Pollutants of Concern Monitoring Report

Water Year 2017 Accomplishments and Water Year 2018 Planned Allocation of Effort



Submitted in Compliance with NPDES Permit No. CAS612008 (Order No. R2-2015-0049), Provision C.8.h.iv





A Program of the City/County Association of Governments

October 10, 2017

CREDITS

This report is submitted by the participating agencies in the



Water Pollution Prevention Program

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Prepared for:

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) 555 County Center, Redwood City, CA 94063 A Program of the City/County Association of Governments (C/CAG)

Prepared by:

EOA, Inc. 1410 Jackson St., Oakland, CA 94610



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LIST OF ABBREVIATIONS

AFR	Alternative Flame Retardant
BASMAA	Bay Area Stormwater Management Agency Association
BMP	Best Management Practice
CEC	Contaminants of Emerging Concern
CEDEN	California Environmental Data Exchange Network
CW4CB	Clean Watersheds for Clean Bay
ECWG	Emerging Contaminants Work Group of the RMP
HDS	Hydrodynamic Separator
MRP	Municipal Regional Permit
NNE	Nutrient Numeric Endpoints
NPDES	National Pollution Discharge Elimination System
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PFAS	Perfluoroalkyl Sulfonates
PFOS	Perfluorooctane Sulfonates
РОС	Pollutant of Concern
RAA	Reasonable Assurance Analysis
RMP	San Francisco Estuary Regional Monitoring Program
RWSM	Regional Watershed Spreadsheet Model
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SPoT	Statewide Stream Pollutant Trend Monitoring
SSC	Suspended Sediment Concentration
STLS	Small Tributary Loading Strategy
тос	Total Organic Carbon
UCMR	Urban Creeks Monitoring Report
WMA	Watershed Management Area
WY	Water Year

1.0 INTRODUCTION

This Pollutants of Concern (POC) Monitoring Report was prepared by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) on behalf of its member agencies 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 reissued by the San Francisco Regional Water Quality Control Board (Regional Water Board) on November 19, 2015 as Order R2-2015-0049. This report fulfills the requirements of Provision C.8.h.iv of the MRP for reporting:

- The allocation of sampling effort for POC monitoring planned for the forthcoming year (i.e., Water Year 2018¹); and
- What was accomplished for POC monitoring during the preceding Water Year (i.e., WY 2017).

In accordance with Provision C.8.h.iv, this report includes monitoring locations, number and types of samples collected, purpose of sampling (Management Questions addressed), and analytes measured. Data and interpretations will be provided in the WY 2017 Urban Creeks Monitoring Report (UCMR) which will be submitted to the Regional Water Board by March 31, 2018. Data generated from sampling of receiving waters (e.g., creeks) will be submitted to the San Francisco Bay Area Regional Data Center by March 31, 2018 for upload to the California Environmental Data Exchange Network (CEDEN). Similar reports were submitted for WY 2016 POC monitoring.

1.1. POC Monitoring Requirements

Provision C.8.f of the MRP requires monitoring of several POCs including polychlorinated biphenyls (PCBs), mercury, copper, emerging contaminants², and nutrients. Provision C.8.f specifies yearly (i.e., Water Year) and total (i.e., permit term) minimum numbers of samples for each POC. In addition, POC monitoring must address the five priority management information needs (i.e., Management Questions) identified in C.8.f:

- 1. **Source Identification** identifying which sources or watershed source areas provide the greatest opportunities for reductions of POCs in urban stormwater runoff;
- Contributions to Bay Impairment identifying which watershed source areas contribute most to the impairment of San Francisco Bay beneficial uses (due to source intensity and sensitivity of discharge location);
- 3. **Management Action Effectiveness** providing support for planning future management actions or evaluating the effectiveness or impacts of existing management actions;
- 4. Loads and Status providing information on POC loads, concentrations or presence in local tributaries or urban stormwater discharges; and

¹POC monitoring is conducted on a Water Year (WY) basis, with each WY beginning on October 1 and concluding on September 30 of the named year. For example, WY 2018 began October 1, 2017 and concludes September 30, 2018.

