SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

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Submitted via email and by upload to Water Board FTP site on October 15, 2018

October 15, 2018

Bruce Wolfe, Executive Officer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: Submittal of *SMCWPPP Pollutants of Concern Monitoring Report, Water Year 2018 Accomplishments and Water Year 2019 Planned Allocation of Effort*, dated October 15, 2018

Dear Mr. Wolfe:

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), a program of the City/County Association of Governments of San Mateo County (C/CAG), is pleased to submit the attached report entitled *Pollutants of Concern Monitoring Report, Water Year 2018 Accomplishments and Water Year 2019 Planned Allocation of Effort*, dated October 15, 2018. This report was prepared on behalf of all of C/CAG's member agencies in compliance with Municipal Regional Permit (MRP; Order No. R2-2015-0049) Provision C.8.h.iv. As such, this report describes the allocation of sampling effort for pollutants of concern (POC) monitoring for the forthcoming year and what was accomplished for POC monitoring during the preceding water year. The report includes Water Year (WY) 2018 POC monitoring locations, number and types of samples collected, purpose of sampling, and analytes measured. Data and interpretations will be submitted by March 31, 2019 with the annual Urban Creeks Monitoring Report. Exact POC monitoring locations for WY 2019 are under development based on SMCWPPP's on-going efforts to identify likely PCBs and mercury source properties.

I certify under penalty of law that the attached report was prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my enquiry of the person or persons who manage the system, or those directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, please call me at (650) 599-1419.

Sincerely,

Matthew Fabry

Matthew Fabry, P.E.
Program Manager

CC: Tom Mumley, Janet O'Hara, and Richard Looker, SF Bay Regional Water Board

Attachment: *SMCWPPP Pollutants of Concern Monitoring Report, Water Year 2018 Accomplishments and Water Year 2019 Planned Allocation of Effort*, dated October 15, 2018

Pollutants of Concern Monitoring Report

Water Year 2018 Accomplishments and Water Year 2019 Planned Allocation of Effort

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

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

A Program of the City/County Association of Governments

October 15, 2018

CREDITS

This report is submitted by the participating agencies in the

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
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City of Brisbane
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City of San Carlos
City of San Mateo
City of South San Francisco
Town of Woodside
County of San Mateo
San Mateo County Flood Control District

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:

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1410 Jackson St., Oakland, CA 94610

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AFR	Alternative Flame Retardant
BASMAA	Bay Area Stormwater Management Agencies 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
POC	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
TOC	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 2019[1]); and
- What was accomplished for POC monitoring during the preceding Water Year (i.e., WY 2018).

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 2018 Urban Creeks Monitoring Report (UCMR) which will be submitted to the Regional Water Board by March 31, 2019. 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, 2019 for upload to the California Environmental Data Exchange Network (CEDEN).

1.1. POC Monitoring Requirements

Provision C.8.f of the MRP requires monitoring of several POCs including polychlorinated biphenyls (PCBs), mercury, copper, emerging contaminants[2], 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;
2. **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

[1]POC 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.

[2]Emerging 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 and implement the work plans.

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 five year permit term, 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 gives 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 four[3] 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 numbers 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 develop and maintain 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 are provided with each Annual Report, beginning with the 2016 Annual Report that was submitted on September 30, 2016. 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. To achieve compliance with Provision C.12.e, MRP Permittees agreed to collectively conduct this sampling via the Bay Area Stormwater Management Agencies Association (BASMAA).

- Provisions C.11.c and C.12.c require that Permittees submit a Reasonable Assurance Analysis 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. Although these provisions will be met through modeling, POC monitoring focused on management action effectiveness may help inform development and calibration of the models. To learn more about the effectiveness of selected stormwater treatment controls, MRP Permittees are collectively conducting monitoring studies through BASMAA.

[3]Note 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.

Pollutant of Concern	Media	Total Samples [d]	Yearly Minimum	Yearly Average	Minimum Number of Samples That Must Be Collected for Each Information Need by the End of Year Four				
					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]	--	--	--	--	--	--	--	--	--

[a] Ammonium[4], nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, total phosphorus (analyzed concurrently in each nutrient sample).

[b] Must 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).

[c] Total 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.

[d] Total samples that must be collected over the five-year Permit term.

[4] There 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 (NH_3) and ionized ammonia (ammonium, NH_{4+}). 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.

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 used by SMCWPPP to help address Provision C.8.f monitoring requirements.

