in the urban portion of the Santa Clara Basin. Although there were high relative costs associated with POC monitoring, there was a high level of benefit associated with the data collected during MRP 2.0. Nutrient and copper monitoring were less useful in answering monitoring questions associated with these pollutants. Considerations of whether similar POC data collection efforts are predicted to be useful during MRP 3.0 should be taken before MRP 3.0 POC monitoring requirements are finalized. As source property identification efforts become less fruitful, it may be helpful to shift POC monitoring resources away from source characterization and towards other priority monitoring questions (e.g., trends and control measure effectiveness). |
| C.8.g | Pesticides and Toxicity Monitoring | $ | ★★ | There were relatively low costs expended by the Program for Pesticides and Toxicity Monitoring during MRP 2.0. Data collected via the statewide SPoT program provides important information on trends in pesticides and toxicity in stream sediments over time and helps supplement important data needs. Low costs and low/moderate benefits suggest that refinements are needed to improve the cost-benefits of the data collected via provision C.8.g during MRP 3.0. Currently a statewide effort to develop an Urban Pesticide Coordinated Monitoring Program is underway, and the Program is actively participating in this process. For SCVURPPP, the goal is to stabilize costs for pesticide/toxicity monitoring, while improving and enhancing coordination of data collection efforts on a statewide basis with the California Department of Pesticide Regulation (DRP) to fill important information gaps that will improve the regulation of pesticides that effect stormwater quality. |
| NA | NPDES Surcharge - Surface Water Ambient Monitoring Program (SWAMP) | $$ | ★ | Provided limited usefulness to local programs and stormwater managers. Benefits are not readily apparent. Moderate costs, with limited benefits. |

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