²Emerging contaminant monitoring requirements will be met through participation in the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) special studies. The special studies will account for relevant Contaminants of Emerging Concern (CECs) in stormwater and will address at least perfluorooctane sulfonates (PFOS), perfluoroalkyl sulfonates (PFAS), and alternative flame retardants being used to replace polybrominated diphenyl ethers (PBDEs). Bay Area Stormwater Management Agencies Association (BASMAA) representatives are working with the RMP to develop the work plan.

5. **Trends** – providing information on trends in POC loading to the Bay and POC concentrations in urban stormwater discharges or local tributaries over time.

The MRP specifies the minimum number of samples that must be collected and analyzed for each POC. For example, over the first five years of the permit, a minimum total of 80 PCBs samples must be collected and analyzed. On average 16 PCBs samples should be collected per year to meet the total requirement of 80 samples; however, the Permit requires a minimum of at least 8 PCBs samples per year. This requirement therefore gives some flexibility to collect more samples some years and less other years. The MRP also specifies the minimum number of samples for each POC that must address each Management Question. For example, by the end of year four³ of the permit term, each of the five Management Questions must be addressed with at least 8 PCBs samples. It is possible that a single sample can address more than one Management Question. POC monitoring requirements are summarized in Table 1. In addition to the required yearly and cumulative total number of samples, Table 1 lists the yearly average number of samples that would need to be analyzed to meet the total sample goal, a good benchmark to consider when planning annual sampling goals.

Other MRP provisions require studies or have information needs that could be addressed through Provision C.8.f (POC Monitoring) and for which related samples will count towards POC monitoring requirements. These other Permit provisions and their associated timelines are listed below.

- Provisions C.11.a and C.12.a require that Permittees provide a list of management areas (referred to in this report as Watershed Management Areas, or WMAs) in which new mercury and PCBs control measures will be implemented during the permit term, as well as the monitoring data and other information used to select the WMAs. Progress toward developing the list was reported on April 1, 2016 and more complete lists with identified control measures will be provided with each Annual Report. Provision C.8.f (POC Monitoring) is intended to support C.11/12 requirements by requiring monitoring directed toward source identification (i.e., identifying which WMAs provide the greatest opportunities for implementing controls to reduce loads of POCs in urban stormwater runoff and source areas within the WMAs).
- Provision C.12.e requires that Permittees collect at least 20 composite samples (region-wide) of the caulks and sealants used in storm drains or roadway infrastructure in public rights-of-way. Results of the investigation must be reported with the 2018 Annual Report, due by September 30, 2018. The Bay Area Stormwater Management Agencies Association (BASMAA) is currently conducting a regional project to assist member agencies in meeting this requirement.

1.2. Third-Party Data

Provision C.8.a.iii of the MRP allows Permittees to use data collected by third-party organizations to fulfill monitoring requirements, provided the data are demonstrated to meet the required data quality objectives. For example, samples collected in San Mateo County through the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), the Clean Watersheds for a Clean Bay (CW4CB) EPA grant-funded project, and the State's Stream Pollution Trends (SPoT) Monitoring Program may be counted by SMCWPPP towards meeting Provision C.8.f monitoring requirements.

³Note that the minimum sampling requirements addressing information needs must be completed by the end of year four of the permit; whereas, the minimum number of total samples does not need to be met until the end of year five of the permit.

Table 1. MRP monitoring requirements for POCs.

					Minimum Number of Samples That Must Be Collected for Each Information Need by the End of Year Four				
Pollutant of Concern	Media	Total Samples ^d	Yearly Minimum	Yearly Average	Source Identification	Contributions to Bay Impairment	Management Action Effectiveness	Loads and Status	Trends
PCBs	Water or sediment	80	8	16	8	8	8	8	8
Total Mercury	Water or sediment	80	8	16	8	8	8	8	8
Total & Dissolved Copper	Water	20	2	4				4	4
Nutrients ^a	Water	20	2	4				20	
Emerging Contaminants ^b									
Ancillary Parameters ^c									

^aAmmonium⁴, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, total phosphorus (analyzed concurrently in each nutrient sample).

^bMust include perfluorooctane sulfonates (PFOS, in sediment), perfluoroalkyl sulfonates (PFAS, in sediment), alternative flame retardants. The Permittee shall conduct or cause to be conducted a special study that addresses relevant management information needs for emerging contaminants. The special study must account for relevant Contaminants of Emerging Concern (CECs) in stormwater and would address at least PFOS, PFAS, and alternative flame retardants being used to replace polybrominated diphenyl ethers (PBDEs).