2.0 POC MONITORING ACCOMPLISHMENTS (WY 2018) AND GOALS (WY 2019)

In compliance with Provision C.8.f of the MRP, SMCWPPP conducted POC monitoring for PCBs, mercury, copper, and nutrients in WY 2018. 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 2018, the agency conducting the monitoring, and the Management Questions addressed. Table 2 also includes this information for WYs 2016 and 2017 and shows cumulative progress towards the MRP minimum sample requirements. Specific monitoring stations (if applicable) are listed in Table 3 and Appendix A and mapped in Figure 1. The sections below describe details of the monitoring accomplished in WY 2018 and the planned allocation of effort for WY 2019. A summary of the planned allocation of effort for WY 2019 is presented in Table 4.

Table 2. SMCWPPP and Third-Party POC Monitoring Accomplishments, WY 2016 – WY 2018.

Pollutant of Concern/ Organization	Number of Samples	Management Question Addressed [a]					Sample Type and Comments
		1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
PCBs & Mercury							
(WY 2018)							
SMCWPPP	13	13	13	--	13	--	Stormwater runoff samples to characterize WMAs
SMCWPPP	57	57	--	--	--	--	Upland sediment samples to identify source properties
BASMAA	5	5	--	--	--	--	Regional public infrastructure caulk/sealant samples (1/4 of project total)
BASMAA	8	--	--	8	--	--	Regional HDS unit & biochar effectiveness study (1/4 of project total)
RMP STLS	2	2	2	--	2	2	Stormwater runoff re-samples to characterize WMAs
SPoT	1	--	--	--	--	1	Sediment sample to assess trends (mercury only, no PCBs)
(WY 2017)							
SMCWPPP	17	17	17	--	17	--	Stormwater runoff samples to characterize WMAs
SMCWPPP	67	67	--	--	--	--	Upland sediment samples to identify source properties
RMP STLS	4	4	4	--	4	--	Stormwater runoff samples to characterize WMAs
SPoT	1	--	--	--	--	1	Sediment sample to assess trends (PCBs only, no mercury)
(WY 2016)							
SMCWPPP	8	8	8	--	8	--	Stormwater runoff samples to characterize WMAs
RMP STLS	7	7	7	--	7	--	Stormwater runoff samples to characterize WMAs
CW4CB	--	--	--	3	--	--	BMP effectiveness samples at Bransten Road bioretention facilities
Total / MRP Minimum [b]	189 / 80	180 / 8	51 / 8	11 / 8	51 / 8	3 / 8	(Note: mercury-only samples are not included in totals.)
Copper							
(WY 2018)							
SMCWPPP	4	NA	NA	NA	4	4	Creek water samples collected during storm event and following spring base flow
SPoT	1	NA	NA	NA	--	1	Sediment sample to assess trends at long-term monitoring station
(WY 2017)							
SMCWPPP	1	NA	NA	NA	1	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
SMCWPPP	5	NA	NA	NA	5	2	Creek water samples collected during storm event and following spring base flow
(WY 2016)							
SMCWPPP	3	NA	NA	NA	3	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
Total / MRP Minimum [b]	14 / 20	NA	NA	NA	13 / 4	7 / 4	
Nutrients							
(WY 2018)							
SMCWPPP	4	NA	NA	NA	4	NA	Creek water samples collected during storm event and following spring base flow
(WY 2017)							
SMCWPPP	5	NA	NA	NA	5	NA	Creek water samples collected during storm event and following spring base flow
(WY 2016)							
SMCWPPP	2	NA	NA	NA	2	NA	Water samples collected from bottom-of-the-watershed stations
Total / MRP Minimum [b]	11 / 20	NA	NA	NA	11 / 20	NA	

[a] Individual samples can address more than one Management Question concurrently.

[b] The MRP overall minimum number of samples must be met by the end of the five-year permit term (i.e., 2020). The MRP minimum number of samples for each Management Question must be met by the end of year four of the permit term (i.e., 2019).