^cTotal Organic Carbon (TOC) should be collected concurrently with PCBs data when normalization to TOC is deemed appropriate. Suspended sediment concentration (SSC) should be collected in water samples used to assess loads, loading trends, or Best Management Practice (BMP) effectiveness. Hardness data are used in conjunction with copper concentrations collected in fresh water.

^dTotal samples that must be collected over the five-year Permit term.

⁴There are several challenges to collecting samples for "ammonium" analysis. Therefore, samples will be analyzed for total ammonia which is the sum of un-ionized ammonia (NH₃) and ionized ammonia (ammonium, NH₄₊). Ammonium concentrations will be calculated by subtracting the calculated concentration of un-ionized ammonia from the measured concentration of total ammonia. Un-ionized ammonia concentrations will be calculated using a formula provided by the American Fisheries Society that includes field pH, field temperature, and specific conductance. This approach was approved by Regional Water Board staff in an email dated June 21, 2016.

2.0 POC MONITORING ACCOMPLISHMENTS (WY 2017) AND GOALS (WY 2018)

In compliance with Provision C.8.f of the MRP, SMCWPPP conducted POC monitoring for PCBs, mercury, copper, and nutrients in WY 2017. The MRP-required yearly minimum number of samples was met or exceeded for all POCs. Table 2 lists the total number of samples collected for each POC in WY 2017, the agency conducting the monitoring, and the Management Questions addressed. Table 2 also includes this information for WY 2016 and shows cumulative progress towards the MRP minimum sample requirements. Specific monitoring stations are listed in Table 3 and Appendix A and mapped in Figure 1. The sections below describe details of the monitoring accomplished in WY 2017 and the planned allocation of effort for WY 2018. A summary of the planned allocation of effort for WY 2018 is presented in Table 4.

		Ma	anagemen	t Questio	n Address	eda	
Pollutant of Concern/ Organization	Number of Samples	1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	Sample Type and Comments
PCBs & Mercurv							
(WY 2017)							
SMCWPPP	17	17	17		17		Stormwater runoff samples to characterize catchments of interest
SMCWPPP	68	68					Upland sediment samples to identify source properties
RMP STLS	4	4	4		4		Stormwater runoff samples to characterize catchments of interest
SPoT	1					1	Sediment sample to assess trends (PCBs only, no mercury)
(WY 2016)			1				· · · ·
SMCWPPP	8	8	8		8		Stormwater runoff samples to characterize catchments of interest
RMP STLS	7	7	7		7		Stormwater runoff samples to characterize catchments of interest
CW4CB				3			BMP effectiveness samples at Bransten Road bioretention facilities
Total / MRP Minimum ^b	105 / 80	104 / 8	36 / 8	3/8	36 / 8	1/8	
Copper							
(WY 2017)							
SMCWPPP	1				1		Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
SMCWPPP	4				4		Creek water samples collected during storm event
(WY 2016)		L	L	L			
SMCWPPP	3				3		Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
Total / MRP Minimum ^b	8 / 20				8 / 4	0/4	
Nutrients							
(WY 2017)							
SMCWPPP	5				5		Creek water samples collected during storm event and following dry weather
(WY 2016)							
SMCWPPP	2				2		Water samples collected from bottom- of-the-watershed stations
Total / MRP Minimum ^b	7 / 20				7 / 20		

Table 2. SMCWPPP and Third-Party POC Monitoring Accomplishments, WY 2016 – WY 2017.

^aIndividual samples can address more than one Management Question simultaneously.

^bThe MRP overall minimum number of samples must be met by the end of the five-year permit term. The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit.



Figure 1. POC Monitoring Stations in San Mateo County, WY 2017.

Table 3. POC Monitoring Stations in San Ma	ateo County, WY 2017.
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Organization	Station Code	Sample Date	Latitude	Longitude	Matrix	PCBs	Mercury	Suspended Sediment	Total Copper	Dissolved Copper	Hardness as CaCO3	Nutrients ^a
SMCWPPP	SM-SSF-316A	12/10/2016	37.64795	-122.38726	water	х	х	х	х	х	х	
SMCWPPP	SM-SSF-317A	12/10/2016	37.64771	-122.39193	water	х	х	х				
SMCWPPP	SM-SSF-318A	12/10/2016	37.64707	-122.39234	water	х	х	х				
SMCWPPP	SM-SSF-292A	12/15/2016	37.64126	-122.40866	water	х	х	х				
SMCWPPP	SM-SSF-1001B	12/15/2016	37.64077	-122.40637	water	х	х	х				
SMCWPPP	SM-SSF-294B	12/15/2016	37.64896	-122.40178	water	х	х	х				
SMCWPPP	SM-BUR-141A	12/15/2016	37.59184	-122.36627	water	х	х	х				
SMCWPPP	SM-BUR-142A	12/15/2016	37.59183	-122.36626	water	х	х	х				
SMCWPPP	SM-BUR-1006A	12/15/2016	37.59186	-122.36628	water	х	х	х				
SMCWPPP	SM-RCY-323A	1/8/2017	37.48505	-122.23276	water	х	х	х				
SMCWPPP	SM-RCY-324A	1/8/2017	37.48355	-122.22763	water	х	х	х				
SMCWPPP	SM-SMO-89A	1/10/2017	37.54878	-122.30455	water	х	х	х				
SMCWPPP	SM-BEL-60A	2/9/2017	37.52884	-122.27823	water	х	х	х				
SMCWPPP	SM-BEL-60B	2/9/2017	37.52746	-122.27438	water	х	х	х				
SMCWPPP	SM-SMO-156A	2/20/2017	37.55662	-122.30845	water	х	х	х				
SMCWPPP	SM-SMO-408A	2/20/2017	37.55916	-122.30476	water	х	х	х				
SMCWPPP	SM-MPK-66A	3/24/2017	37.48074	-122.14501	water	х	х	х				
SMCWPPP	(68 samples. See	Appendix A for o	details.)		sediment	х	х					
SMCWPPP	204ATH010	1/9/2017	37.45973	-122.19573	water				х	х	х	х
SMCWPPP	204ATH050 ^b	1/9/2017	37.42707	-122.22752	water				х	х	х	х
SMCWPPP	204RED010	1/9/2017	37.48130	-122.22620	water				х	х	х	х
SMCWPPP	204RED010	5/22/2017	37.48130	-122.22620	water							х
SMCWPPP	204RED050 ^b	1/9/2017	37.44652	-122.23541	water				х	х	х	х
RMP STLS	290	1/8/2017	37.6442	-122.4139	water	х	х	х				
RMP STLS	296	1/8/2017	37.6508	-122.4181	water	х	х	х				
RMP STLS	Colma C/Linden	2/7/2017	37.6502	-122.4119	water	х	х	х				
RMP STLS	359	2/7/2017	37.6429	-122.3968	water	х	х	х				
SPoT	204SMA020	June 2017	37.5703	-122.3186	sediment	х						

^aAmmonia (for ammonium), nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus are analyzed concurrently in each nutrient sample.

^b204ATH050 and 204RED050 were also sampled for nutrients as part of the spring bioassessment monitoring program.

2.1. PCBs and Mercury

During WY 2017 SMCWPPP collected 17 stormwater runoff samples for PCBs and mercury analysis. Four additional stormwater runoff samples were collected in San Mateo County through the RMPs Small Tributary Loading Strategy (STLS). These combined 21 samples address Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment). Data may also be used by the RMP STLS to improve calibration of the Regional Watershed Spreadsheet Model (RWSM) which is a land use based planning tool for estimation of overall POC loads from small tributaries to San Francisco Bay at a regional scale (i.e., Management Question #4 – Loads and Status). SMCWPPP also collected 68 sediment samples to address Management Question #1 (Source Identification). One additional sediment sample was collected in San Mateo County by the SPoT program and analyzed for PCBs to address Management Question #5 (Trends).