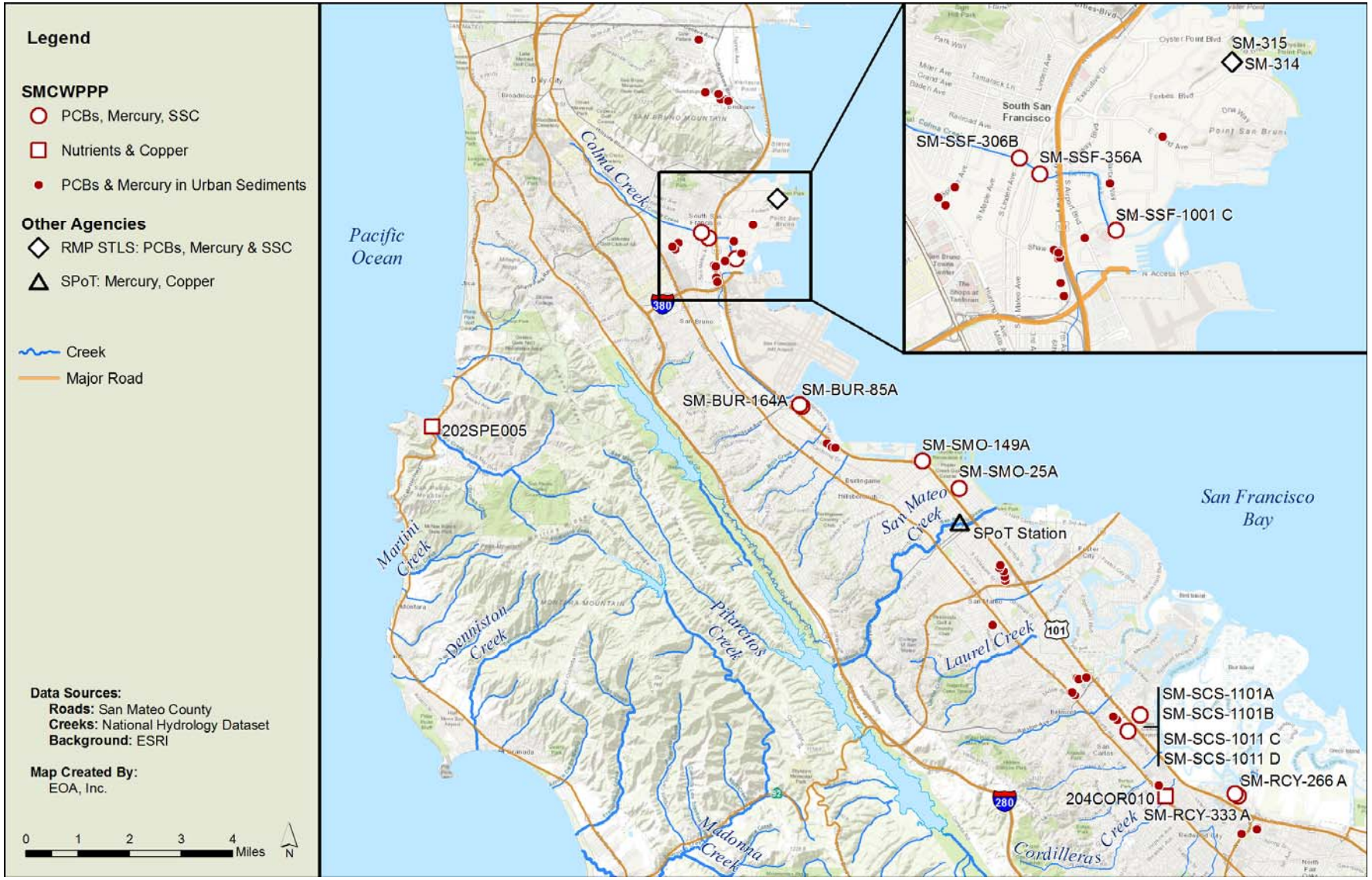

Figure 1. POC Monitoring Stations in San Mateo County, WY 2018. (BASMAA regional project sample locations are not mapped.)

Table 3. POC Monitoring Stations in San Mateo County, WY 2018. (BASMAA regional project samples are not included.)

Organization	Station Code	Sample Date	Latitude	Longitude	Matrix	PCBs	Mercury	Suspended Sediment	Total Copper	Dissolved Copper	Hardness as CaCO3	Nutrients [a]
SMCWPPP	SM-BUR-85A	1/8/2018	37.60200	-122.37508	water	x	x	x				
SMCWPPP	SM-BUR-164A	1/8/2018	37.60249	-122.37584	water	x	x	x				
SMCWPPP	SM-SCS-1101A	1/8/2018	37.51701	-122.25379	water	x	x	x				
SMCWPPP	SM-SCS-1101B	1/8/2018	37.51692	-122.25373	water	x	x	x				
SMCWPPP	SM-SMO-25A	1/8/2018	37.57970	-122.31911	water	x	x	x				
SMCWPPP	SM-SMO-149A	1/8/2018	37.58710	-122.33222	water	x	x	x				
SMCWPPP	SM-SSF-356A	1/24/2018	37.64870	-122.40909	water	x	x	x				
SMCWPPP	SM-SCS-1011 C	3/1/2018	37.5125	-122.2578	water	x	x	x				
SMCWPPP	SM-SCS-1011 D	3/1/2018	37.5124	-122.2578	water	x	x	x				
SMCWPPP	SM-RCY-266 A	3/1/2018	37.4948	-122.2187	water	x	x	x				
SMCWPPP	SM-RCY-333 A	3/1/2018	37.4955	-122.2198	water	x	x	x				
SMCWPPP	SM-SSF-1001 C	3/1/2018	37.64310	-122.3993	water	x	x	x				
SMCWPPP	SM-SSF-306B	4/6/2018	37.65024	-122.41170	water	x	x	x				
SMCWPPP	(57 samples. See Appendix A for details.)				sediment	x	x					
SMCWPPP	202SPE005	1/8/2018	37.59420	-122.50530	water				x	x	x	x
SMCWPPP	204COR010	1/8/2018	37.49450	-122.24430	water				x	x	x	x
SMCWPPP	202SPE005	5/17/2018	37.59420	-122.50530	water				x	x	x	x
SMCWPPP	204COR010	5/21/2018	37.49450	-122.24430	water				x	x	x	x
RMP STLS	SM-315	Jan. 2018 [b]	37.66033	-122.38502	water	x	x	x				
RMP STLS	SM-314	Jan. 2018 [b]	37.66033	-122.38510	water	x	x	x				
SPoT	204SMA020	June 2018 [b]	37.5703	-122.3186	sediment		x		x			

[a] Ammonia (for ammonium), nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus are analyzed concurrently in each nutrient sample.

[b] Specific sampling dates have not yet been provided by the RMP STLS and the SPoT program.

2.1. PCBs and Mercury

During WY 2018 SMCWPPP collected 13 stormwater runoff samples for PCBs and mercury analysis. Two additional stormwater runoff samples were collected in San Mateo County through the RMPs Small Tributary Loading Strategy (STLS) at stations that were previously sampled in WY 2016. These combined 15 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). In addition, the RMP STLS samples address Management Question #5 (Trends). SMCWPPP also collected 57 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 mercury to address Management Question #5 (Trends).

2.1.1. SMCWPPP Accomplishments and Goals

WY 2018 Accomplishments

As in previous years, the primary goal of PCBs and mercury monitoring conducted by SMCWPPP in WY 2018 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. There were two general approaches to PCBs monitoring implemented in WY 2018:

- SMCWPPP collected 13 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. Station identification and sample collection in WY 2018 were consistent with previous efforts (SMCWPPP 2015, 2016a, 2016b, 2017a, 2017b, 2018). 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[5] (method EPA 1668C), total mercury (method EPA 1631E), and SSC (method ASTM D3977-97).

- SMCWPPP collected 57 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 previously (SMCWPPP 2015, 2016a, 2016b, 2017a, 2017b, 2018). Individual and composite sediment samples collected from manholes, storm drain inlets, driveways, and

[5] The "RMP 40" congeners include: congeners PCB-8, PCB-18, PCB-28, PCB-31, PCB-33, PCB-44, PCB-49, PCB-52, PCB-56, PCB-60, PCB-66, PCB-70, PCB-74, PCB-87, PCB-95, PCB-97, PCB-99, PCB-101, PCB-105, PCB-110, PCB-118, PCB-128, PCB-132, PCB-138, PCB-141, PCB-149, PCB-151, PCB-153, PCB-156, PCB-158, PCB-170, PCB-174, PCB-177, PCB-180, PCB-183, PCB-187, PCB-194, PCB-195, PCB-201, PCB-203.

sidewalks were analyzed for the "RMP 40" PCB congeners (method EPA 8082), total mercury (method EPA 1631E), and total solids[6] (method EPA 160.3M).

WY 2019 Goals

As stated above, WY 2018 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). A similar focus is planned for WY 2019 with the collection of 25 sediment sample in priority WMAs, primarily in an attempt to identify specific source properties that may eventually be referred to the Regional Water Board for investigation and abatement. The specific coordinates for the WY 2019 samples are not yet known and will be influenced by several logistical field considerations such as 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 2015 - 2018 dataset.