2.1.1. SMCWPPP WY 2017 Accomplishments and WY 2018 Effort Allocation

The primary goal of PCBs and mercury monitoring conducted by SMCWPPP **in WY 2017** was to inform identification of WMAs and source properties where control measures could be implemented to comply with MRP requirements for load reductions of PCBs and mercury. There were two general approaches to PCBs and mercury monitoring implemented in WY 2017:

- SMCWPPP collected 17 storm composite samples from WMA outfalls containing high interest parcels with land uses associated with PCBs such as old industrial, electrical and recycling. WMAs were identified and prioritized for sampling by evaluating several types of data, including: PCBs and mercury concentrations from prior sediment and water sampling efforts, land use data, municipal storm drain data showing pipelines and access points (e.g., manholes, outfalls, pump stations), catchment areas delineated from municipal storm drain data, and logistical/safety consideration (SMCWPPP 2015). Station identification and sample collection were consistent with the WY 2016 POC Monitoring Plan (SMCWPPP 2016). Composite samples consisting of six to eight aliquots collected during the rising limb and peak of the storm hydrograph (as determined through field observations) were analyzed for the "RMP 40" PCB congeners (method EPA 1668C), total mercury (method EPA 1631E), and SSC (method ASTM D3977-97). One of the samples was also analyzed for total and dissolved copper (method EPA 200.8) and hardness (method SM 2340C).
- SMCWPPP collected 68 sediment samples as part of the source property investigation program. The goal of this program is to identify source properties that can be referred to the Regional Water Board for abatement. These samples were collected in the right-of-way near parcels with characteristics associated with potential PCBs use and/or in WMAs with previously observed elevated PCBs concentrations. Sample collection methods were similar to the methods implemented in WY 2015 for the reconnaissance sediment sampling program summarized in SMCWPPP (2015). Individual and composite sediment samples collected from manholes, storm drain inlets, driveways, and sidewalks were analyzed for the "RMP 40" PCB congeners (method EPA 8082), total mercury (method EPA 1631E), and total solids⁵ (method EPA 160.3M).

As stated above, WY 2017 PCBs and mercury monitoring conducted by SMCWPPP primarily focused on addressing Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment), while contributing to the regional dataset being used to address Management #3 (Loads and Status). SMCWPPP is still in the process of evaluating the above WY 2017 PCBs/mercury POC monitoring data

⁵Samples were analyzed for total solids so that dry weight calculations could be made.

and developing a plan for monitoring for these pollutants during WY 2018. SMCWPPP may collect storm composite samples from WMAs, primarily to continue informing classification of WMAs. In some cases, WMAs previously targeted may be resampled in order to confirm unexpected results and develop a more robust dataset. SMCWPPP may also collect additional sediment samples within WMAs, primarily to identify specific source properties that may eventually be referred to the Regional Water Board for investigation and abatement. Regardless of the number of stormwater vs. sediment samples collected during **WY 2018**, SMCWPPP will collect the minimum annual numbers of PCBs/mercury samples specified by the MRP (Table 1). As in recent years, SMCWPPP may collect additional samples beyond these minimums, if ongoing evaluation of the data collected to-date suggests that this would continue to be a cost-effective approach to informing development of pollutant controls. The specific coordinates for the WY 2018 samples are not yet known and will be influenced by several logistical field considerations such as tidal conditions during storm events (for storm samples), the presence of sediment that can be sampled within the storm drain system and right-of-way (for sediment samples), and ongoing review of the WY 2017 dataset.

In WY 2019, PCBs and mercury monitoring will include addressing Management Question #3 (Management Action Effectiveness) and addressing MRP Provision C.12.e through a regional project being implemented by BASMAA.

- The BASMAA "POC Monitoring Project for Source Identification and Management Action Effectiveness" includes two somewhat independent monitoring studies. The Best Management Practices (BMP) Effectiveness Study will collect a total of 32 samples (8 samples for each of the four counties subject to Provision C.8.f POC monitoring requirements) to (a) quantify PCBs and mercury load removal during maintenance of hydrodynamic separator (HDS) units and (b) identify biochar media amendments that improve PCBs and mercury load removal by bioretention BMPs. A major consideration of the study is collection of data in support of conducting the Reasonable Assurance Analysis (RAA) that is required by Provision C.12.c.iii.(3) which must be submitted with the 2020 Annual Report (September 30, 2020).
- The BASMAA PCBs in Infrastructure Caulk Study will satisfy the Provision C.12.e requirement to collect 20 composite caulk samples throughout the MRP permit area. The study will evaluate whether PCBs are present in right-of-way infrastructure caulk and sealants in the Bay Area. Summary reports for both studies are anticipated in late 2018.

Other PCBs and mercury monitoring approaches for future years are under development.