2.1.2. BASMAA Accomplishments

In WY 2018, SMCWPPP participated in the BASMAA "POC Monitoring Project for Source Identification and Management Action Effectiveness." This regional project includes two somewhat independent monitoring studies that were designed during WY 2017 and implemented during WY 2018. As one of four Countywide Programs subject to Provision C.8.f POC Monitoring requirements, SMCWPPP's POC monitoring accomplishments include ¼ of the total number of samples collected through this regional project (Table 2). At this time, BASMAA is not planning additional POC monitoring in WY 2019.

- The PCBs in Infrastructure Caulk Study was developed to satisfy the Provision C.12.e requirement to collect 20 composite caulk/sealant samples throughout the MRP permit area and evaluate (at a screening level) whether PCBs are present in right-of-way infrastructure caulk and sealants in the Bay Area. This study also addresses Management Question #1 (Source Identification). In WY 2018, the BASMAA project team collected 54 samples of caulk/sealant materials from ten types of roadway and storm drain infrastructure on a "blind" basis (i.e., participating municipalities remained anonymous). The individual samples were grouped by structure type and sample appearance (color and texture) into 20 composites and analyzed for the RMP 40 PCB congeners using a modified method EPA 8270C. The final project report was included with SMCWPPP's FY 2017/18 Annual Report. Because these samples were collected on a blind basis, they are not mapped in Figure 1; nor are coordinates listed in Table 3.

- The Best Management Practices (BMP) Effectiveness Study was developed to satisfy Provision C.8.f requirements to collect at least 8 PCBs and mercury samples that address Management Question #3 (Management Action Effectiveness). A major consideration of the study was 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). In WY 2018 the BASMAA project team collected a total of 34 samples. Results of the study will be summarized in a report that will be submitted with SMCWPPP's WY 2018 Urban Creeks Monitoring Report by March 31, 2019.

[6]Samples were analyzed for total solids so that dry weight calculations could be made.

- Eight of the samples consisted of sediment and leaf debris collected from hydrodynamic separator (HDS) unit sumps during regularly scheduled cleanouts to evaluate the PCBs and mercury load reduction effectiveness of these units. The HDS unit samples were analyzed for the RMP 40 PCB congeners (method EPA 1668C), total mercury (method EPA 1631E), and total solids[7] (method EPA 160.4M).

- Twenty-six of the samples consisted of influent/effluent pairs from column tests of biochar-enhanced bioretention soil media (BSM). Stormwater from two sites during two storm events was run through six columns with five different biochar-enhanced BSM mixes and one standard BSM as a control to evaluate which mix was most effective at removing PCBs and mercury. Dilutions were run of two columns to assess removal efficiencies with less concentrated pollutant loads in the influent. Samples were analyzed for the RMP 40 PCB congeners (method EPA 1668C), total mercury (method EPA 1631E, SSC (method ASTM D3977-97), and total organic carbon (method EPA 9060).

2.1.3. Third-Party Accomplishments and Goals

RMP STLS

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 2018, the STLS Team continued wet weather characterization sampling using a similar approach to the PCBs and mercury sampling that was implemented by SMCWPPP. Two catchments (i.e., two storm composite samples) were sampled for PCBs and mercury by the RMP's STLS in San Mateo County in WY 2018. Both catchments were previously sampled using the same methods in WY 2016 and had unexpectedly low concentrations. Revisiting these stations in WY 2018 will help confirm prior findings and provide information on variability during different years and types of storm events.

RMP STLS monitoring in WY 2019 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 or less and, similar to WY 2018, will likely be at stations that were previously sampled but had unexpectedly low PCBs concentrations. Two to four additional stations will likely be monitored using un-manned "remote" samplers that capture suspended sediment from the water column throughout the duration of their deployment which is typically during one storm event. The STLS Team has been pilot testing these devises since WY 2015 and recently concluded that they generate data adequate for evaluating whether a WMA should be prioritized for source property investigations. 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 included 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

[7] Samples were analyzed for total solids so that dry weight calculations could be made.

delay monitoring and focus instead on identifying practical modeling approaches. STLS Trends monitoring is not anticipated to commence before WY 2020.

SPoT Monitoring Program

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 2018, SPoT monitoring in San Mateo Creek did not include PCBs but samples were analyzed for mercury, copper, pesticides, organic pollutants, and toxicity. It is unlikely that the SPoT program will include any of the POCs identified in the MRP before WY 2020 (K. Siegler personal communication, August 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 2018, SMCWPPP collected two copper samples during a large storm event at bottom-of-the-watershed stations on San Pedro Creek and Cordilleras Creek, concurrent with nutrient monitoring and Provision C.8.g.iii Wet Weather Pesticides and Toxicity Monitoring. The two sites were sampled again during dry season base flows. The goal of this approach is to address Management Question #5 (Trends) by comparing copper concentrations during different flow events. Management Question #4 (Loads and Status) is also addressed by characterizing copper concentrations in mixed-use watersheds. These data are supplemented by the SPoT sample collected in San Mateo Creek and analyzed for copper to assess long-term trends (Management Question #5).

In WY 2019, SMCWPPP is planning to collect a minimum of two copper samples. At this time, the approach to copper monitoring has not yet been determined.

2.3. Nutrients

Nutrient monitoring addresses Management Question #4 (Loads and Status). 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 over-enrichment 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 2018, POC monitoring for nutrients in San Mateo County was conducted during a large storm event at two bottom-of-the-watershed stations on San Pedro Creek and Cordilleras Creek, concurrent with nutrient monitoring and Provision C.8.g.iii Wet Weather Pesticides and Toxicity Monitoring. Follow-up monitoring at both stations was conducted during the dry season. All sampling results will be

assessed in the POC interpretive report to be submitted with the WY 2018 Urban Creeks Monitoring Report by March 31, 2019.

A minimum of two nutrient samples will be collected in WY 2019, likely from bottom-of-the-watershed locations in mixed land-use watersheds during spring baseflow. 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's 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, monitor and minimize impacts. The RMP published a CEC Strategy "living" document in 2013 and completed a full revision in 2017 (Sutton et al. 2013; Sutton and Sedlak 2015; Sutton et al. 2017). The CEC Strategy document guides RMP special studies on CECs using a tiered risk and management action framework.

Provision C.8.f of the MRP identifies three emerging contaminants that must be addressed through POC monitoring: Perflourooctane Sulfonate Substances (PFOS), Perfluoroalkyl Sulfonate Substances (PFAS), and Alternative Flame Retardants (AFRs). PFOSs are identified in the CEC Strategy as "moderate" concern due to Bay occurrence data suggesting a high probability of a low-level effect on Bay wildlife. PFASs and AFRs are identified as "possible" concern due to uncertainties in measured or predicted Bay concentrations or in toxicity thresholds. RMP staff recently published reports summarizing PFOS and PFAS monitoring results (Houtz et al. 2016; Sedlak et al. 2017; Sedlak et al. 2018).

AFRs came into use following state bans and nationwide phase-outs of polybrominated diphenyl ether (PBDE) flame retardants in the early 2000s. They include many categories of compounds, including organophosphate esters. In 2018 the RMP STLS and ECWG worked together to conduct a special study to inform ECWG's planning activities related to AFRs. The special study compiled and reviewed available data and previously developed conceptual models for PBDE to support a stormwater-related AFR conceptual model being developed by the ECWG. Organophosphate esters were prioritized for further investigation due to their increasing use, persistent character, and ubiquitous detections at concentrations exceeding PBDE concentrations in the Bay. Limited stormwater data from two watersheds in Richmond and Sunnyvale suggest that urban runoff may be an important source of these compounds. Additional monitoring and modeling were recommended. Results of the AFR special study will be published in a technical report that will be finalized by the RMP in late 2018.

In 2018, the RMP's ECWG also developed a special study proposal to analyze stormwater samples collected from urban watersheds for a large suite of CECs. The list of CECs to be analyzed is based on recent work conducted in Puget Sound streams and is intended to target urban runoff constituents rather than those found in wastewater (e.g., pharmaceuticals). The list includes PFOSs, PFASs, and AFRs. Pilot sampling will begin in WY 2019 in close coordination with the STLS.

These RMP special studies address the POC monitoring requirement for CECs that is included in MRP provision C.8.f.

Table 4. Summary of Planned Allocation of POC Monitoring Effort in San Mateo County, WY 2019.