2.1.2. Third-Party WY 2017 Accomplishments and WY 2018 Effort Allocation

The **RMP's STLS** Team typically conducts annual monitoring for POCs on a region-wide basis. SMCWPPP is an active participant in the STLS and works with other Bay Area municipal stormwater programs to identify opportunities to direct RMP funds and monitoring activities towards supplementing monitoring required by the municipal stormwater permit. POC monitoring activities conducted by the STLS in recent years have focused on pollutant loading monitoring at six region-wide stations (WY 2012 – WY 2014) and wet weather characterization monitoring in catchments of interest (WY 2015 – present). In **WY 2017**, the STLS Team continued wet weather characterization sampling using a similar approach to the PCBs and mercury sampling that was implemented by SMCWPPP. Three catchments and one creek (i.e., four storm composite samples) were sampled for PCBs and mercury by the RMP's STLS in San Mateo County in WY 2017.

RMP STLS monitoring in **WY 2018** will continue to focus on wet weather characterization. The number of stations in San Mateo County that will be targeted by the STLS Team will likely be limited to two to four, some of which may be stations that were previously sampled but had unexpectedly low PCBs concentrations. In future years, RMP STLS monitoring is expected to shift towards Management Question #5 (Trends). The STLS Trends Strategy Team, initiated in WY 2015, is currently developing a regional monitoring program to assess trends in POC loading to San Francisco Bay from small tributaries. The STLS Trends Strategy will initially focus on PCBs and mercury, but will not be limited to those POCs. The preliminary design concept includes additional monitoring at one or two of the region-wide loadings stations to gain a better understanding of the variability in PCBs concentrations/loadings in the existing dataset. However, uncertainties about the utility of developing a trends monitoring program that targets just one or two watersheds coupled with unknowns about how to extrapolate findings to the region has prompted the Trends Strategy Team to delay monitoring and focus instead on identifying practical modeling approaches. STLS Trends monitoring is not anticipated to commence before WY 2019.

The **SPot Monitoring Program** conducts annual dry season monitoring (subject to funding constraints) of sediments collected from a statewide network of large rivers. The goal of the SPoT Program is to investigate long-term trends in water quality (Management Question #5 – Trends). Sites are targeted in bottom-of-the-watershed locations with slow water flow and appropriate micromorphology to allow deposition and accumulation of sediments, including a station near the mouth of San Mateo Creek. In most years, sediments are analyzed for PCBs, mercury, toxicity, pesticides, and organic pollutants (Phillips et al. 2014). In WY 2017, SPoT monitoring in San Mateo Creek did not include mercury but samples were analyzed for PCBs. It is anticipated that the full monitoring program will resume in WY 2018. 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 late 2018.

2.2. Copper

In WY 2017, SMCWPPP collected one copper sample from a storm drain outfall concurrently with one of the PCBs and mercury storm composite samples. Four additional samples were collected during a large storm event at upstream and downstream locations in two creeks (Atherton Creek and Redwood Creek). The goal of this approach is to address Management Question #4 (Loads and Status) by characterizing copper concentrations in stormwater runoff from highly urban catchments. A similar allocation of effort (i.e., four samples) and sampling approach is planned for WY 2018. If possible, two of the four samples will be collected concurrently with Provision C.8.g.iii Wet Weather Pesticides and Toxicity Monitoring. At this time, the specific watersheds that will be targeted has not yet been determined. The process for identifying watersheds will include land use analysis and logistical considerations related to stream access and field crew safety.

2.3. Nutrients

Nutrients were included in the POC monitoring requirements to support Regional Water Board efforts to develop nutrient numeric endpoints (NNE) for the San Francisco Bay Estuary. The "Nutrient Management Strategy for San Francisco Bay" is part of a statewide initiative to address nutrient overenrichment in State waters (Regional Water Board 2012). The suite of nutrients required in the MRP (i.e., ammonium, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus) closely reflects the list of analytes measured by the RMP and BASMAA partners at the six regional loading stations (including a San Mateo County station at the Pulgas Creek Pump Station in the City of San Carlos) monitored in WY 2012 and WY 2013. The prior data were used by the Nutrient Strategy Technical Team to develop and calibrate nutrient loading models. In WY 2017, POC monitoring for nutrients in San Mateo County was conducted at four stations (upstream and downstream locations in two creeks: Atherton Creek and Redwood Creek) during a large storm event. Follow-up monitoring at all four stations was attempted during the dry season concurrent with bioassessment monitoring; however, one of the lower stations was dry when the field crew returned in the spring. Two of the three dry season samples are not counted towards Provision C.8.f POC monitoring requirements because they apply instead to Provision C.8.d Creek Status Monitoring. All sampling results will be assessed in the POC interpretive report to be submitted with the Urban Creeks Monitoring Report by March 31, 2018. Nutrient monitoring addresses Management Question #4 (Loads and Status).