Pollutant of Concern/ Organization	Planned Number of Samples (WY 2019)	Yearly Minimum	Management Question Addressed [a]					Sample Type and Comments
			1. Source Identification	2. Contributions to Bay Impairment	3. Management Action Effectiveness	4. Loads and Status	5. Trends	
PCBs & Mercury								
SMCWPPP	25		X	--	--	--	--	Urban sediment samples primarily to attempt to identify source properties
RMP STLS	up to 2		X	X	--	X	--	Stormwater runoff samples primarily to characterize & classify WMAs
RMP STLS	2 to 4		X	X	--	X	--	Suspended sediment samples collected with remote devices to classify WMAs
SPoT	1		--	--	--	--	X	Long-term trends monitoring program (sediment samples from creek bed)
Copper								
SMCWPPP	4	2	--	--	--	X	--	TBD
Nutrients								
SMCWPPP	4	2	--	--	--	X	--	Water samples collected from bottom-of-watershed stations

[a] Individual samples can address more than one Management Question simultaneously.

3.0 REFERENCES

Houtz, E.F., Sutton, R., Park, J-S., and Sedlak, M. (2017). Poly- and perfluoroalkyl substances in wastewater: Significance of unknown precursors, manufacturing shifts, and likely AFFF impacts. Water Research v. 95, pp. 142-149.

Phillips BM, Anderson B.S., Siegler K, Voorhees J, Tadesse D, Webber L, Breuer, R. (2016). Spatial and Temporal Trends in Chemical Contamination Relative to Land Use in California Watersheds: Stream Pollution Trends (SPoT) Monitoring Program. Fourth Report - Seven-Year Trends 2008-2014. California State Water Resources Control Board, Sacramento, CA. SWAMP-MR-2016-0008.

Phillips, B.M., Anderson, B.S., Siegler, K., Voorhees, J., Tadesse, D., Webber, L., Breuer, R. (2014). Trends in Chemical Contamination, Toxicity and Land Use in California Watersheds: Stream Pollution Trends (SPoT) Monitoring Program. Third Report – Five-Year Trends 2008-2012. California State Water Resources Control Board, Sacramento, CA.

San Francisco Regional Water Quality Control Board (Regional Water Board) (2012). San Francisco Bay Nutrient Management Strategy.

San Francisco Regional Water Quality Control Board (Regional Water Board) (2015). San Francisco Bay Region Municipal Regional Stormwater NPDES Permit. Order R2-2015-0049, NPDES Permit No. CAS612008. November 19, 2016. 152 pp plus Attachments A-G.

SMCWPPP (2015). PCBs and Mercury Source Area Identification, Water Year 2015 POC Monitoring Report. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 2015.

SMCWPPP (2016a). Progress Report: Identification of Watershed Management Areas for PCBs and Mercury. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. April 1, 2016.

SMCWPPP (2016b). Identifying Management Areas and Controls for Mercury and PCBs in San Mateo County Stormwater Runoff. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 30, 2016.

SMCWPPP (2017a). Urban Creeks Monitoring Report, Water Quality Monitoring, Water Year 2016 (October 2015 – September 2016). Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. March 31, 2017.

SMCWPPP (2017b). Control Measure Plan for PCBs and Mercury in San Mateo County Stormwater Runoff. Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. September 30, 2017.

SMCWPPP (2018). Urban Creeks Monitoring Report, Water Quality Monitoring, Water Year 2017 (October 2016 – September 2017). Prepared for San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) by EOA, Inc., Oakland, California. March 31, 2018.

Sedlak, M.D., Benskin, J.P., Wong, A., Grace, R., and Greig, D.J. (2017). Per and polyfluoroalkyl substances (PFASs) in San Francisco Bay wildlife: Temporal trends, exposure pathways, and notable presence of precursor compounds. Chemosphere v. 185, pp. 1217-1226.

Sedlak, M.D., Sutton, R., Wong, A., Lin, D. (2018). Per and polyfluoroalkyl substances (PFASs) in San Francisco Bay: Synthesis and Strategy. San Francisco Estuary Institute, Richmond, CA. Contribution # 867. 130 pages.

Sutton, R. and Sedlak, M. (2015). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. 2015 Update. San Francisco Estuary Institute, Richmond, CA. Contribution # 761.

Sutton, R., Sedlak, M., Sun, J., and Lin, D. (2017). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. 2017 Revision. San Francisco Estuary Institute, Richmond, CA. Contribution # 851.

Sutton, R., Sedlak, M., and Yee, D. (2013). Contaminants of Emerging Concern in San Francisco Bay: A Strategy for Future Investigations. San Francisco Estuary Institute, Richmond, CA. Contribution # 700.

Appendix A

SMCWPPP Sediment Monitoring Stations, WY 2018

Appendix A. SMCWPPP Sediment Monitoring Stations, WY 2018.

Samples analyzed for PCBs and mercury.

Station	Date	Latitude	Longitude
SM-BEL-60-A	5/22/2018	37.526993	-122.276095
SM-BEL-60-B	5/22/2018	37.526668	-122.275683
SM-BEL-60-C	5/22/2018	37.522969	-122.277902
SM-BEL-60-D	5/22/2018	37.522809	-122.277763
SM-BEL-60-D	5/22/2018	37.523037	-122.278022
SM-BEL-60-E	5/22/2018	37.5222	-122.276836
SM-BEL-60-F	5/22/2018	37.522953	-122.278493
SM-BEL-60-G	5/22/2018	37.527093	-122.272933
SM-RCY-12-G	5/22/2018	37.484196	-122.217151
SM-SCS-01-O	5/22/2018	37.515383	-122.261795
SM-SCS-01-P	5/22/2018	37.516427	-122.263084
SM-SCS-06-M	5/22/2018	37.497227	-122.246878
SM-SCS-06-N	5/22/2018	37.497311	-122.246622
SM-BUR-03-C	5/23/2018	37.590872	-122.364552
SM-BUR-03-C	5/23/2018	37.590661	-122.364125
SM-BUR-03-D	5/23/2018	37.590434	-122.363043
SM-BUR-03–E	5/23/2018	37.59032	-122.363048
SM-BUR-03-F	5/23/2018	37.59119	-122.365172
SM-BUR-03-G	5/23/2018	37.590977	-122.365022
SM-BUR-03-H	5/23/2018	37.591336	-122.365468
SM-BUR-03-H	5/23/2018	37.591577	-122.365934
SM-BUR-03-I	5/23/2018	37.590487	-122.364085
SM-SMO-07-D	5/23/2018	37.557557	-122.303384
SM-SMO-07-E	5/23/2018	37.554022	-122.302067
SM-SMO-07-F	5/23/2018	37.55515	-122.30259
SM-SMO-07-G	5/23/2018	37.555132	-122.302342
SM-SMO-07-H	5/23/2018	37.556744	-122.302723
SM-SMO-07-I	5/23/2018	37.557572	-122.304395
SM-SMO-07-J	5/23/2018	37.558402	-122.30395

Station	Date	Latitude	Longitude
SM-SMO-09-A	5/23/2018	37.541565	-122.306363
SM-SSF-01-J	5/24/2018	37.6527	-122.393674
SM-SSF-03-E	5/24/2018	37.647922	-122.400215
SM-SSF-03-F	5/24/2018	37.644486	-122.396903
SM-SSF-03-G	5/24/2018	37.644578	-122.39694
SM-SSF-03-H	5/24/2018	37.644632	-122.39747
SM-SSF-05-C	5/24/2018	37.640126	-122.406533
SM-SSF-05-D	5/24/2018	37.637738	-122.406178
SM-SSF-05-E	5/24/2018	37.640901	-122.406476
SM-SSF-05-E	5/24/2018	37.641021	-122.407102
SM-SSF-05-F	5/24/2018	37.640251	-122.406331
SM-SSF-05-G	5/24/2018	37.640724	-122.406516
SM-SSF-05-H	5/24/2018	37.636425	-122.405719
SM-SSF-07-B	5/24/2018	37.647219	-122.419811
SM-SSF-07-C	5/24/2018	37.645336	-122.42094
SM-SSF-07-C	5/24/2018	37.646108	-122.421831
SM-BRI-02-B	5/29/2018	37.687983	-122.405842
SM-BRI-02-C	5/29/2018	37.687858	-122.404411
SM-BRI-02-D	5/29/2018	37.689748	-122.411432
SM-BRI-02-G	5/29/2018	37.687807	-122.405924
SM-BRI-02-H	5/29/2018	37.689328	-122.40681
SM-BRI-02-H	5/29/2018	37.689407	-122.406673
SM-BRI-02-I	5/29/2018	37.687428	-122.403162
SM-DCY-01-A	5/29/2018	37.704266	-122.41417
SM-DCY-01-A	5/29/2018	37.704499	-122.414149
SM-RCY-07-E	5/29/2018	37.486037	-122.21158
SM-RCY-07-F	5/29/2018	37.485541	-122.211913
SM-SSF-04-G	5/29/2018	37.642299	-122.403231