A minimum of two nutrient samples will be collected in WY 2018, likely from bottom-of-the-watershed locations in mixed land-use watersheds. If possible, due to the association of nutrient concentrations with storm runoff, samples will be collected concurrently with Provision C.8.g.iii Wet Weather Pesticides and Toxicity Monitoring. At this time, the specific watersheds that will be targeted are unknown. The process for identifying watersheds will include land use analysis and logistical considerations related to stream access and field crew safety.

2.4. Emerging Contaminants

Emerging contaminant monitoring is being addressed through SMCWPPP participation in the RMP. The RMP has been investigating Contaminants of Emerging Concern (CECs) since 2001 and established the RMP Emerging Contaminants Work Group (ECWG) in 2006. The purpose of the ECWG is to identify CECs that have the potential to impact beneficial uses in the Bay and to develop cost-effective strategies to identify and monitor, and minimize impacts. The RMP published a CEC Strategy "living" document in 2013 (Sutton et al. 2013; Sutton and Sedlak 2015) and updated the document in 2015 (Sutton and Sedlak 2015). The CEC Strategy document guides RMP special studies on CECs using a tiered risk and management action framework.

In 2018 the RMP STLS plans to implement a special study that will inform ECWG's planning activities related to alternative flame retardants (AFRs). The STLS study will compile and review available polybrominated diphenyl ether (PBDE) stormwater data and conceptual models and will report on the strengths and weaknesses of the available models for addressing AFR information needs in relation to stormwater. Details of the emerging contaminant special study are still being developed.

			Mana	gement (Question	Addre	essed ^a	
Pollutant of Concern/ Organization	Planned Number of Samples (WY 2018)	Yearly Minimum	1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	Sample Type and Comments
PCBs & Mercu	ıry							
SMCWPPP	TBD		Х	Х		Х		Stormwater runoff samples primarily to characterize catchments of interest
SMCWPPP	TBD	8	Х					Urban sediment samples primarily to identify source properties
RMP STLS	2 to 4	0	Х	Х		Х		Stormwater runoff samples primarily to characterize catchments of interest
SPoT	1						Х	Long-term trends monitoring program (sediment samples from creek bed)
Copper								
SMCWPPP	4	2				Х		Copper analyzed on a subset of PCBs/Hg stormwater runoff samples and in large watersheds during storm events
Nutrients								
SMCWPPP	4	2				Х		Water samples collected from bottom-of-watershed stations

Table 4. Summary of Planned Allocation of POC Monitoring Effort in San Mateo County, WY 2018.

^aIndividual samples can address more than one Management Question simultaneously.

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Appendix A

SMCWPPP Sediment Monitoring Stations, WY 2017

Appendix A. SMCWPPP Sediment Monitoring Stations, WY 2017.

Station Code	Sample Date	Latitude	Longitude
SM-SMC-01-A	3/27/2017	37.41451	-122.19379
SM-EPA-02-F	3/27/2017	37.47300	-122.13140
SM-EPA-02-F	3/27/2017	37.47314	-122.13084
SM-EPA-02-G	3/27/2017	37.47029	-122.13244
SM-EPA-02-G	3/27/2017	37.47029	-122.13359
SM-EPA-02-H	3/27/2017	37.47194	-122.13406
SM-MPK-02-D	3/27/2017	37.48592	-122.18493
SM-МРК-02-E	3/27/2017	37.48525	-122.18228
SM-RCY-10-D	3/27/2017	37.48571	-122.18474
<u>SM-МРК-05-В</u>	3/27/2017	37.47939	-122.15569
SM-МРК-05-А	3/27/2017	37.48209	-122.16096
SM-МРК-05-А	3/27/2017	37.48220	-122.16156
SM-RCY-10-C	3/27/2017	37.48581	-122.18504
SM-RCY-10-E	3/27/2017	37.48510	-122.18221
SM-RCY-07-D	3/28/2017	37.48532	-122.21334
SM-SMC-06-I	3/28/2017	37.48415	-122.20792
SM-RCY-12-B	3/28/2017	37.48430	-122.21787
SM-SMC-06-J	3/28/2017	37.48349	-122.20874
SM-SMC-06-J	3/28/2017	37.48338	-122.20886
SM-RCY-12-B	3/28/2017	37.48432	-122.21799
SM-SMC-06-G	3/28/2017	37.48285	-122.20546
SM-SMC-06-D	3/28/2017	37.48393	-122.20670
SM-SMC-06-L	3/28/2017	37.48256	-122.20875
SM-SMC-06-L	3/28/2017	37.48259	-122.20886
SM-SMC-06-H	3/28/2017	37.48278	-122.20531
SM-SMC-06-K	3/28/2017	37.48396	-122.20634
SM-SMC-06-F	3/28/2017	37.48291	-122.20734
SM-RCY-12-A	3/28/2017	37.48444	-122.21848
SM-SMC-06-E	3/28/2017	37.48384	-122.20653
SM-RCY-12-E	3/28/2017	37.48477	-122.21957
SM-RCY-12-F	3/28/2017	37.48551	-122.21624
SM-SCS-01-N	3/30/2017	37.51686	-122.26358
SM-SCS-06-C	3/30/2017	37.49746	-122.24638

Samples analyzed for PCBs and mercury.

Station Code	Sample Date	Latitude	Longitude			
SM-SCS-06-F	3/30/2017	37.49768	-122.24626			
SM-SCS-06-D	3/30/2017	37.49733	-122.24555			
SM-SCS-06-G	3/30/2017	37.49776	-122.24615			
SM-SCS-01-G	3/30/2017	37.51664	-122.26351			
SM-SCS-01-L	3/30/2017	37.51528	-122.26202			
SM-SCS-06-H	3/30/2017	37.49942	-122.24278			
SM-SCS-01-M	3/30/2017	37.51397	-122.26382			
SM-SCS-06-B	3/30/2017	37.49690	-122.24589			
SM-SCS-06-I	3/30/2017	37.50158	-122.24354			
SM-SCS-06-A	3/30/2017	37.49630	-122.24495			
SM-RCY-12-C	3/30/2017	37.48438	-122.21774			
SM-SCS-06-E	3/30/2017	37.49614	-122.24537			
SM-SCS-01-J	4/3/2017	37.51818	-122.26392			
SM-SCS-01-H	4/3/2017	37.51623	-122.26455			
SM-SCS-01-I	4/3/2017	37.51798	-122.26386			
SM-SCS-05-A	4/3/2017	37.50645	-122.25071			
SM-SCS-05-B	4/3/2017	37.50686	-122.25492			
SM-SSF-01-E	4/3/2017	37.65864	-122.39130			
SM-SSF-01-G	4/3/2017	37.66241	-122.38908			
SM-SSF-01-I	4/3/2017	37.65870	-122.38012			
SM-SSF-04-C	4/3/2017	37.64613	-122.40198			
SM-SSF-04-D	4/3/2017	37.64450	-122.40173			
SM-SSF-04-E	4/3/2017	37.64608	-122.40147			
SM-RCY-05-C	4/5/2017	37.51088	-122.20749			
SM-SSF-06-H	4/5/2017	37.64240	-122.41370			
SM-SSF-03-D	4/5/2017	37.65253	-122.40025			
SM-SSF-06-G	4/5/2017	37.64073	-122.41731			
SM-SSF-02-D	4/5/2017	37.66313	-122.39876			
SM-SCS-06-L	4/5/2017	37.50021	-122.24113			
SM-SSF-06-I	4/5/2017	37.64212	-122.41325			
SM-SSF-06-F	4/5/2017	37.64299	-122.41425			
SM-SSF-02-C	4/5/2017	37.66440	-122.39508			
SM-SSF-02-C	4/5/2017	37.66248	-122.39600			
SM-SSF-02-F	4/5/2017	<u>37.6618</u> 9	-122.39608			
SM-SMO-07-C	4/5/2017	37.55518	-122.30716			